Award-Winning Energy Technologies

In Japan, several energy-related foundations have established energy grand prize and awarding programs to recognize outstanding innovative energy-related technologies in their respective fields.

With the supervision of METI (Ministry of Economy, Trade and Industry) and the courtesy of relevant foundations and award-winning companies, this chapter introduces the technologies by the recent winners of these awards.

The awards of the energy technologies and the awarding organizations are as follows:

Energy Conservation Grand Prize Award:	ECCJ(Energy Conservation Center, Japan)
Demand Side Management Award:	HPTCJ(Heat Pump and Thermal Storage Technology Center of Japan)
Cogeneration Grand Prise Award:	ACEJ(Advanced Cogeneration and Energy Utilization Center JAPAN)
New Energy Grand Prise:	New Energy Foundation (NEF)

Award-Winning Technology Contents

Top Menu

Nissan Motor Co., Ltd. Tochigi Plant

Challenge for energy saving in the melting production process of cast iron

Features

This is the electricity reduction activity of holding furnace in the melting production process of cast iron.

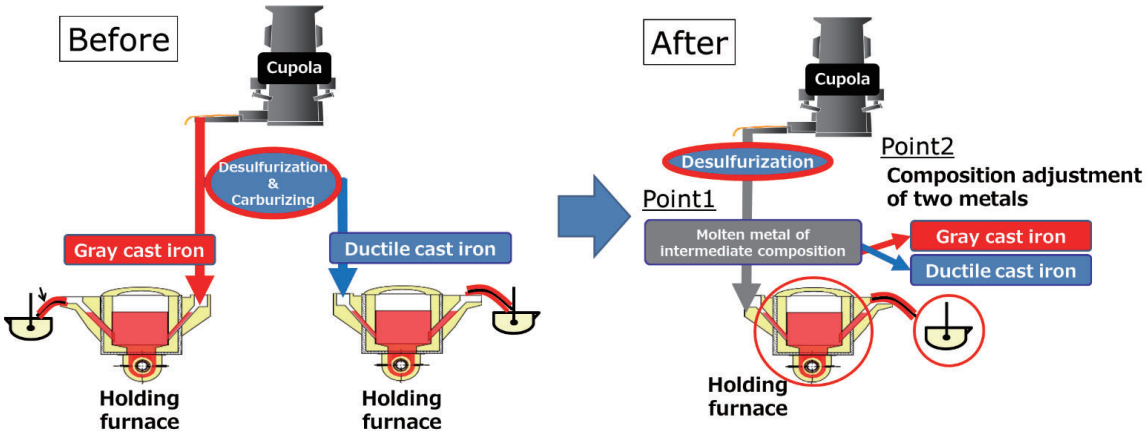
- By adjusting the composition ratio of iron melted in a cupola, we made two kinds of molten metals. The molten metals were stored by two holding furnaces, and were supplied to each factory.
- We adjust the composition ratio when molten metals are supplied, and we make two kinds of molten metals. As result, we were able to stop usage of one holding furnace.
- Electricity reduction effect:3,564MWh/year (crude oil:897kℓ CO_2: 1,693t) It is equivalent to 45% of electricity usage of the holding furnace on the fourth cast iron factory in Nissan Motor Co., Ltd. Tochigi Plant.

Basic Concept or Summary

Nissan Motor Co., Ltd. established the mid-term environment plan “Nissan·Green·Program 2022” and is coping with four environment problems: Climate change, Resources dependence, Atmosphere quality and aquatic resources. In Tochigi Plant, we are reducing CO_2 emissions caused by manufacture, and this case is one of our CO_2 emissions reduction activities.

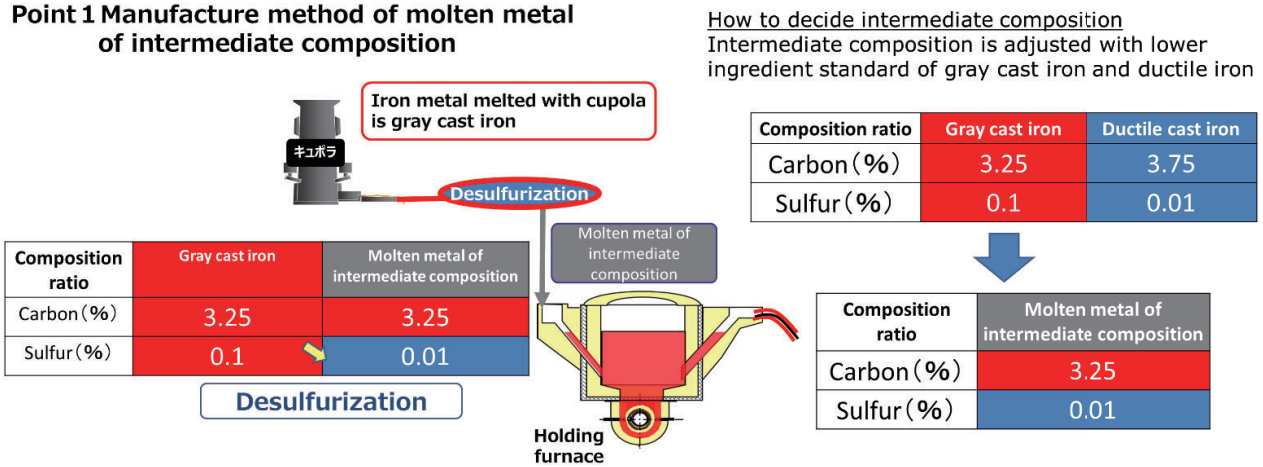
Summary

Different molten metal materials are used depending on the production parts. The Gray cast iron is generated by melting by cupola. And the ductile cast iron is generated by removing sulfur and adding carbon from the gray cast iron. These materials were stored by each holding furnace. When there is a decrease in production, energy loss increases when two holding furnaces are operating. So we made two changes and stopped usage of one holding furnace.



Point1 Manufacture method of molten metal of intermediate composition

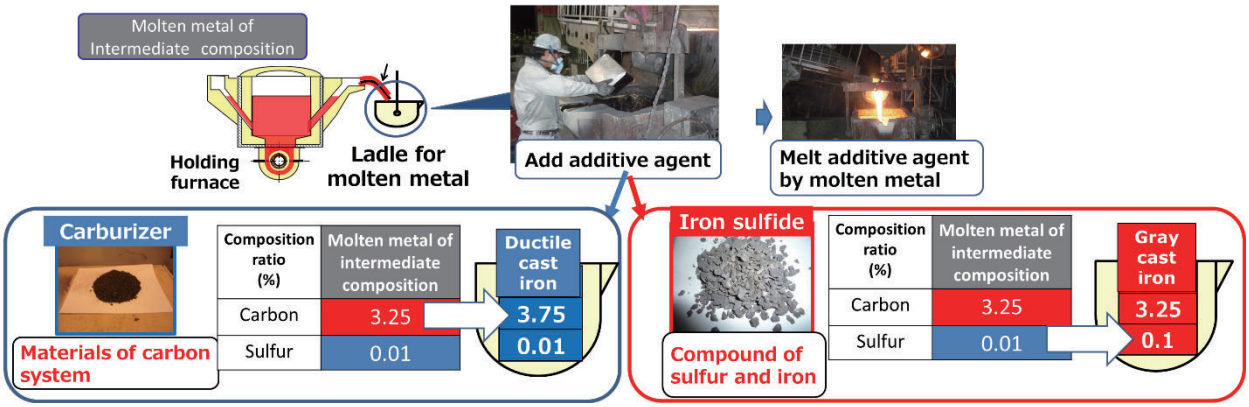
We make molten metal of the intermediate composition by desulfurizing iron melted with cupola, and it is stored by a holding furnace. To adjust the composition ratio by adding additive agents, the intermediate composition should first be adjusted with the lower ingredient standard of the gray cast iron and ductile cast iron.



Point2 Composition adjustment of two metals

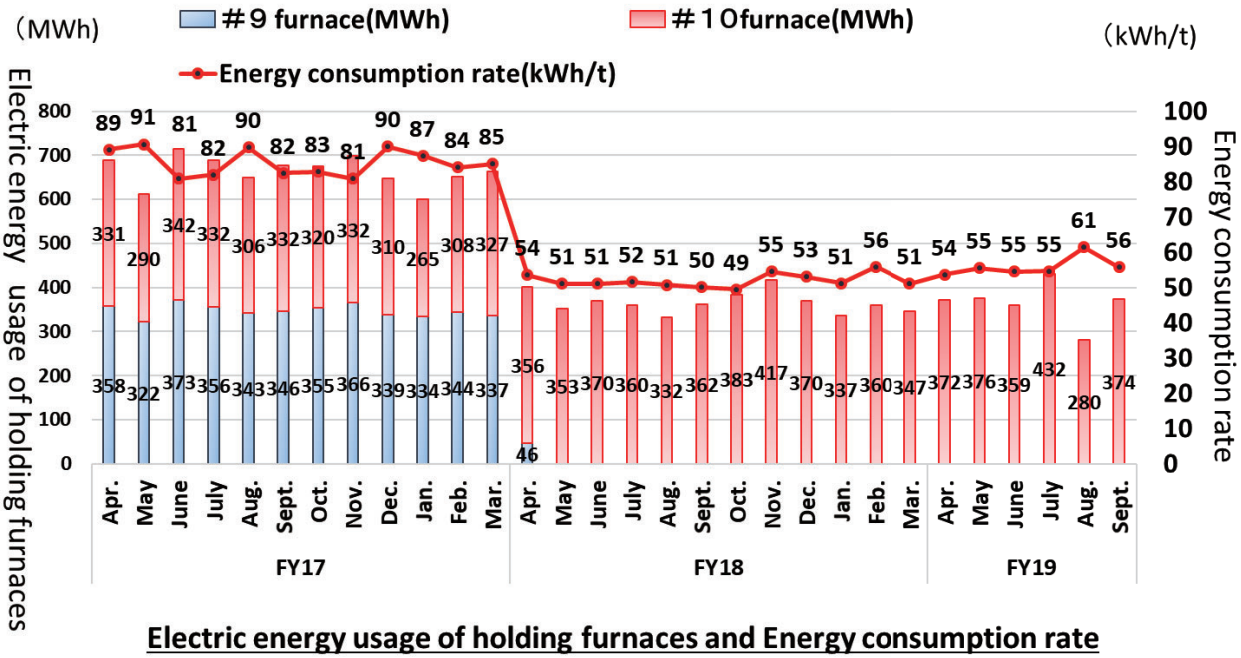
We add carburizer for making ductile cast iron, and add iron sulfide (compound of sulfur and iron) for making gray cast iron from molten metal of the intermediate composition. By changing the additive agent depending on the kind of molten metal, we can make two kinds of molten metals from one holding furnace.

Point2 Composition adjustment of two metals



Effects or Remarks

- Electricity reduction effect: 297kWh/month 3,564MWh/year (crude oil:897kℓ CO_2: 1,693t)
- Awards
  Director General Prize of Agency of Natural Resources and Energy (small group activity)
  at the 2019 Energy Conservation Grand Prize (supported by Ministry of Economy, Trade and Industry)



Electric energy usage of holding furnaces and Energy consumption rate

Introduction to Other Companies
- Notes for Introduction
- Installation in Practice or Schedule

Notes for Introduction By changing the additive agent and addition method, it can decrease the unmelted residue of the additive agent

Records of Domestic and Overseas Introduction Domestic The fourth cast iron factory in Nissan Motor Co., Ltd. Tochigi Plant.

Contact: **Nissan Motor Co., Ltd.** Tochigi Plant, Production Engineering department, Environment and Energy group Tel:+81-285-56-1246
Nissan Motor Co., Ltd. Tochigi Plant, Engineering section No.2, Casting section No.2
Tel:+81-28-556-1351

						S4	Factory Energy Management System (FEMS)
BP02	Keywords	Y3	equipment or facility	Z3/Z4	natural gas/electricity	E15	printing & allied industry

ADBANK Co., Ltd.

Energy Conservation at Printing Factory by New Ink Materials and Drying Technologies

Features

- Addressing development of web offset LED-UV printing since 2016, we domestically succeeded in its practical use for the first time in October 2017. Allowing printing on thinner paper, this method has reduced “paper cost”. It has also achieved zero consumption of gas energy because there is no need to use a large dryer which had been required in the drying process, and furthermore, VOC control measures have allowed environmental friendliness.
- Introduced main technologies
  1. High-output LED lamp
     Since domestically manufactured LED lamps had been lacking power, we pioneered use of an overseas LED-UV lamp manufacturer, realizing 600 rpm by high-power lamps capable of instantaneous curing.
  2. Development of LED-UV inks
     Using pigments cured in response to ultraviolet rays, we have jointly developed with a manufacturer LED-UV inks which do not blur under high-speed rotation, reducing gas energy required in the drying process by 100%.
  3. Lower paper cost by printing on thinner paper
     Development of LED-UV curing technology has realized printing on thinner paper and reduced paper cost by 12%.

New company building (Completed in Feb. 2018)

Basic Concept or Summary

Introduced technologies

1. Development of a web press provided with high-output LED lamps
   - Since conventional UV lamps have a high environmental load because of their mercury-based method and high energy cost, we have chosen long life, power-saving and high-power LED-UV lamps free from producing heat and ozone.
   - Overseas high-power LEDs have been introduced in order to print without lowering the maximum web offset speed from 600 rpm.
   - A hybrid web press with oil-based inks has been developed and designed to endure actual operation.

Large dryer unnecessary for LED printing

2. Development of UV curing inks capable of enduring high-speed rotation
   - Since pigments cured in response to ultraviolet rays are very expensive, original blending which allows sufficient curing with a small amount has been jointly developed with an ink manufacturer.
   - The first LED-UV inks have been developed domestically, and they do not blur in high-speed printing at 600 rpm or more.
   - Since the inks are dried by the ultraviolet curing method, a large dryer is not required, achieving zero consumption of gas.
   - Emissions of VOC (Volatile Organic Compounds) gases generated from the oil-based inks are reduced to protect the environment.

Web press with oil-based/UV curing inks

Effects or Remarks

Energy Conservation Results

AD BANK

■ **Effects of the web offset LED-UV printing**

1. Energy conservation

Measure	Before activity	After activity	Total energy conservation result
Power-saving	150 kW x 7 hours (per web press) x 72 rotations/year = 75,600 kWh ➔ 19 kL	65 kW x 7 hours (per web press) x 72 rotations/year = 32,760 kWh ➔ 8 kL	–11 kL (57.9% reduction)
Gas energy reduction	76,046 m^3 (annual consumption) x 23.8% (LED print operating rate) = 18,090 m^3 ➔ 21 kL	0 kL	–21 kL (100% reduction)
Total	40 kL	8 kL	–32 kL (80% reduction)

Conventional ratio: Annually 80% reduction in terms of crude oil equivalent

2. Cost reduction

B2 equivalent of 40-kg paper has been reduced to 37-kg thinner paper, reducing paper cost by 12%.

Conventional ratio: Annually 12% reduction

◆ Subsidy projects

2014 Adopted the FY2013 supplementary budget, manufacturing subsidy.
2015 Adopted the FY2014 supplementary budget, manufacturing subsidy.
2017 Adopted the FY2016 supplementary budget, manufacturing subsidy.
2018 Adopted the FY2017 supplementary budget, manufacturing subsidy.
2019 Adopted the FY2018 supplementary budget, manufacturing subsidy.

◆ Major awards received

Oct. 2017 Press conference “Web Offset LED-UV Printing for Cost Reduction”
Feb. 2018 Approved management innovation plan “Practical Use of LED-UV Printing”.
Nov. 2018 Acquired the CLIONE mark “GOLD+”.
Dec. 2019 Awarded the “SME Agency Director General’s Prize” of the Successful Case of Energy Conservation in Factory & Building.

Introduction to Other Companies
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- Installation in Practice or Schedule

Domestic Major introduction record
The company name cannot be mentioned, but a leading printing company is considering introduction.

Contact: **ADBANK Co., Ltd.**
52 Kisshoin Shimanomazumecho, Minami-ku, Kyoto
Tel: +81-75-694-1312
URL: http://adbank.co.jp/

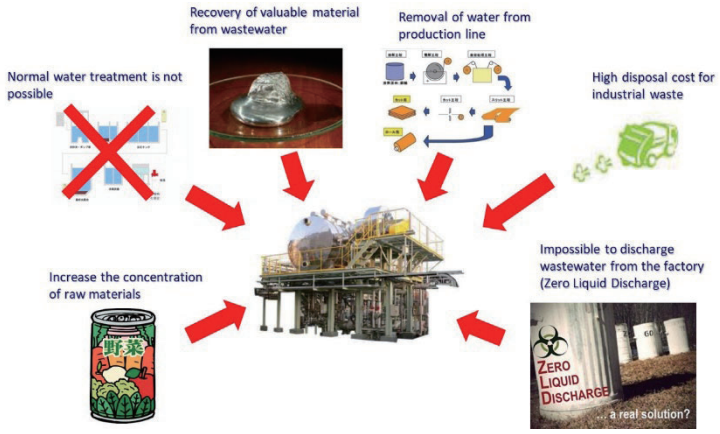
						S4	Factory Energy Management System (FEMS)
BP03	Keywords	Y3	equipment or facility	Z2/Z3	oil/natural gas	E26	manufacturer of production machinery

Sasakura Engineering Co., Ltd.

MVR Type Evaporating Concentrator contributing to sustainable production activities

Features

- Contribution to 3R (Reuse, Reduce, Recycle) by energy saving
- Reuse of waste steam for heat source by collecting waste steam and increasing temperature at vapor compressor (Mechanical Vapor Recompression [MVR])
- In-house design of a vapor compressor dedicated to our evaporating concentrator



Application of Evaporating Concentrator

MVR Type Evaporating Concentrator

Basic Concept or Summary

Operation principle of MVR type evaporating concentrator

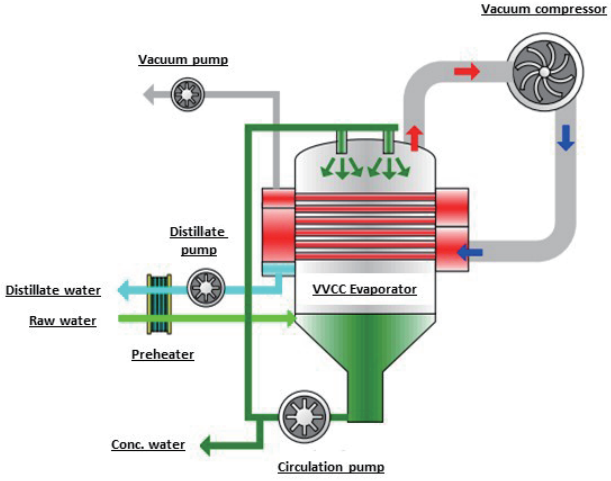
① Reduce the pressure inside the evaporator by vacuum pump

② Raw water is sprayed and distributed as a thin film over the outside of the tubes by circulation pump.

③ Heated steam is forwarded into the heat transfer tube inside, and the thin film boils at the outside of the tube surface.

④ Newly created vapor from the thin film is compressed passing through the vapor compressor and its temperature is thus raised before being passed to the inside of the tubes, where it condenses to form the condensate inside the heat transfer tubes. Condensate is discharged to outside of the system.

⑤ Concentration of the raw water progresses, and the liquid concentrated to a predetermined concentration is discharged by the circulation pump to outside of the circulation line



Flow of MVR Type Evaporating Concentrator

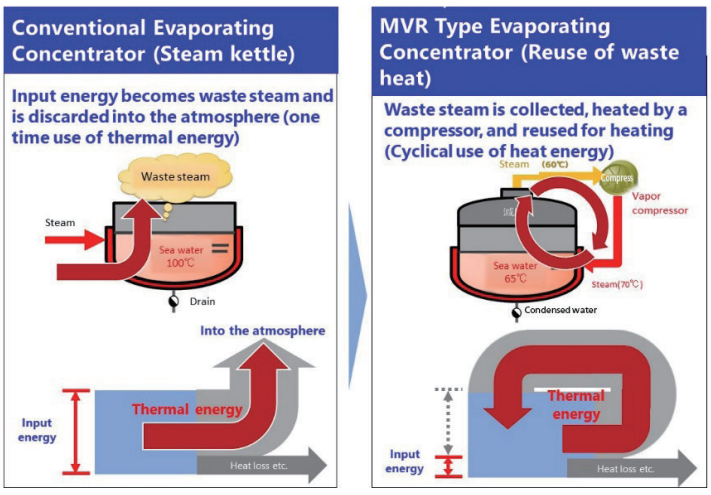
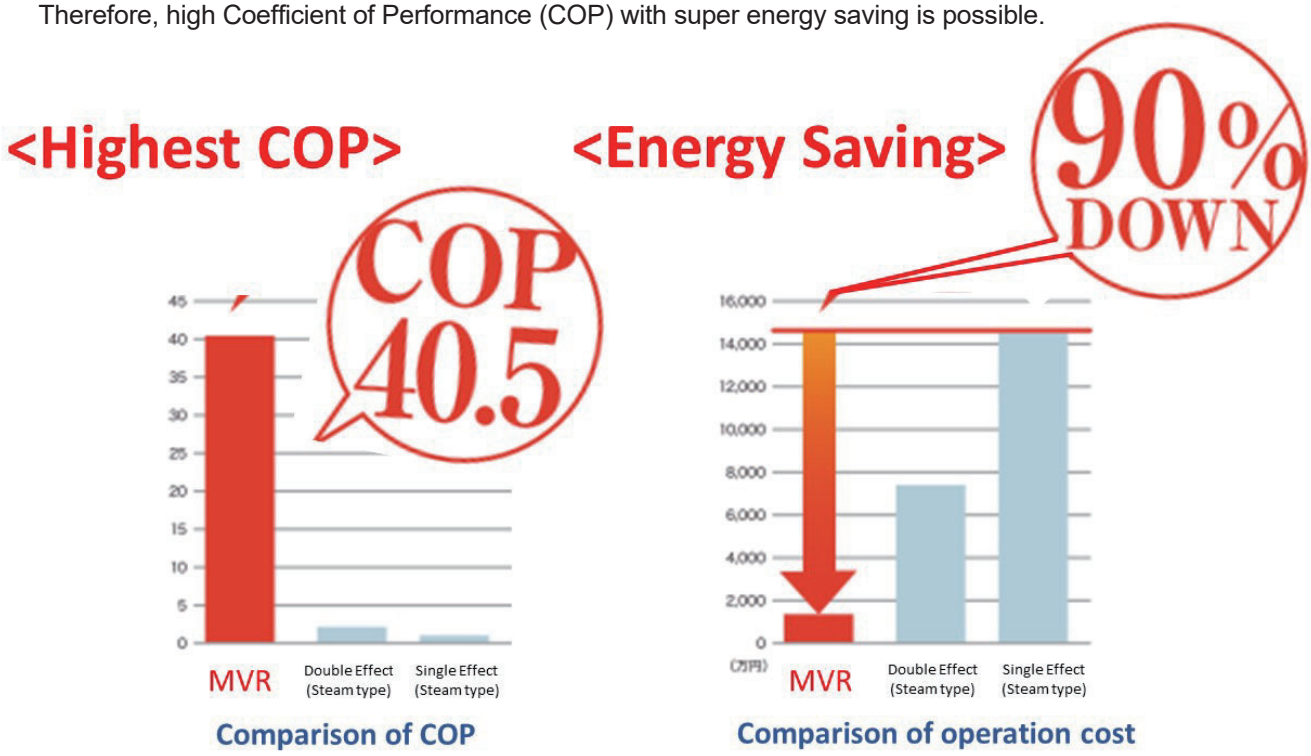


Image of MVR

Effects or Remarks

◆ Energy saving effect
Although steam is used as a heat source at startup, if the evaporation operation reaches a steady condition, evaporating concentration is possible with only the power of the vapor compressor and a small amount of steam for backup.
Therefore, high Coefficient of Performance (COP) with super energy saving is possible.



◆ Example (Example by change from typical disc dryer to our MVR type evaporating concentrator)
Reduction of 95% energy consumption in the concentration process (Crude oil equivalent of -1,184kL/Year)
Simple investment payback year is 0.72 year

◆ Awards
1) 2019 Energy Conservation Grand Prize, Agency for Natural Resources and Energy Award
2) 2019 L2-Tech certified products

Introduction to Other Companies
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Notes for Introduction
Lab test using actual sample liquid may be required in order to realize the optimum design.

Records of Domestic and Overseas Introduction
Japan: More than 830 units
Other countries: More than 120 units

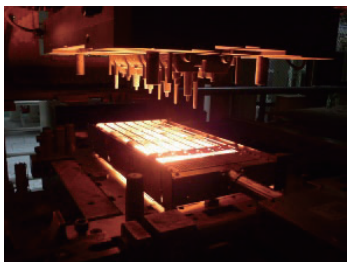
Vietnam:	2010, 2011, 2014
Chile:	2013
Thailand:	2012, 2015, 2018
Indonesia:	2014, 2015, 2017, 2019
Philippines:	2008

Contact: **Sasakura Engineering Co., Ltd.**
Tokyo Water Treatment Marketing Section
TEL: +81-3-5566-1212 FAX: +81-3-5566-1233
URL: http://www.sasakura.co.jp/e/products/water/112.html

SUZUKI MOTOR CORPORATION METRO DENKI KOGYO Co., Ltd./Chubu Electric Power Miraiz Co., Inc.

Energy conservation and labor saving by introducing infrared heater type mold heater in casting

Features

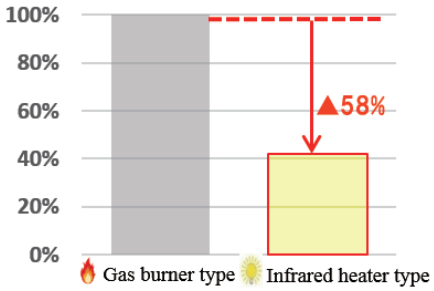


This is an initiative to significantly reduce energy consumption and heating time in low-pressure casting processes focusing on the mold heating phase*, which consumes much energy.

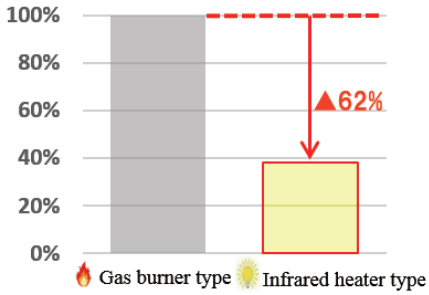
Gas burner using LP gas, etc. has been mainly used for mold heating of casting equipment that produces engine casting parts. We've replaced it with an "infrared heater type mold heater" with a high power infrared heater, which was designed, developed, tested and improved by three companies.

As a result, we've achieved energy conservation and labor saving in field work, and also improved safety and productivity, by reducing energy consumption by 58%, CO_2 emissions by 62%, and the required time for mold heating by 32% in comparison with conventional gas burners.

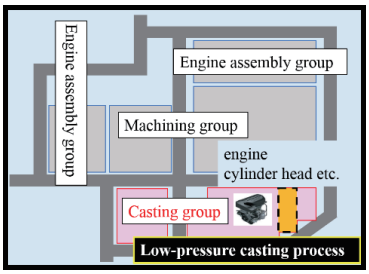
* It is necessary to preheat the mold before casting for the purpose of stabilizing product quality and protecting the mold.



Comparison of energy consumption

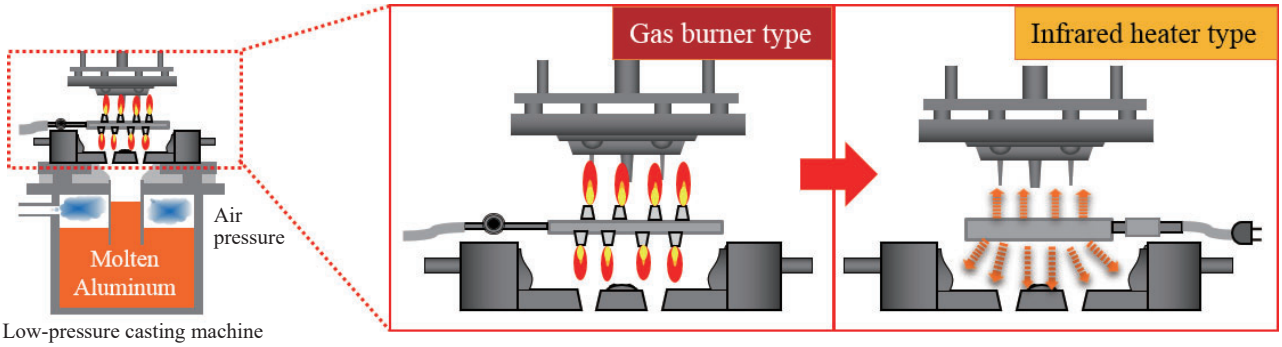


Comparison of CO_2 emission



Four-wheeler engine plant at Sagara plant

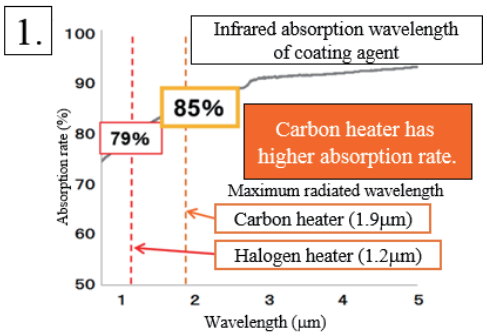
Basic Concept or Summary

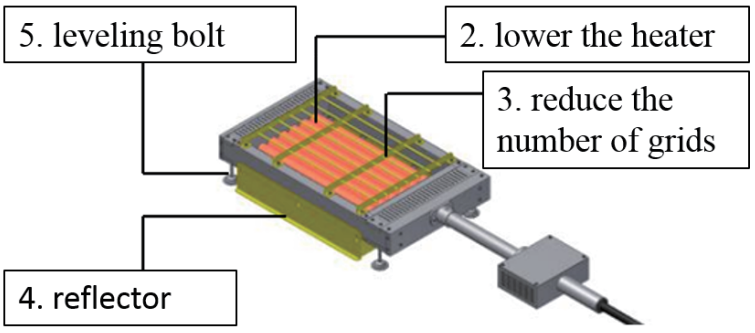


Low-pressure casting machine

<The development of infrared heater type mold heater with high power and short heating time>

1. Use mid-infrared heater that can shorten the heating time since its wavelength matches the infrared absorption wavelength and the coating agent on the mold surface.
2. Lower the heater position to the limit in the device in order to shorten the distance between the heater and the mold.
3. Reduce the number of protective grids by installing them between heater lamps.
4. Install reflector on the side to prevent infrared leakage.
5. Install leveling bolts for height adjustment so that the heater is able to be installed in various molds.



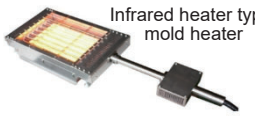


Effects or Remarks

■ Energy saving effect

	Gas burner type	Infrared heater type	Amount of reduction	Reduction rate
LP gas consumption [t/month]	17	0	-17	-100%
Power consumption [MWh/month]	52	58	+ 6	+12%
Crude oil equivalent [kL/month]	35.7	14.9	- 20.8	- 58%
CO_2 emissions [t-CO_2/month]	77.5	29.5	- 48.0	- 62%

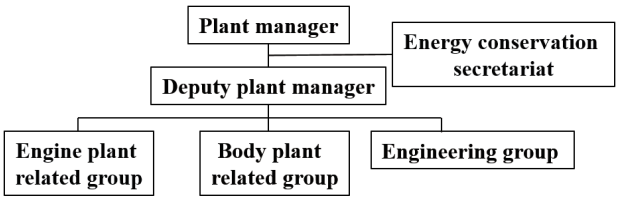
■ Incidental effects
- Labor saving by abolishing flame monitoring when using gas burner and extending the repair cycle of mold coating agent.
- Labor saving by reducing mold trouble caused by convection heat when using gas burner.
- Improvement of non-defective rate by equalizing mold temperature distribution.


Infrared heater type mold heater

Item	Specification
Rated voltage	Three-phase 200V
Rated power consumption	18kW (3kW × 6 units)
Maximum current	52A
Heating element	Carbon
Heating element temperature	1,250°C
Maximum energy wavelength	1.9μm
Significant exothermic length	L300mm × W200mm
Model number	SUS304

■ Payback period(per 20 units)
Initial cost: approximately 30 million yen(including electric work)
Annual running cost savings: approximately 10 million yen
Calculated investment payback period:3 years

■ Sagara plant energy conservation system and joint development execution system



Sagara plant energy conservation system

Related-companies	Roles
SUZUKI	・drawing the concept of the device ・application to the target equipment and quality evaluation
METRO	・design and production of the device ・evaluation of the prototype and data collection
中部電力ミライズ	・design of the device and performance evaluation ・data analyzing and energy measurement

Joint development execution system

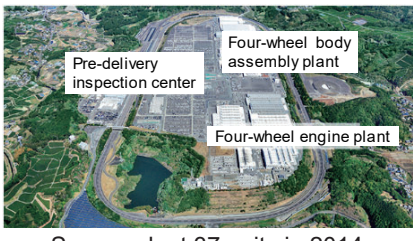
■ Awards received
- Energy Conservation Center energy conservation grand prize Agency for Natural Resources and Energy Directors award 2015
- Patent: “Mold heating device” Application No. 2014-215570
- Patent: “Mold heating device” App. No. 2018-222680
- Patent: “low-pressure casting equipment and heater unit for low-pressure casting equipment” App. No. 2019-125433

Introduction to Other Companies - Notes for Introduction - Installation in Practice or Schedule

Notes for Introduction

It is necessary to examine specifications such as heater power according to mold size and heating temperature.

Records of Domestic and Overseas Introduction



Sagara plant 37 units in 2014


Osuka plant 14 units in 2016


SIM plant(Indonesia) 4 units in 2019


SMG plant(India) 10 units in 2019

Our product has been already introduced to SUZUKI MOTOR CORPORATION and other automobile-related manufacturers. We will keep expanding its introduction in the future.

Contact: **Chubu Electric Power Miraiz Co., Inc.**
URL/inquiry information: https://miraiz.chuden.co.jp/

BP05	Keywords	Y3	equipment or facility	Z4	electricity	E31	manufacturer of transportation equipment

Thermal Management Unit (TMU) Manufacturing Department, DENSO CORPORATION

Helium Leak Test Process Based on New Idea – Approaches to Half Energy Usage –

Features

Setting the environmental policy “DENSO Eco Vision 2025”, we have been making efforts to halve energy usage (compared with 2012) by 2025 across the company. In order to achieve this goal, the TMU Manufacturing Department has set three core activities (1) “Advanced energy JIT”, (2) “Advanced visualization” and (3) “1/N and N times by technological innovation” to address “matchless energy conservation activities” (Fig. 1). As a result, we reduced electric energy consumption by 25,460 MWh (crude oil equivalent of 6,358 kL) and CO_2 emissions by 15.1% from FY2015 to FY2016. This time, of those activities, the following mainly introduces a “helium leak tester dispensing with a vacuum pump under atmospheric pressure”, a technological innovation case we addressed, taking the opportunity of installing a new line along with switching to a new radiator product. This technological development has dispensed with the need for a vacuum pump which had been naturally and conventionally required in the test process, helping greatly reduce energy usage. The developed technology has been not only globally rolled out, but also applied to other products requiring a leak test, having a large effect on global CO_2 reduction.

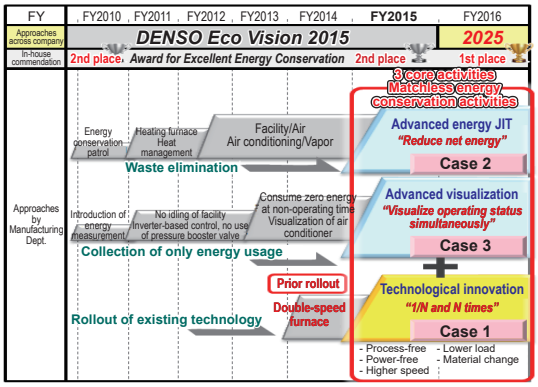


Fig. 1. Matchless Energy Conservation Activities

Basic Concept or Summary

Case 1. “1/N and N times by technological innovation”: Atmospheric helium leak tester

◆ Difference between the vacuum and atmospheric methods
A conventional leak test method vacuumizes a test chamber, encapsulates helium into a product and measures leaked helium with a detector. To conduct high-accuracy measurement, it is essential to vacuumize the test chamber. Conflicting with this, however, since vacuumization cost is very high in both energy and facility expenses, it was decided to attempt an “atmospheric helium leak test” this time, which basically dispenses with vacuumization.
In the vacuum method, there are hardly any gases other than helium which have leaked from the product, resulting in a high helium diffusion rate as shown in Fig. 2. Accordingly, helium diffuses instantaneously to uniformize concentration distribution. In the atmospheric method on the other hand, a collision with gases other than helium slows down the diffusion rate very much, requiring a longer time for diffusion and resulting in non-uniform concentration distribution in a short time. In such a state, defective products may be incorrectly evaluated as being defectless.

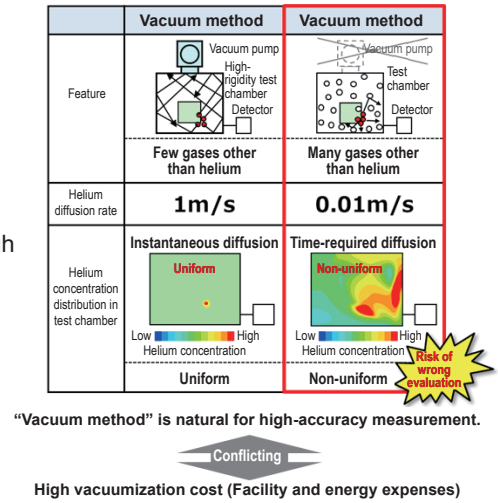


Fig. 2. Difference between Vacuum and Atmospheric Methods

◆ Consideration of a stirring means
First, a test was conducted by internally stirring with multiple fans. When a leak master position for a constant leak amount was changed to make measurement as shown in Fig. 3, the leak amount varied greatly, failing to satisfy a target value in the case where a detector is located near the leak position. On the other hand, the leak amount varied less in the case where the detector is located far from the leak position. The reason for this was considered to be because the helium concentration varies due to the impact of the air direction around the detector in the case where it is located near the leak position, and because helium is stirred in the path to the detector, this resulted in uniformizing the concentration in the case where it is located far from the leak position.
Accordingly, the following three variation reduction factors were estimated.
(1) Detection far from the leak position
(2) Uniformization by stirring in the path to the detector
(3) Detection after uniformization
Based on these, a new method was designed, different from the conventional detector position and stirring method.

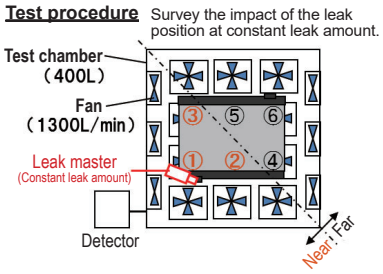


Fig. 3. Consideration of Stirring Means

◆ Embodiment of the idea
Fig. 4 shows the very device. Helium leaking from the product is uniformized by collecting and stirring in one direction by a blower. And by detecting helium “daringly far” from the leak position, it can be uniformized wherever it leaks.
When it was cross-checked with a testing machine whether the leak amount is equivalent in both the vacuum and atmospheric methods, there was linear correlation as shown in Fig. 5, realizing the “atmospheric helium leak test” as equivalent to the vacuum method.

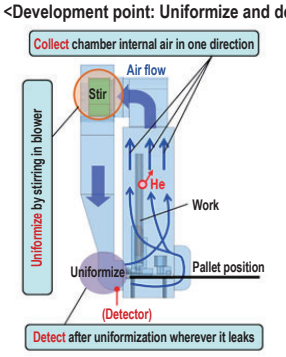


Fig. 4. Atmospheric Test Method

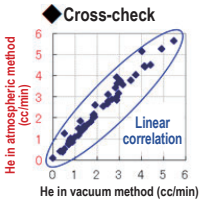
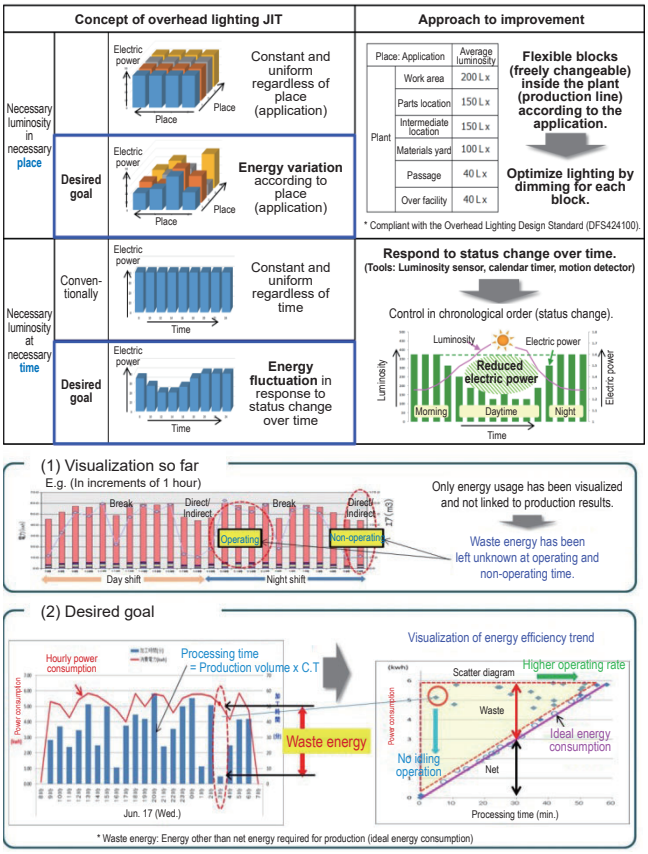


Fig. 5 Comparison of Leak Amount with Vacuum Method

Case 2. “Advanced energy JIT”: Lighting energy JIT
The goal is to reduce energy usage in overhead lighting to 25%. As shown in Fig. 6, overhead lighting has been designed based on the JIT idea of varying overhead lighting energy which is constant and uniform regardless of place and time.
As an approach to improvement for the “place”, a production line has been divided to blocks according to an application to optimize luminosity by dimming. For the “time”, luminosity has been automatically controlled by responding to a change in sunlight, thereby reducing energy usage to 25% in overhead lighting of a model production line.

Case 3. “Advanced visualization”: Visualization of waste energy
The goal is “zero waste energy”. Conventionally, only energy usage had been visualized and not linked to production results, leaving waste energy unknown at operating time. Accordingly, the relations between energy usage and production results have been graphed and their scatter diagram has been prepared in order to further visualize an energy efficiency trend, thereby making the waste visible (Fig. 7). This system has been utilized to improve stoppage of the vacuum pump when the existing vacuum helium leak tester is not operating and to reduce waste energy, promoting rollout of this improvement.



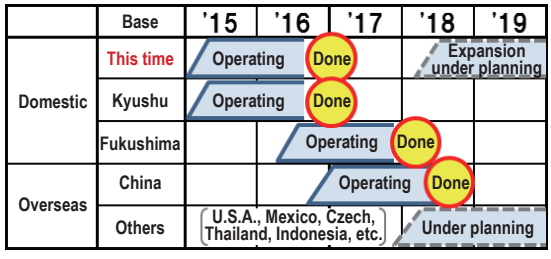
Effects or Remarks

(1) Atmospheric helium leak tester
 1) Leak test electric energy reduced to 1/10 (per production line)
 2) Already rolled out domestically and overseas, resulting in 220 kL/year less usage in crude oil equivalent (up to FY2017).
 3) Useful knowledge for minimizing the work area, higher maintainability, contribution to helium depletion problem and future alternative gas for helium owing to lower facility expenses and simplified facilities
(2) Lighting energy JIT
 1) Overhead lighting electric energy reduced to 1/4 (model production line), resulting in 25 kL/year less usage in crude oil equivalent.
 2) When fully rolled out within this department, the expected effect is approx. 1,200 kL/year less usage.
(3) Visualization of waste energy
 1) Improvement of stoppage of the vacuum pump when the vacuum helium leak tester is not operating: 42 kL/year less usage in crude oil equivalent (rolled out production lines)
 2) Production lines where the waste energy visualization system has been introduced: 8 lines

◆ Awards received
(1) FY2015 METI/ARNE Director General’s Prize of the Successful Case of Energy Conservation in Factory & Building (Industrial sector)
(2) FY2017 METI/ARNE Director General’s Prize of the Successful Case of Energy Conservation in Factory & Building (Industrial sector)

Introduction to Other Companies
- Notes for Introduction
- Installation in Practice or Schedule

◆ Atmospheric helium leak tester
As shown in Fig. 8, the tester has been already rolled out to two domestic bases in Kyushu and Fukushima, and one overseas base in China, globally having good results. (Up to FY2017)
Conventionally, vacuumization (vacuum pump) was essential to strike a balance between high-accuracy measurement and productivity. However, it is now possible to dispense with the vacuum pump by drastically reviewing the measurement principle.
We will continue to roll out the tester to new domestic and overseas production lines, replace the existing production lines and globally promote further energy conservation activities, thereby contributing to realization of a carbon-neutral society.



Contact: **Manufacturing Planning Office, Thermal Management Unit Manufacturing Department, DENSO CORPORATION**
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						S3	ZEB/BEMS
BP06	Keywords	Y4	system or software	Z4	electricity	D	Design & Construction

TAKENAKA CORPORATION

~ZEB BY YOUR SIDE~ APPROACHABLE ZEB

Features

- This new office building has been completed with a more economical cost than regular buildings and achieved “Nearly ZEB” (88% energy saving) as the actual operation.
- In partnership with clients, “PDCA” of energy design and management has been proceeding through both design and operation phases.
- Mainly focusing on the issue of ZEB’s cost, the 4 concepts of ”Comfort, Economical, General Technologies, Easy Operation” have been created for the realization of Approachable ZEB which can contribute to the spread of ZEB socially.
- Regarding S rank CASBEE-Saitama and S rank CASBEE- Wellness Office, these buildings have both comprehensive environment efficiency and excellent health quality.

Building name	TS TECH Head Office
Building use	Office
Location	Asaka City, Saitama Pref. JP
Total floor area	3,727m²
Story, Structure	3 Stories, Steel
Operation start	March 2018

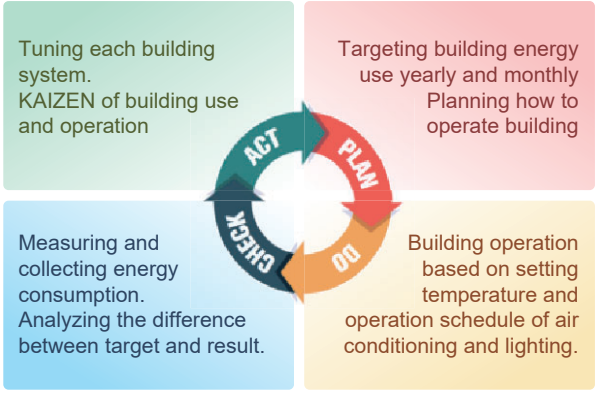
Basic Concept or Summary

Design

Four Concepts for Approachable ZEB

Operation

Energy Management Meeting with Client one year after starting building use.

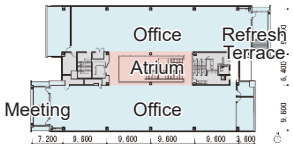


Main technologies for Approachable ZEB

View, daylight, open-feeling and excellent insulation

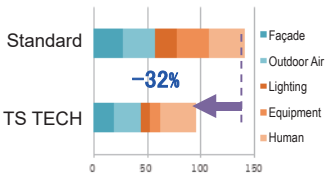
Façade with a comfortable view, daylighting and high-performance heat insulation.
Atrium with high-side-lighting between open offices.

Facade

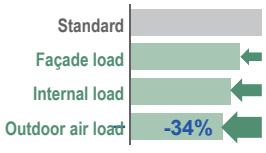


Office floor area

Minimizing air conditioning load and equipment capacity

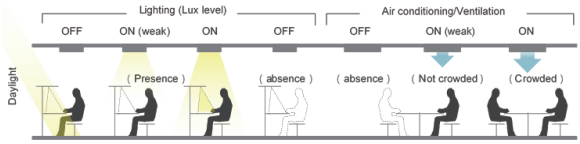


Facade



Office floor area

Air conditioning and illumination control by presence/ absence detection by the thermopile sensor.



Real time monitoring of energy saving achievement degree and Outside comfort display

Effects or Remarks

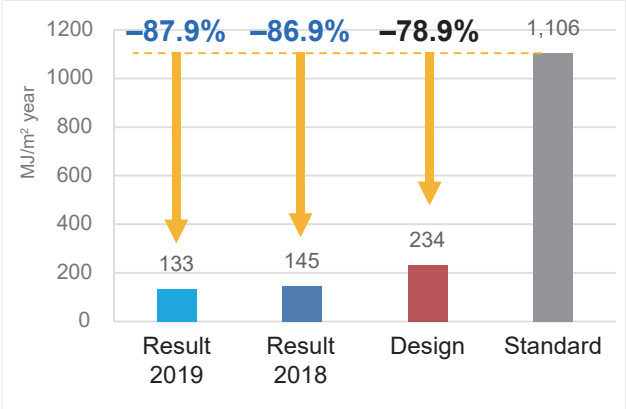
- Achieved “Nearly ZEB” as the actual operation
  Yearly primary energy consumption
  2018: 145MJ/m², -86.9% from standard
  2019: 133MJ/m², -87.9% from standard

- BELS Certificate
  Nearly ZEB (BEI=0.22) (Certified in Jan 2018)

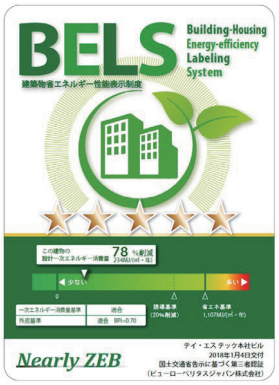
- CASBEE
  CASBEE-Saitama S rank
  CASBEE Wellness Office S rank
  (self-confirmation)

- For Zero water building
  City water use reduced by 64%
  Almost all graywater used was supplied by rainwater.

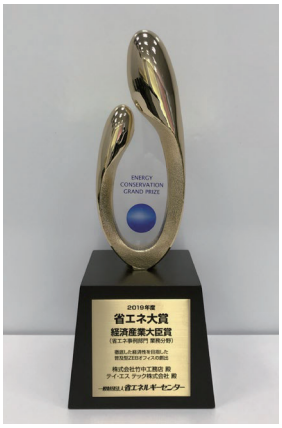
- Awards
  Energy Conservation Grand Prize 2019:
  Minister of Economy, Trade and Industry
  Award 8th Carbon Neutral Awards:
  Grand prize



Yearly primary energy consumption result



BELS Certificate
(Nearly ZEB・BEI=0.22)



Energy Conservation Grand Prize
Minister of Economy, Trade and Industry Award

Introduction to Other Companies
- Notes for Introduction
- Installation in Practice or Schedule

Major ZEB Achievement

TAKENAKA Higashi-kanto Branch Office

TAKENAKA Tokyo Head Office

OPTAGE Building

Noda-Kamada Gakuen Yokohama Specialized Training College

Tokyo University of Agriculture Atsugi Campus

Dai-ichi-Life Shin-Ohi Office

and others

Contact: **TAKENAKA CORPORATION**
URL: https://www.takenaka.co.jp/takenaka_e/

BP07	Keywords	Y3	equipment or facility	Z3	natural gas	E29	maufacturer of electrial machinary, equipment and supplies

Primearth EV Energy Co., Ltd.

Approaches to high-efficiency Heat Utilization at New Lithium Ion Storage Battery Plant

Features

Fig. 1. Lithium Ion Storage Battery Pack for Hybrid Vehicles

Approaches to the climate change issue by Primearth EV Energy

1. Automobile manufacturers have been increasing the electrification ratio of running vehicles toward lower CO_2 emissions. We address the climate change issue by meeting the demand for storage batteries, or key parts for electrification.
2. Considering a product's life cycle, we make efforts to reduce CO_2 emissions during production. When constructing a new plant, we jointly develop an energy conservation system with our in-house construction project team with the purpose of realizing high-efficiency thermal energy which accounts for the majority of energy usage during production, a chiller manufacturer and a facility management company as a means for lower CO_2 emissions, reducing the crude oil equivalent of 1,762 kL/year (27% lower) in comparison with a conventional plant (entire building).

Basic Concept or Summary

In order to enhance production of lithium ion storage batteries, a new plant building construction plan was launched in the precincts of the Miyagi plant in 2014. When analyzing the energy consumption ratio of the existing plant, the heat for air conditioning (heating, cooling, dehumidification) and drying and heating of products accounted for 70% of energy utilization. Accordingly, we launched approaches to high-efficiency heat utilization.

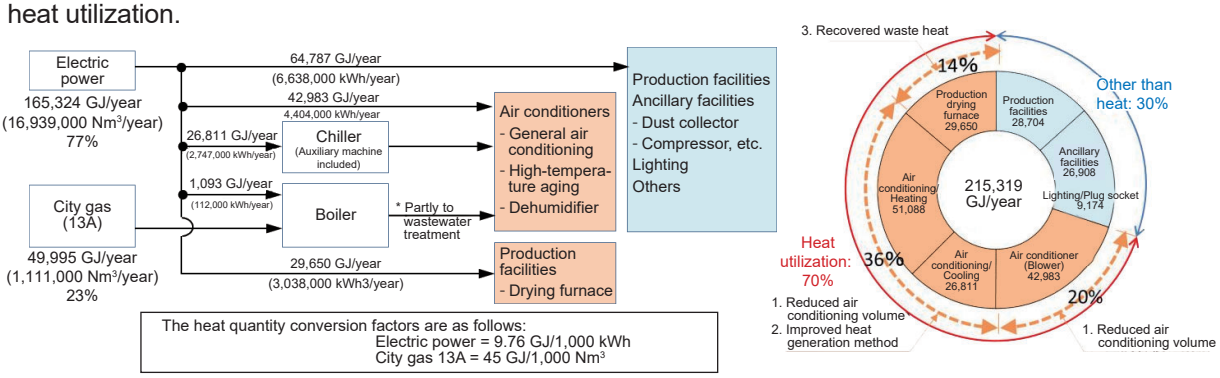


Fig. 2. Energy Flow and Ratio by Application at Existing Plant (on Heat Quantity Basis)

Approaches to high-efficiency heat utilization

1. Reduced air conditioning volume
   At the existing plant, the air conditioning facilities had been utilizing 56% (36% + 20%) of the energy usage (Fig. 2). Accordingly, it was decided to reduce air conditioning energy by reducing the volume of the production area.
2. Improved heat generation method
   At the existing plant, heating and cooling by air conditioning had accounted for 36% of the energy usage. Particularly for the heating source, steam had been supplied by a gas-fired boiler to be utilized at each place of the plant, but there had been lots of heat losses, resulting in low efficiency (Fig. 3). Accordingly, in a new plant, it was decided to utilize a heat pump capable of heightening an output heat quantity with respect to input electric power. Compared with a boiler of the same capability, however, the heat pump requires a higher investment amount, and its efficiency falls as the working temperature increases (Fig. 4). Because of high return on investment by improvement of running costs at less than 100°C where efficiency is high, it was decided to utilize the heat pump.
3. Recovered and utilized waste heat
   For regeneration as to the drying furnace and humidifier which heat at 100°C or higher, it was decided to employ an electric heater, which is less efficient, but inexpensive and has higher controllability, and increase efficiency by recovering high-temperature waste heat.

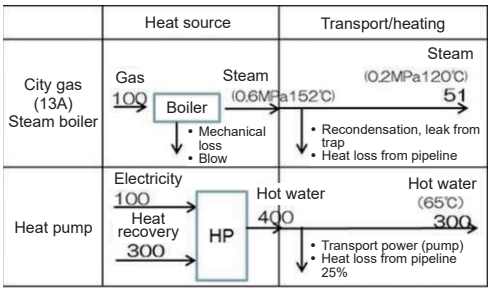


Fig. 3. Heat Losses of Gas Boiler vs. Heat Pump

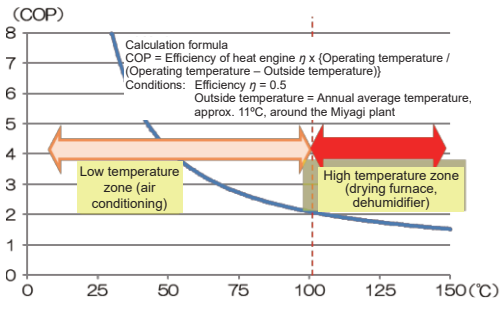


Fig. 4. Efficiency of Heat Pump depending on Temperature Zone

Effects or Remarks

1. Reduced air conditioning volume
   As a source control measure, efforts were made to reduce the volume of the production area which requires air conditioning.
   - Improvement of processing capability of the facilities (Double speed, higher speed)
   - Downsizing of the process

   These efforts resulted in:
   27% less area of the production process
   20% lower rated power of the production facilities (Fig. 5)
   [Energy conservation effect: -299 kL/year]

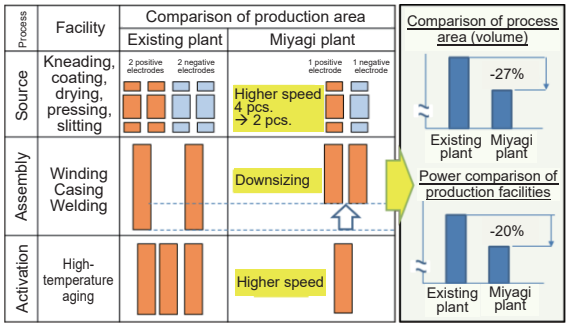


Fig. 5. Comparison of Production Area

2. Improved heat generation method

(1) Development of high-capacity heat pump for air conditioning
Heating for air conditioning has been changed from steam supply by a boiler to hot water supply by a heat pump (Fig. 6). In summer, cooling water of a chiller for air conditioning has been used as a heat source water, contributing waste cold water to improved efficiency of the chiller. In winter, an air heat source is utilized in fear of heat source water freezing. For this reason, the heat pump HEM-3WAY made by Kobe Steel (heating capability: 84.4 kW x 5 units) has been utilized, capable of switching between water- and air-based heat sources. When the outside temperature falls in winter, defrosting operation is required, lowering the capability. As a measure, the waste heat (production exhaust, compressor's waste heat, etc.) generated in the plant has been consolidated into the heat pump through ducts in order to secure the ambient air temperature of 10°C or higher at which defrosting operation is not required. As a result, an overall system efficiency (COP) of 3.1 has been expected.

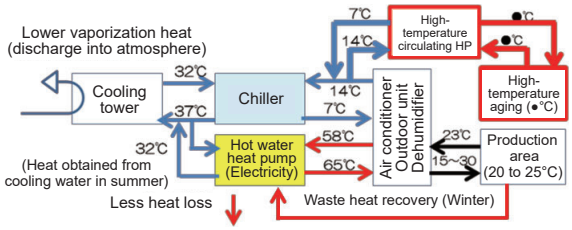


Fig. 6. Heat Source Flow at New Plant

(2) Development of high-temperature circulating heat pump
The aging process requires the room temperature of 50°C or higher, and the temperature of hot water supplied by the heat pump utilized in (1) cannot meet the requirements. Accordingly, an air conditioner has been jointly developed with a chiller manufacturer, which circulates the air at 60°C or higher to achieve the efficiency (COP) of 3 or above (first in the industry). What is ingenious about the system is utilization of air conditioning cold water (return) which has a low temperature of less than 14°C as a hot water source, but can be stably supplied even in winter, in order to stably supply the heat throughout the year.
Efficiency at rated operation: COP 3.7 (Heating: 2.3, Cooling: 1.4)
Efficiency at maximum load: COP 5.7 (Heating: 3.3, Cooling: 2.4)
[Energy conservation effect in (1) and (2): -1,762 kL/year]

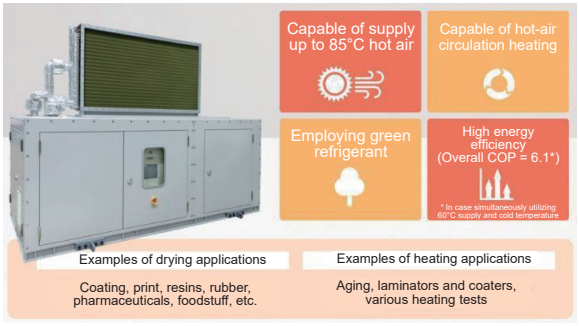


Fig. 7. Commercially Available Hot Air Supply Heat Pump, Eco-Circuit™ Made by Mayekawa Mfg. Co., Ltd.

3. Recovered and utilized waste heat
The electrode drying process requires a high temperature of 100°C or higher. A solvent contained in the exhaust gas from the drying furnace is recovered after cooling and condensation by the solvent recovery device. Then, it is heat-exchanged with high-temperature exhaust to circulate the air to the drying furnace (Fig. 8). Since this process had consumed approx. 17% of electric power usage, 2 required furnaces have been reduced to 1 unit by increasing the inner temperature of the drying furnace to shorten a drying time, thereby saving energy. Also, efforts have been made to review the plate thickness and heat transfer area of the heat exchanger to increase the supply temperature to the furnace. As a result, a required heat quantity is now expected to be reduced from 270.8 kWh to 111.6 kWh (59% lower).
[Expected energy conservation effect: ▲251 kL/year]

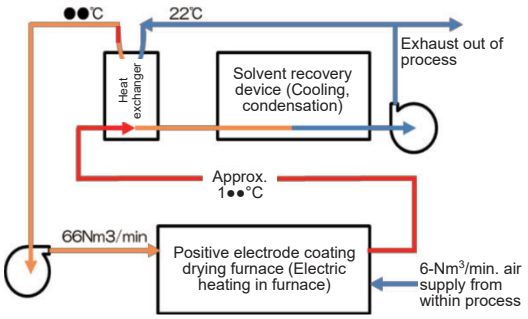


Fig. 8. Overview of Exhaust System of Drying Furnace

Introduction to Other Companies
- Notes for Introduction
- Installation in Practice or Schedule

Primearth EV Energy
Miyagi 4th plant (2019), Miyagi 5th plant (2020), Miyagi 6th plant (Scheduled in 2021)

Contact: **Primearth EV Energy Co., Ltd.**
Environmental Affairs & Engineering Group, Plant Engineering Department
Corporate information: https://www.peve.jp/ Inquire at: https://www.peve.jp/contact/

Reduced Power Consumption for Air Conditioning and Lighting with Wireless Communications at Shopping Center

Features

- Case of reduced power consumption at a large shopping center “UNIMO Chiharadai” located in Ichihara city, Chiba prefecture and annually attracting 5.5 million visitors.
- These facilities are managed by utilizing a real estate securitization scheme. Three companies, LaSalle Investment Management (asset manager), Jones Lang LaSalle IP, Inc. (property manager) and AEON Delight Co., Ltd. (building management company) have been closely collaborating to showcase their respective advantages.
- Taking the replacement of the asset manager in February 2015 as an opportunity, approaches to energy conservation associated with investments have been promoted to aim at realization of highest-level sustainability.
- Compared with 4 years prior to replacement of the asset manager, annual electric usage has been reduced by 29.6%, or 488 kL in terms of the crude oil equivalent.
- In autumn, 2015, lighting in common-use spaces was changed to LEDs. Furthermore in July 2017, an air conditioning control system was also introduced to reduce electric usage for air conditioning in the common-use spaces. Both the LEDs and air conditioning control system have employed advanced systems based on wireless communication technology.

Basic Concept or Summary

- In LED installation work, not only lighting of the entire building has been replaced with LEDs, but also wireless dimming LEDs have been employed. The wireless dimming LEDs automatically sense building internal luminosity with luminosity sensors, including impact of outside light, to save waste power and enhance energy conservation effects.

■ Settings to maintain luminosity with daylight

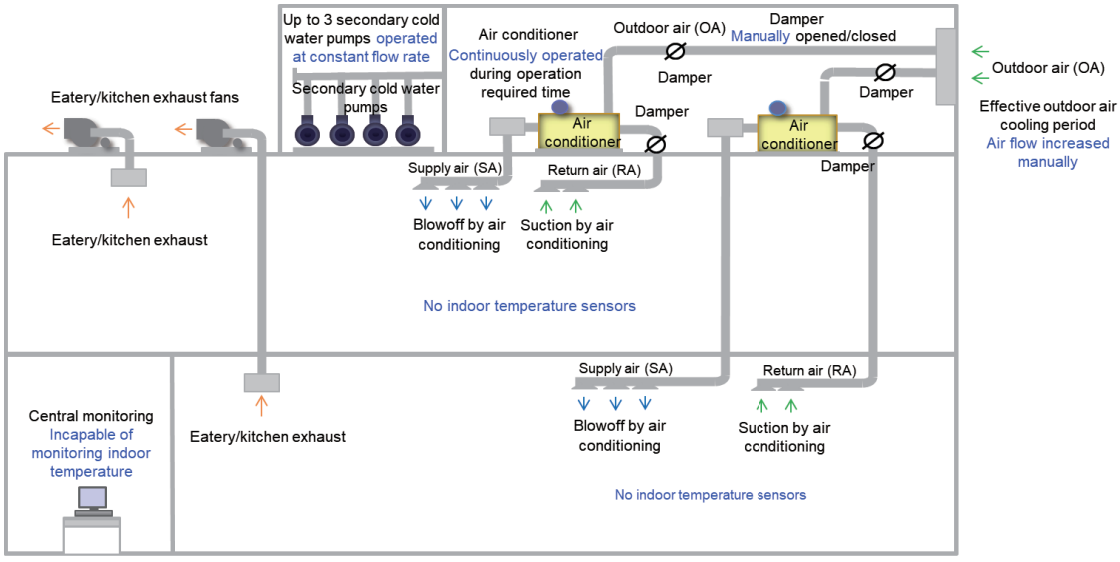
Area	Standard setting rate	Standard luminosity	Standard area	Min. setting rate
1st-floor passage (Circuit)	80%	270 lx	Floor surface luminosity	60%
1st-floor restaurant passage	70%	210 lx	Floor surface luminosity	No daylight setting
2nd-floor passage (Circuit)	100%	287 lx	Floor surface luminosity	60%
2nd-floor food court	60%	570 lx	Desk surface luminosity	50%

■ Setting controller

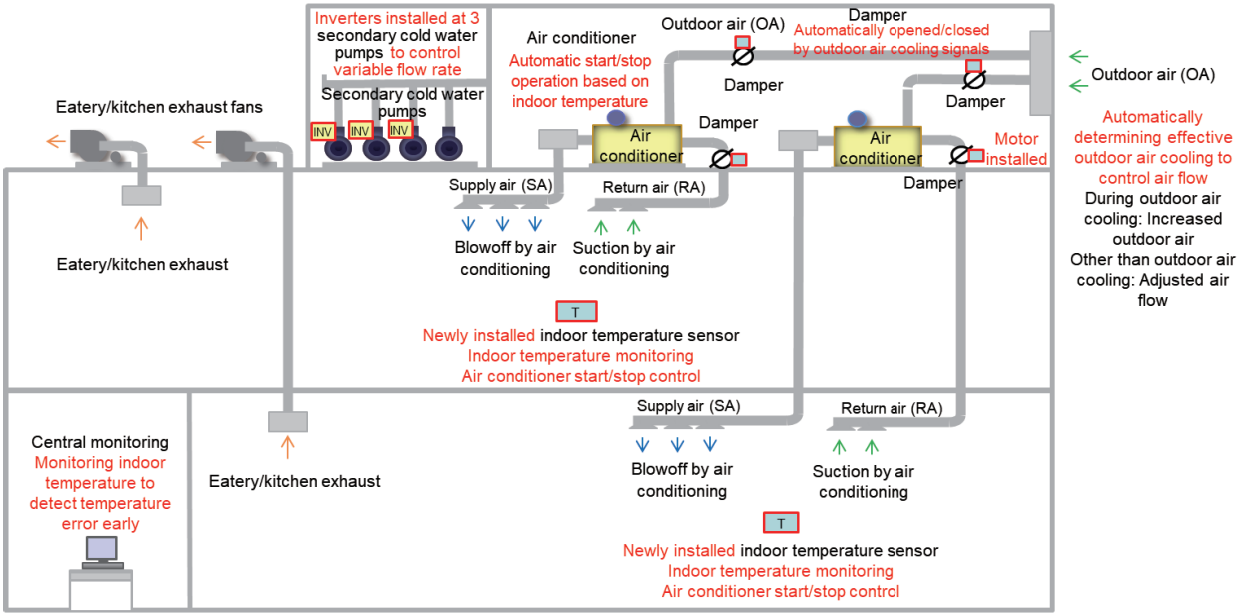
- Air conditioning (cooling only) in the common-use spaces of this shopping center uses nighttime power, and the heat source stored in the ice heat storage device is used for cold water pumps and air handling units to feed the cold air into the building. Inefficiency has been improved by the air conditioning control system.

Area	Old system (Before introduction)	New system (After introduction)
AHU	No temperature sensor, only scheduled operation allowed.	On/Off control by wireless temperature/humidity (outdoor/indoor air) sensors. Turned on/off automatically according to the set temperature.
Damper (OA, RA)	Manual dampers with fixed opening. Opened/closed according to the season, but not timely opened/closed.	Automatic opening control by electric dampers. Effective outdoor air cooling based on measurement data by wireless thermometers/hygrometers.
Secondary cold water pump (Cooling of AHU circulation water)	Scheduled operation. No inverter-based control employed. Required amount controlled by turning on/off three pumps, causing a loss.	Variable flow rate control by newly installed inverters. Required flow rate considered based on measurement data of discharge pressure and cold water out-going/in-coming temperature to automatically control inverter frequency.

[Before introduction]
Flow rate adjustment of the secondary cold water pump, operation/stop of the air conditioner and effective use of outdoor air cooling had been mainly operated manually, making it difficult to respond to a load change.



[After introduction]
Power consumption has been reduced and the indoor temperature has been uniformized by automatic control responding to a load change.
Temperature/humidity sensors with built-in batteries are installed in 13 places in the building and 1 place outside, and their data are taken into the system by wireless communication technology to automatically control the air conditioners.



Effects or Remarks

- LED installation work has reduced annual electric usage in the common-use spaces by 549,000 kWh (crude oil equivalent of 141 kL). With respect to an investment amount of ¥46,220,000, the improvement effect was ¥13,650,000/year and the payout period was 3.4 years.
- The air conditioning control system has reduced electric usage in the common-use spaces by 1,055,000 kWh (crude oil equivalent of 265 kL) in one year after introduction, greatly exceeding 544,000 kWh/year, the reduction goal at introduction time. With respect to an investment amount of ¥28,750,000 in this installation work, the improvement effect was ¥29,800,000 in two years, recovering the investment in two years after introduction.
- There had been no introduction case of the air conditioning control system into other facilities. It took time to explain its introduction to the investors, but we have obtained more reduction effects than expected.
- Awarded the FY2019 ECCJ Chairman's Prize of the Successful Case of Energy Conservation in Factory & Building.

Introduction to Other Companies - Notes for Introduction - Installation in Practice or Schedule

Notes for Introduction

- With promotion of sustainability by LaSalle Investment Management, investors' understanding was obtained to launch LED installation work and introduce the air conditioning control system. Since both of them had few past successful results at other facilities, however, repeated discussions and explanations were required before introduction.
- At a shopping center opened for business 365 days a year, a chief administrator cannot be stationed every day, resulting in issues of uniformization at the management level. However, efficient operation is allowed any time because both the wireless dimming LEDs and air conditioning control system have been automated.
- Particularly, the air conditioning control system is a sensuously operable visualized system, allowing speedy operation.

Records of Domestic and Overseas Introduction

- Introduction results of air conditioning control system into other facilities: 4 cases
  Energy amount reduction, electricity: total 1,591,000 kWh, heavy oil: 15.4 kL, gas: 18,000 m^3 (437 kL/6 months)

Contact: **UNIMO Chiharadai Operation Center, Jones Lang LaSalle IP, Inc.**
Tel: +81-436-76-0003
E-mail: unimo.sp@ap.jll.com

						S3	ZEB/BEMS
BP09	Keywords	Y4	system or software	Z4	electricity	I	Wholesale and Retail Trade

FUKUSHIMA GALILEI CO. LTD.

Realization of Comfortable & Energy-Saving Environment by PMV Control with AI Technology

Features

Major application	Food supermarket
Place at	Kanoya, Kagoshima / Omihachiman, Shiga
Total floor area	3,829 m² / 3, 866 m²
Floor	on story building
Completion year	May 2018 / June 2018

- In June 2018, we introduced our technology into 2 supermarkets in Japan and actualized the creation of further comfortability and energy-saving result in the supermarkets.
- Contents of Technology introduced.

① Ventilation System

Shifting from previous ventilation system with exhaust fan to outside air processing ventilation system (Desiccant Air Conditioning Unit). Reducing 70% of air conditioning load, and 20% of chiller & freezer showcase load have been achieved.

② Air Conditioning System

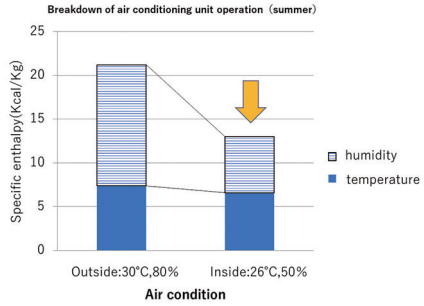
Adopted “High Sensible Heat” air conditioning units and optimized the positioning of the air conditioners in the shops. At Sales floor, adopted indirect vaporization cooling system. Combining with the effect of desiccant air conditioning unit, it achieved about 67% reduction of air-cooling energy consumption.

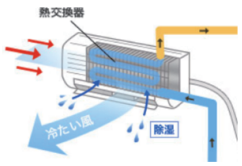
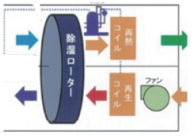
③ Inter-integrated control system among equipment & facilities

Realization of comfortable shop environment following PMV through inter-integrated control of desiccant air conditioning unit, air conditioner, and chiller/freezer showcase system. While keeping the comfortable environment in the supermarkets, AI technology automatizes the calculation of control parameters to minimize the energy consumption in the supermarkets.

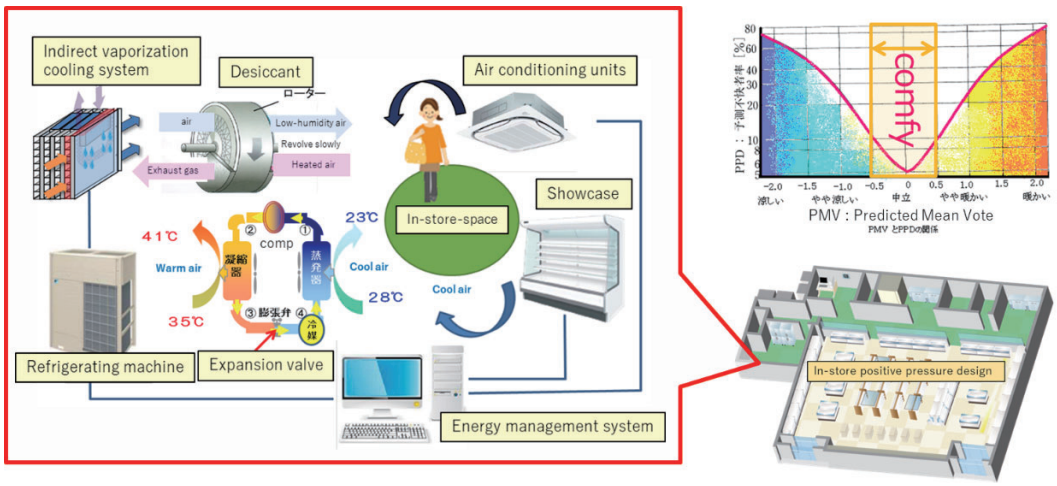
Basic Concept or Summary

The system’s scheme is to realize more energy-efficiency by replacing previous air conditioning units with desiccant air conditioning units as a method of removing humidity, which takes the most of energy during the summer season.



	Air conditioning unit	Desiccant air conditioning unit
Image		
Energy Consumption	Condensation of steam requires large amount of energy.	Energy for adsorption and desorption.

Visual summary of the system as below: adopted desiccant air conditioning units to have positive-pressure ventilation inside the supermarkets. By supplying the dehumidified air made by the desiccant system from the bottom of showcases, it creates a stratified air conditioning environment. The arrangement and locations of air conditioning units were revised, “high sensible heat” air conditioning units as main specification were used and indirect vaporization cooling system was adopted. To automatize the cooling operation inside of the supermarkets, PMV is adopted, and through auto-controlling by EMS, a comfortable and energy efficient shop environment has been realized.



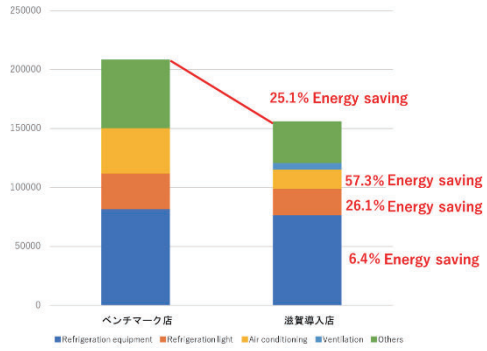
Effects or Remarks

◆ Energy Saving Effect

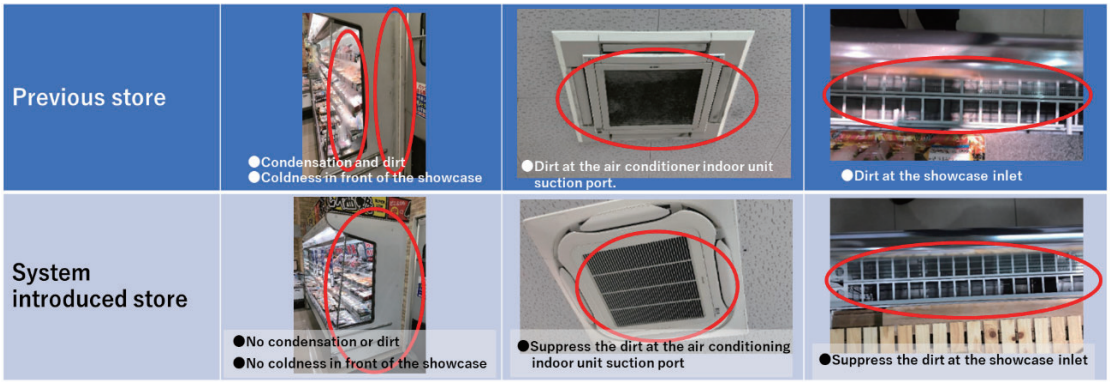
Achieved the result of higher energy saving from the actual tests compared to the estimated energy saving effect calculated during the planning stage. Achieved higher energy saving result than the targeted 20% energy saving rate during the summer time.

As further effects, the below results were achieved:

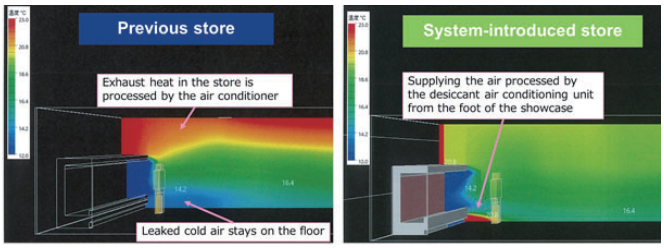
① Contribute to above 16% energy saving per year on the electric consumption of whole shops.
② Contribute to above 140t reduction of CO_2.
③ Contribute to sales increase by improving the comfortability in shop environment (enhancement of migratory time).
④ Make air conditioning temperature check by staff unnecessary. Enable staff to focus on the running of shop operations.
⑤ The creation of positive-pressure environment in the shops enhances cleaner hygiene environment (leading to the prevention of mold, insect and dust).
⑥ Prevention of condensation around showcases through dehumidifying.
⑦ Prevention of cold isle in front of showcases by desiccant system.



◆ Energy Saving Effect



◆ Remarks



Investment on ventilation systems at supermarkets tends to be minimized only to meet the minimum requirements of regulations. Especially these days, from the perspective of energy saving, that investment has tended to be restrained as much as possible. Being forced to reconsider about the significance of the role of the ventilation system with the widespread COVID-19 virus, it is expected that shop environments will be deteriorated by increasing ventilation more than before. Taking “with Corona” concept in mind for shop planning, implementation of our system will play a significant role not only for low carbonization but also as one of preventive actions against the infection.

◆ Awards･Patent･Subsidy

- 2014, January, received the Minister of Economy, Trade and Industry Award at the Energy Conservation Grand Prize. 2019, January, received the Minister of Economy, Trade and Industry Award at the Energy Conservation Grand Prize.
- Open Patent, patent publication number: 2020-071010 “店舗設備制御システム”
- Subsidy “L2-tech” in 2017(Ministry of Environment)

Introduction to Other Companies - Notes for Introduction - Installation in Practice or Schedule

Domestic Trial Company ,Inc: Super Center Trail x 2shops (Shiga prefecture, Kagoshima prefecture) 2020, start to sell Galilei Air Tech System. Planning to introduce to supermarkets throughout Japan.

Overseas 2020, start to sell through our local subsidiaries in the South-East Asia region

Contact: **FUKUSHIMA GALILEI CO. LTD.** Sales Strategy Departmen
TEL: +81-6-6477-2011(main) FAX: +81-6-6477-0755
URL: https://www.galilei.co.jp/
e-mail: ts@galilei.co.jp

movie→

BP10 | Keywords | Y3 | equipment or facility | Z4 | electricity | E31 | manufacturer of transportation equipment

Thermal Management Unit (TMU) Manufacturing Department, DENSO CORPORATION

Approaches to Energy Conservation by Predictor Management

Features

Setting the environmental policy “DENSO Eco Vision 2025”, we have been making efforts to halve energy usage (compared with 2012) by 2025 across the company. In order to achieve this goal, the TMU Manufacturing Department has set three core activities (1) “Advanced energy JIT”, (2) “Advanced visualization” and (3) “1/N and N times by technological innovation” to address “matchless energy conservation activities” (Fig. 1). As a result, we reduced electric energy consumption by 47,200 MWh (crude oil equivalent of 11,760 kL) and CO_2 emissions by 28% from FY2015 to FY2018. This time, of these activities, the following introduces a case of advanced visualization “Approaches to Energy Conservation by Predictor Management”.

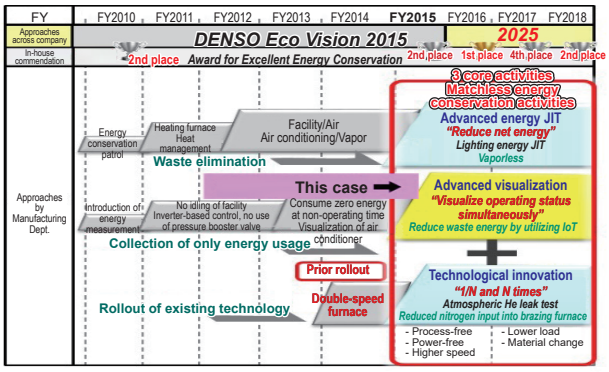


Fig. 1. Matchless Energy Conservation Activities

Targeting general processing facilities, this case is to create energy conservation effects by preventing facility failures, or major factors of waste energy. A mechanism has been built inexpensively, which timely outputs an alarm to prevent a failure when maintenance is required, by always sensing many cylinder operating speeds at which error predictors had not been grasped so far. It has been already rolled out to in-house production lines. As it is easy to roll out to similar processes, it is expected to greatly contribute to reduced waste energy and lower CO_2 emissions.

Basic Concept or Summary

1. Concept of reduced waste energy by predictor management

Fig. 2 shows the concept of reduced waste energy across the production lines by predictor management. Targeted this time are radiator production lines, which are consistent production lines consisting of multiple processes such as assembly of aluminum parts, their brazing and leak test. Consequently, stoppage of one process affects all processes, wasting a great deal of energy. Accordingly, in order to prevent failures and increase the operating rate of all production lines to obtain large energy conservation effects, we have made efforts for monitoring the cylinder operating speed of various facilities, heater leak current value of the furnace, oscillation range of RC (stirring) fans, light quantity of workpiece check sensors, and so on. This time, we describe predictor management of cylinder failures which account for a particularly higher ratio among these failure factors.

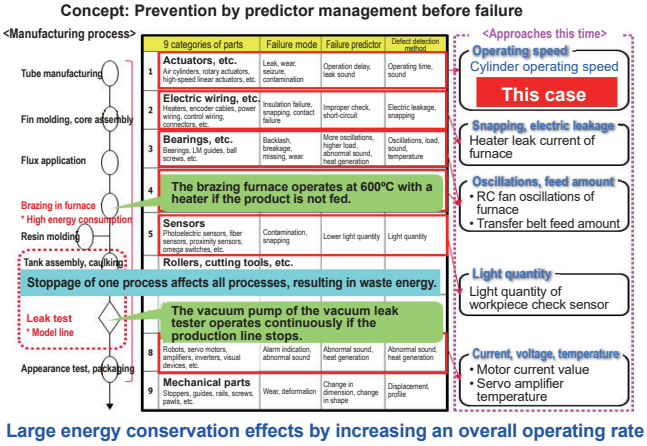


Fig. 2. Predictor Management Parts and Detection Method

2. Predictor management by monitoring the cylinder operating speed

Fig. 3 shows a mechanism of cylinder malfunction. An air cylinder is delayed in operation because of a pressure drop by internal/external air leak and a sliding resistance due to contamination/insufficient lubrication. Even when there is an operational delay, it is difficult to notice an error if an operation check sensor is turned on. After this, repeating the operational delay, the facility finally fails and stops. The error is only noticed at that time. Conceiving based on this that monitoring the cylinders operating with different connected parts leads to monitoring of the operating condition of the entire facility, we have developed and introduced a system which always monitors the forward- and backward-moving speeds of all 350 cylinders of the target production lines.

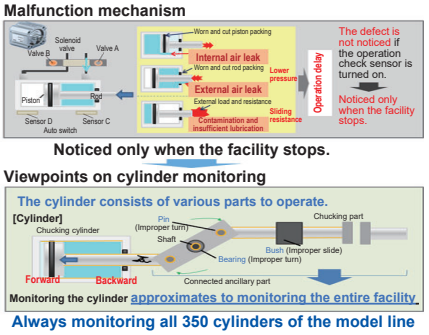


Fig. 3. Viewpoints on Predictor Management for Cylinders

3. Development of the predictor management system

In monitoring the cylinder operating speed, the system illustrated in Fig. 4 was built.

Conventionally, there were no sequencers directly connected to a network, requiring an exclusive PC to relay the data. In addition, it was necessary to measure an operating time on the part of the existing sequencer in order to collect operating speed signals and process the data, and a high cost and a lead time for remodeling were required, making introduction difficult. This time, by employing a new commercially available network sequencer capable of simply collecting the data, measurement of the operating time has been enabled any time through a simple program. In addition, Excel has been used to internally produce a cylinder operation visualization tool.

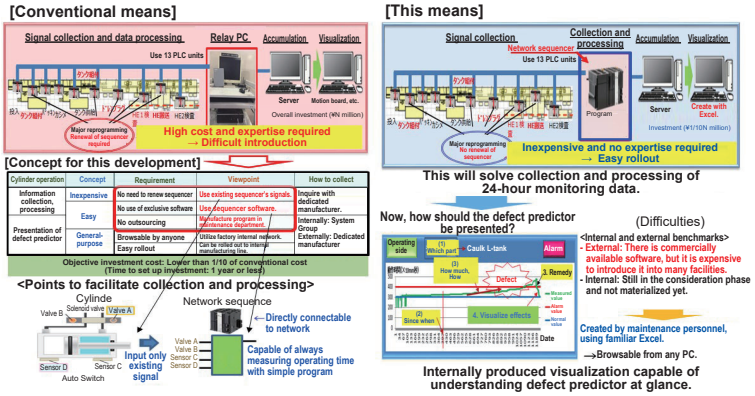


Fig. 4. Predictor Management System Configuration

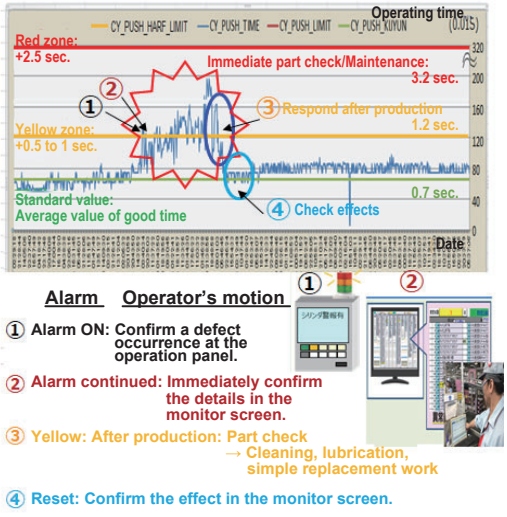


Fig. 5. Operation Method and Processing Workflow

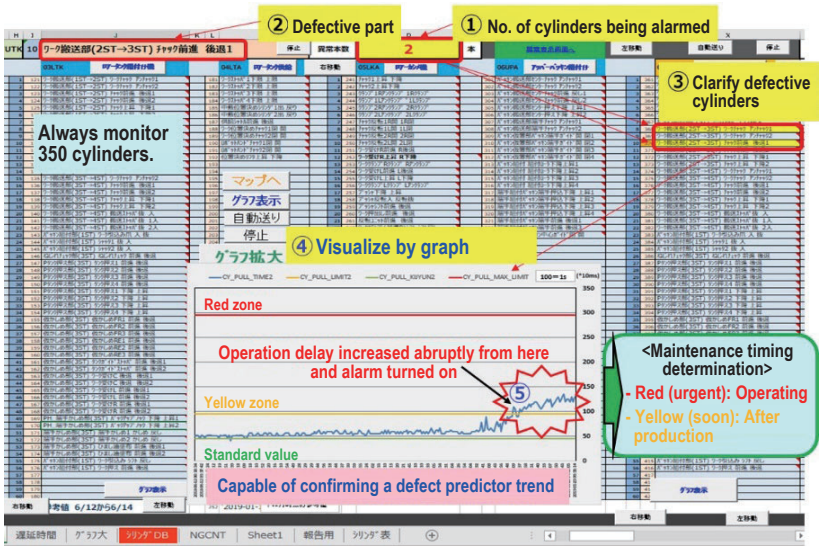


Fig. 6. Predictor Monitor Screen

Fig. 5 shows a method to operate the predictor management system and a processing workflow. Setting a standard operating time (average value when operating normally) for each cylinder, an alarm is output to inform the occurrence of a defect when reaching this standard and causing a delay. Two defect thresholds are set: a "red zone" (standard value + 2.5 seconds) requiring immediate cylinder check and maintenance and a "yellow zone" (standard value + 0.5 to 1.0 second) requiring a response after daily production. In order to increase the reliability, the alarm is output when exceeding the threshold for 10 cycles running.
Next, Fig. 6 shows the predictor monitor screen which always monitors 350 cylinders. The screen displays (1) the number of cylinders being alarmed and (2) a defective part and clarifies the defective cylinder in (3) yellow. Movements of this yellow cylinder are visually graphed (4) to allow operators to confirm a defect predictor trend. This graph in the figure shows an example of outputting the alarm "yellow" due to an abruptly increased operation delay from (5). In response to this alarm, a production line operator checks, cleans and lubricates the cylinders after daily production, including simple replacement work of packings, etc. depending on the situation, to normalize cylinder operation.

Effects or Remarks

(1) Production line under cylinder/sensor predictor management (assembly and leak tests): Reduced electric energy by 85 MWh/year. (Crude oil equivalent: 20 kL)
(2) Production line under furnace predictor management: Reduced electric energy by 234 MWh/year (Crude oil equivalent: 55 kL)

Cylinder predictor management
When fully rolled out within the department: 612 MWh/year expected (Crude oil equivalent: 153 kL, 0.7% of the entire department)

◆ Awards received
(1) FY2015 METI/ARNE Director General's Prize of the Successful Case of Energy Conservation in Factory & Building (Industrial sector)
(2) FY2017 METI/ARNE Director General's Prize of the Successful Case of Energy Conservation in Factory & Building (Industrial sector)

Introduction to Other Companies - Notes for Introduction - Installation in Practice or Schedule

The developed predictor management system is scheduled to be introduced into the 800-unit facilities in the department by the end of the FY2021. Also, it can be easily rolled out for internal and external facilities and production lines having predictor management target parts such as cylinders and sensors, with large effects on energy conservation being expected. We will continue to globally promote further energy conservation activities, thereby contributing to realization of a carbon-neutral society.

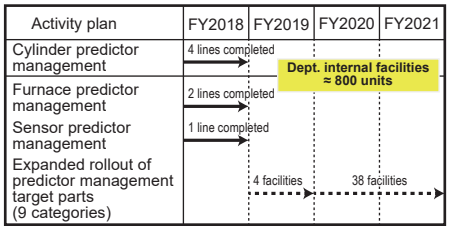


Fig. 7. Predictor Management Rollout Plan

Contact: **Manufacturing Planning Office, Thermal Management Unit Manufacturing Department, DENSO CORPORATION**
Tel: +81-563-55-1603 Fax: +81-563-55-1960
e-mail: akihiko.yamamoto.j2w@jp.denso.com

TOKYO TOSHI SERVICE COMPANY

Efforts for Higher-efficiency Heat Supply Plant Utilizing the “Energy Balance Flow”

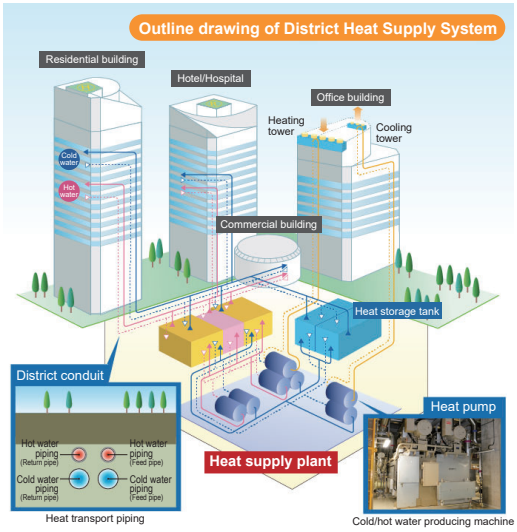
Features

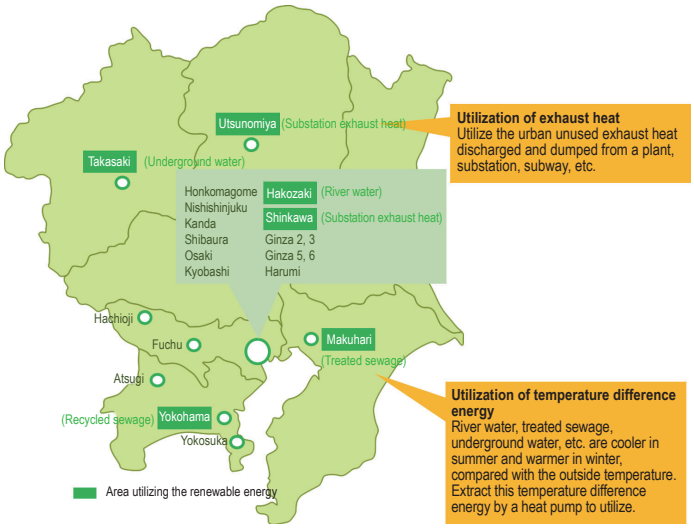
Our heat supply plants in 19 districts have different requirements such as load fluctuations and utilization of renewable energy, depending on the plant scale and the application of the customer’s building. To solve the issues of each plant, it was necessary to consider measures for stable supply and higher efficiency individually for each plant in the 19 districts.
For this reason, we have launched reviewing and enhancing systems, tools, etc. in order to spur small-group (energy conservation) activities at each plant.

- ◆ Small-group activities for energy conservation and higher efficiency at the plant
  - Building an energy management structure
  - Enhancing support of plant energy conservation activities at the main and branch offices
  - Enhancing management and support across the company
- ◆ Introduction of an energy balance flow: Visualizing a heat flow by creating the “Energy Balance Flow” using the measurement data

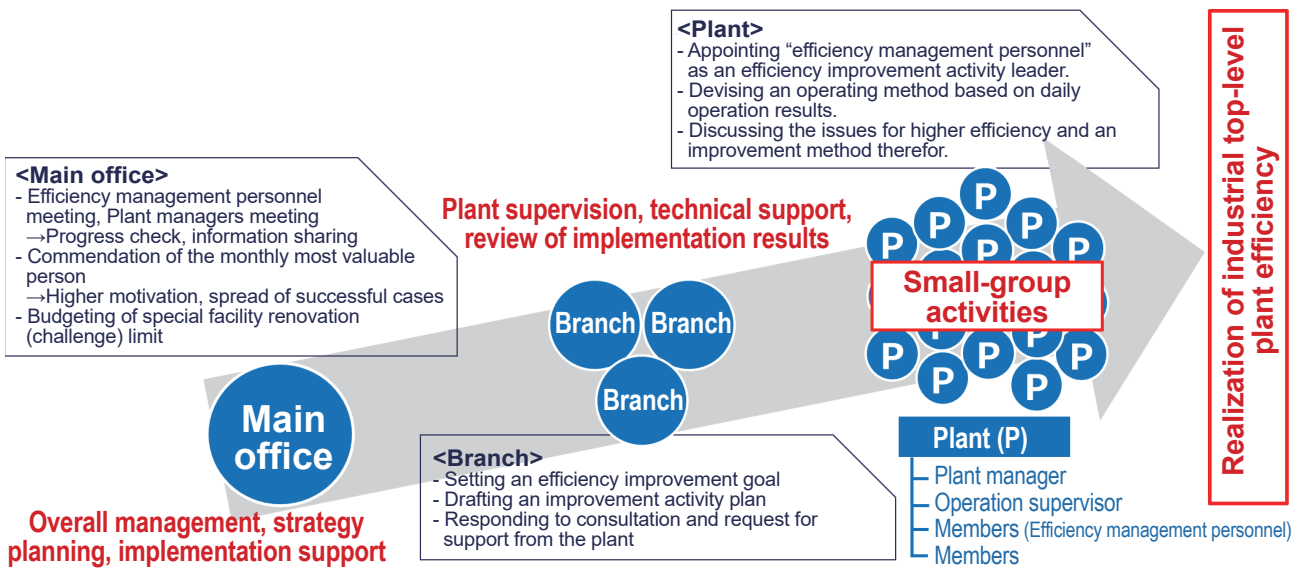
Basic Concept or Summary

- ◆ Summary of our heat supply business
  - Supply cold and hot water produced at the heat supply plant using electric heat pump system and large-capacity heat storage tanks to multiple buildings in the district through district conduits.
  - 19 districts centering on the Tokyo metropolitan area (6 of them utilize renewable energy)

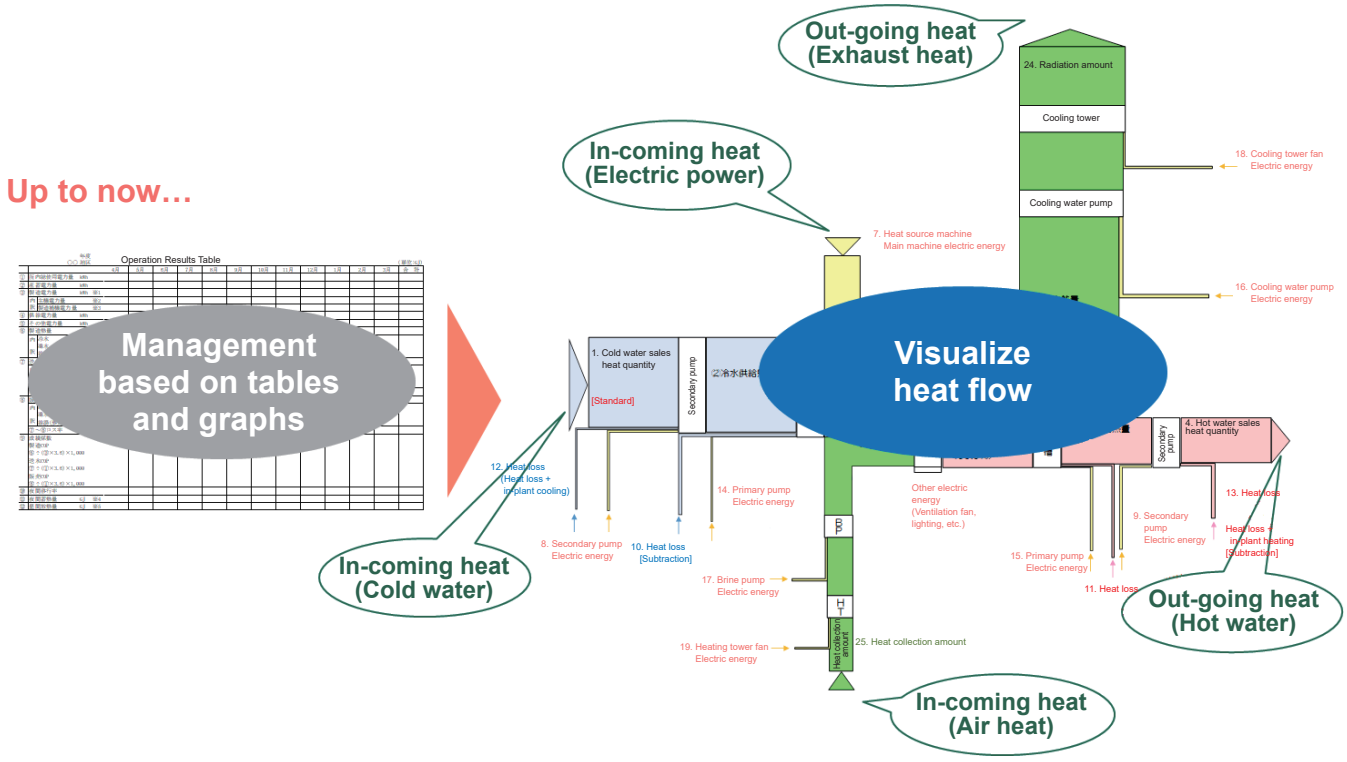




- ◆ Small-group activities for energy conservation and higher efficiency at the plant



◆ Introduction of the energy balance flow
- In addition to a heat flow of cold and hot water, summarize all in-coming and out-going energies at the plant such as heat losses of the heat storage tank and conduits, and power consumption of the heat source machine (heat pump) and transfer pump in one sheet for visualization.
- Examine and analyze the causes for heat losses, etc. based on the created energy balance flow.
- Discover losses and waste left unnoticed so far by comparing with other plants.



Effects or Remarks

◆ Effects of small-group activities at the Kanda Surugadai district heat and cool supply center (hereinafter referred to as the Kanda DHC)

The following three items were improved based on realization obtained by utilizing support of energy conservation activities and the energy balance flow.

1. Reduced transfer power
2. Recovered efficiency of the heat exchanger in each heat source machine
3. Reduced standby electric power

Annual Energy Conservation Effects (Kanda DHC)

Item	FY2016 before improvement	FY2018 after improvement	Reduced amount	Reduction rate (%)
1	187	164	23	12
2	244	230	14	6
3	8	0	8	100
Total	439	394	45	10

* Crude oil

Introduction to Other Companies
- Notes for Introduction
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◆ Approaches by small-group activities
- Improved heat losses by operational change of hot water in summer
- Higher efficiency by cleaning the heat exchanger of the water-cooled chiller with chemicals
- Lower transformation loss by operational change of the transformer
- Smaller hot water supply pump
- Program change to control the number of supply pumps

Contact: **TOKYO TOSHI SERVICE COMPANY**
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E-mail: tts-customer-ml@tts-kk.co.jp URL: https://www.tts-kk.co.jp/

BP12	Keywords	Y3	equipment or facility	Z4	electricity	F29	maufacturer of electrial machinary, equipment and supplies

Panasonic Corporation Tsu Factory

Energy saving activities at mother factory combining BCP measures ~Implementation of advanced air control, etc. and guidance to other factories~

Features

Global warming is progressing, and natural disasters are occurring frequently. In particular, the number of large earthquakes is increasing in Japan, and there is an urgent need for infrastructure development in consideration of early restoration in order to minimize the damage.

In addition, Panasonic must accelerate its energy-saving activities in order to reverse the ratio of "energy used and energy created" by 2050.

The Tsu Factory is adjacent to Ise Bay, and there is an urgent need to promote energy saving and develop factory infrastructure in combination with BCP for business continuity.

<Results of Activities>

[Tsu Factory] CO_2 emissions basic unit: △ 8.2% decrease, 23.0t/100 million yen (FY2014) → 21.1t/100 million yen (FY2018)

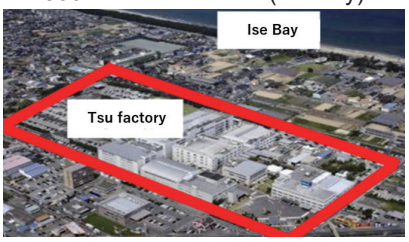
[Instruction / deployment to other sites] Proposal contents for FY2016-2018: CO_2 reduction amount of 800t, energy saving amount of 400kL (estimate, expected)

Basic Concept or Summary

In pursuit of our company's environmental policy of "combining comfort and eco-friendliness," the Tsu Factory contributes to reducing its environmental impact as a base for manufacturing wiring equipment.

It acquired "ISO14001" in 1996, and all the personnel carry out continuous energy saving and environmental activities. While promoting further energy-saving activities, the know-how cultivated as a mother factory is being spread horizontally to domestic and overseas sites.

500m from the coast (Ise Bay)



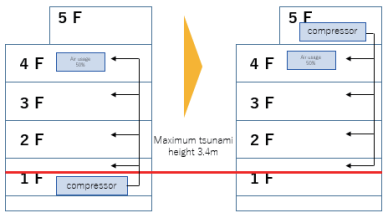
In the event of an emergency, the air supply needs to be restored along with the restoration of electricity, so when the compressor was renewed, it was relocated to the top floor of the building. As a result, even in the event of an emergency such as a tsunami, air can be supplied to the factory at an early stage, reducing the risk of disasters.

Maximum tsunami height at time of Nankai Trough earthquake:
3.4m (1st floor is submerged)

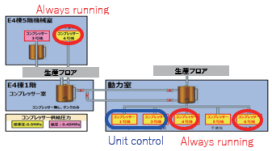
Effects or Remarks

The point of energy saving is "advanced air control in collaboration with external companies"

Upper floor installation of compressor

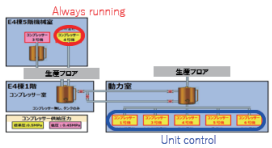


【Air supply diagram before improvement】



Always running
Power room No. 4 (185kW), No. 6 (270kW)
E4 building No. 4 (250kW)
Unit control (order device control)
Power room ① No.1 (270kW), ② No.3 (225kW)

【Air supply diagram after improvement】



Always running
E4 building No. 4 (250kW)
Unit control (equipment control according to load)
Power room No. 1 (270kW), No. 3 (225kW)
No. 4 (185 kW), No. 5 (160 kW)
No. 6 (270kW)

<Effect of setting up the upper floor of the building>

Reduction of disaster risk, and measures against pressure loss of air supply by shortening piping routes

① Analysis of air consumption for advanced air control in collaboration with an external company

Currently, air is supplied to each building from the air supply facility, but it was found that about half of the factory air is used for the molding floor on the 4th floor. Furthermore, it was found that a large amount of air was used in the deburring process of direct pressure molding on the molding floor. Even at the end of the month when the operation was low, it was consumed in large quantities, which was also the cause of the deterioration of the basic unit.

② Reduction of air power consumption by introducing a low-pressure compressor exclusively for direct pressure molding

When introducing the compressor, we set the optimum air pressure for deburring in cooperation with the manufacturer, production technology, and manufacturing department. The supplied air pressure was reduced from 0.50Mpa to 0.45Mpa. At the time of production adjustment at the end of the month, the basic unit was improved by completely stopping the low-pressure compressor and installing a switching valve between factory pressure air and low-pressure air.

③ Advanced air control in collaboration with external companies

The air leak investigation, which is an invisible improvement activity, continues to play cat and mouse with the site. We must continue to identify and repair leaks early. In collaboration with an electric power company, we adopted a high-precision leak detector to realize "visualization of leak points and leak amount". All the members are continuing to repair and address such leaks.

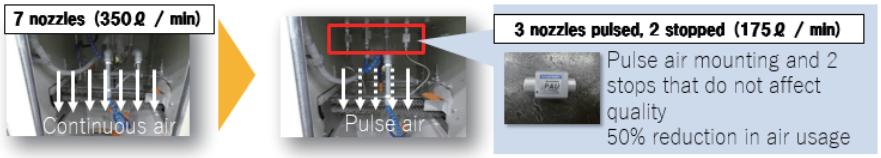
In addition, in collaboration with an air equipment manufacturer, we succeeded in improving the continuous air blow in direct pressure molding after trial and error so that the quality would not be affected. A pulse blow device was attached to three of the seven nozzles, and two of the remaining four were stopped, reducing the amount of air used by 50%.

④ Reduced compressor power by optimal unit control

Of the six compressors, three were always in full operation, two were being controlled and one was stopped as a spare. When updating the control panel of the compressor, we changed the number that could be controlled from two to five, and the optimum air supply system was realized according to the load.

Details of improvement: Utilization of air pulse blow

Reduce the amount of molding deburring air used in collaboration with air equipment manufacturers



<Initiatives in collaboration with equipment manufacturers and related departments>

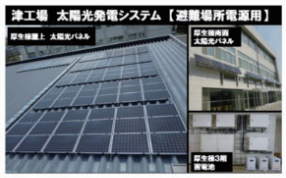
In line with the renewal of air conditioners, we worked to reduce the power consumption of constant temperature and humidity air conditioning in the mold workshop in collaboration with the manufacturing department. We proposed mitigation of temperature and humidity conditions with reference to the air conditions at the head office of the mold workshop. After confirming with the machine tool manufacturer, the allowable temperature was expanded to ± 2 °C and the humidity was revised to 70% or less without affecting the accuracy of the mold. As a result, the amount of electric power consumed could be reduced by 40%. In addition, in cooperation with the mold design department, we were able to increase the number of molded parts from 8 to 12. The production efficiency was improved and the production power was reduced.

<Installation of Solar power generation facilities and use of LEDs to reduce lighting power consumption>

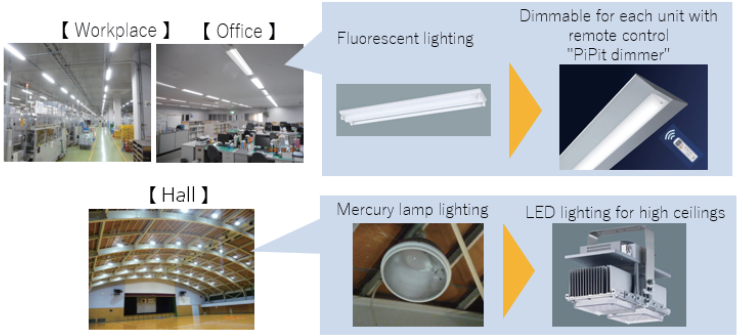
A solar power generation facility was installed in the building designated as a nearby evacuation building in the event of an emergency, and storage batteries were added. Power supply as an emergency power source and energy saving were realized. It has become possible to supply 30 KWh (12 hours) of electricity.

In addition, although it is not a BCP measure, a solar carport is adopted in the parking lot. With an annual power generation capacity of 373 MWh, it contributes to the spread of renewable energy.

We are also a manufacturer of lighting devices. We therefore replaced old lighting with new LEDs, which were our industry's highest level products, and we were able to significantly reduce the amount of electricity. From 2016 to the present, the cumulative power reduction amount has reached 1,047 MWh per year, achieving a cumulative LED conversion rate of 95%. We have also adopted "PiPit dimming equipment" in workplaces and offices that can be dimmed for each unit and contribute to further energy saving by reducing the illuminance at the places with no people, equipment and parts shelves.



Updated 8,625 units from 2016 to 2018 → Updated 2,500 units in 2019 LED conversion rate 95%



Introduction to Other Companies
- Notes for Introduction
- Installation in Practice or Schedule

Records of Domestic and Overseas Introduction

As the mother factory, Tsu factory has carried out steady energy saving activities.

We have developed energy-saving improvements for air, air conditioning, lighting, production equipment and so on by closer cooperation with other departments. Based on our possessed know-how, we have created the energy-saving survey guideline and the air leak survey procedure manual. Now we are expanding these to overseas factories. The establishment of these methods has led to the development of human resources to accelerate the localization of overseas factories.

Establishment of energy-saving survey method

Accumulation of energy saving improvement at Tsu factory, which is the mother factory (air equipment, air conditioning equipment, lighting, production equipment)

Cooperation with the head office and the environmental office of the business division

Energy saving investigation procedure,air leak investigation procedure

Contact: **Panasonic Corporation Tsu Factory**
URL: https://www.panasonic.com/jp/top.html

JFE Engineering Corporation

Multi-site Integrated Energy Network Services for Energy Saving

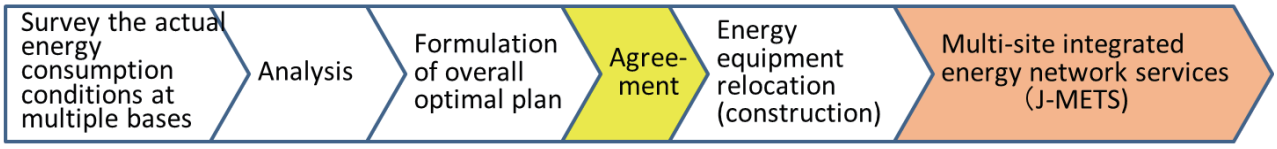
Features

As a new energy conservation promotion measure in the industrial sector, we are developing multi-site integrated energy network services (JFE-METS) as a product.

- Analyzes the actual energy consumption conditions at multiple bases, such as business units and area units, rather than individual bases
- Deploys integrated energy-related facilities in each base
- Implements energy sharing including remote areas

⇒ It provides the energy service that generates energy conservation in a comprehensive manner.

By expanding our JFE-METS as a product, we aim to achieve annual energy saving of 200,000 kL (equivalent to 500,000 tons per year of CO_2).



Basic Concept or Summary

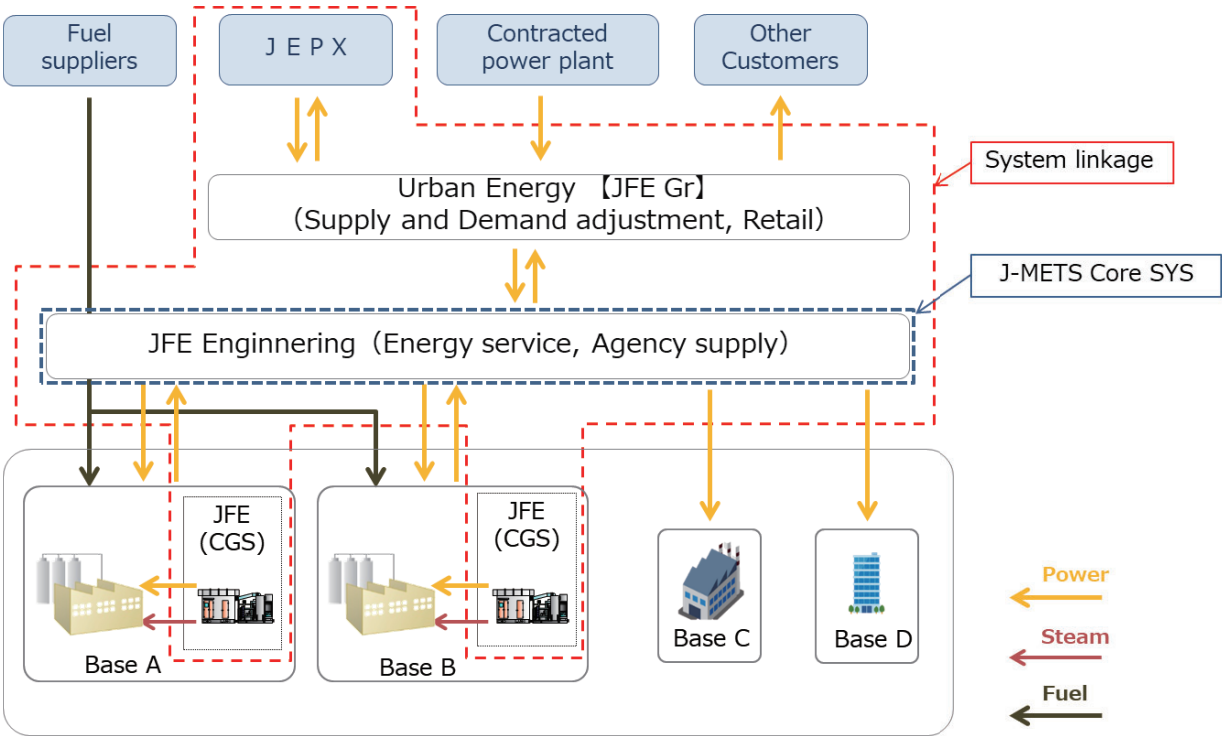
In the industrial sector, promotion of energy conservation is an important theme, and the person in charge is making efforts to further wring out the "dry rag" in order to achieve energy conservation as much as possible by making full use of all measures. JFE-METS, by changing our viewpoint so far, analyzes the actual energy consumption conditions at multiple bases, such as business units and area units, rather than individual bases, and deploys integrated energy-related facilities in each base. By implementing energy sharing including remote areas, it provides the energy service that generates energy conservation in a comprehensive manner.

The effects of this service are as follows:

① high operation rate of facilities for reduction of fossil fuels such as cogeneration
② reduction of fuel cost by overall contract management
③ rationalization by overall energy management

These realize energy saving at the same time as energy cost reduction.

We are developing JFE-METS as a business model that can accommodate a variety of groups and various energy facility structures depending on the companies or areas, and we believe that we can contribute to social energy conservation by disseminating this business model through sales efforts.



Effects or Remarks

In order to disseminate this business model, the promotion to the food, chemical, and pharmaceutical industries, which have relatively large heat demand and generates large energy saving effect in the production activity, is considered to be the first thing. Assuming that the model can be disseminated to 10% of businesses in these industries, the market size can be 70-140 billion yen per year. Assuming an energy saving rate of 10%, energy can be reduced by 100,000-200,000 kL per year, and CO_2 can be reduced by 250,000-500,000 tons per year.
Looking at the period up to 2050, as a means of further expanding JFE-METS, it is possible to plan and implement more energy-efficient models by creating more effective combinations of models by integrating individual units into multiple operators or multiple areas. In order to achieve this, not only further developing the control systems, but also deregulation is necessary, such as enabling the exchange of power between different operators utilizing the existing transmission and distribution networks. In this regard, we would like to aim for CO_2 reductions of 1 million tons per year by 2050.

Introduction to Other Companies - Notes for Introduction - Installation in Practice or Schedule

Notes for Introduction

- Using a lot of Steam and/or hot water
- Easy access to natural gas infrastructure

Records of Domestic and Overseas Introduction

Please see the following websites for examples and details

- Japan's First! Optimization of Energy from Procurement to Supply at All Production Bases of The Nisshin OilliO Group, Ltd. Nationwide - 17% Reduction of CO_2 Emissions and Reform of Cost Structure - https://www.jfe-eng.co.jp/en/news/2017/20171013.html

- JFE-METS Receives 2019 Energy Saving Award, Minister of Economy, Trade and Industry Award - Realizing Energy Saving by Collectively Managing Energy at Multi-site https://www.jfe-eng.co.jp/news/2020/20200130.html

Contact: **JFE Engineering Corporation**
URL: https://www.jfe-eng.co.jp/

Nagoya City Energy Co., Ltd./Nikken Sekkei Ltd./Nikken Sekkei Research Institute/Shinryo Corporation

Achievement of district energy conservation and load leveling through the best mix of electricity and gas usage and utilization of reclaimed sewage water

Features

This district heating and cooling (DHC) system project for the Sasashima Live 24 District (Nakamura and Nakagawa Wards, Nagoya City, Aichi) has delivered a distinctive energy conservation model that combines the following major features: utilization of unused energy (heat from reclaimed sewage water) for running the heat supply plant, a partnership program with the City of Nagoya; nighttime thermal storage (water thermal storage tank) using a centrifugal chiller; and gas engine cogeneration systems (CGS). It has been designed to achieve the best mix of the advantages of electricity and gas heating through joint efforts of participating companies while increasing the District's disaster preparedness, mainly through securing an emergency power supply.

This model highlights the adoption of reclaimed sewage water as a heat source. It takes advantage of the resource's property of remaining at a constant temperature throughout the year to provide winter heating and summer cooling with higher energy efficiency.

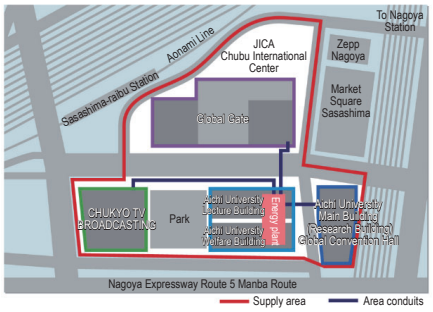
Basic Concept or Summary

◆ Basic Concept

Sasashima Live 24 District is located approximately 1km south of Nagoya Station. After the Sasajima Freight Station was closed in 1986, the City of Nagoya began a land redevelopment project. This became the current redeveloped area with the theme of "Hub for international hospitality and exchange".

The energy center has a plant area of approximately 2,600 m^2. It is located in the basement of the Lecture Building and the Welfare Building of Aichi University, and supplies heat to the following buildings:

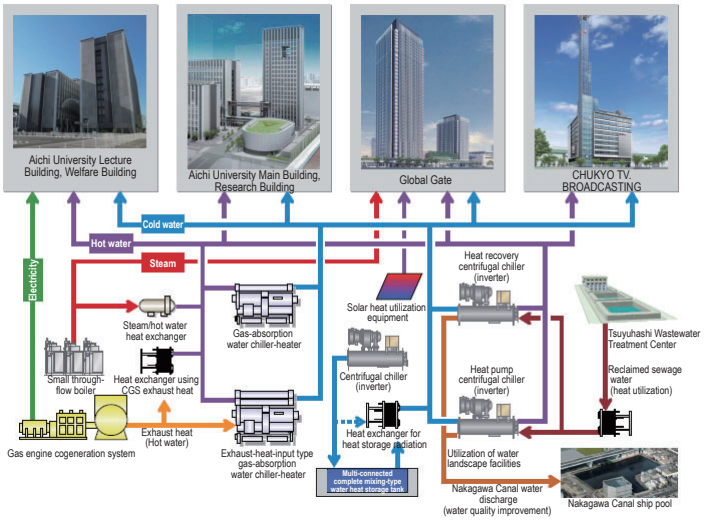
- Global Gate: A building with state-of-the-art office, hotel, and conference facilities and commercial facilities.
- Aichi University Nagoya Campus buildings: An urban-type campus comprised of the Main Building, the Lecture Building, the Welfare Building, and the Global Convention Hall.
- CHUKYO TV. BROADCASTING : A designated terrestrial core broadcasting operator for television broadcasting covering the Chukyo region broadcasting area.



District heating/cooling supply area (Total supplied floor area: 252,700 m^2)

◆ Equipment configuration and features

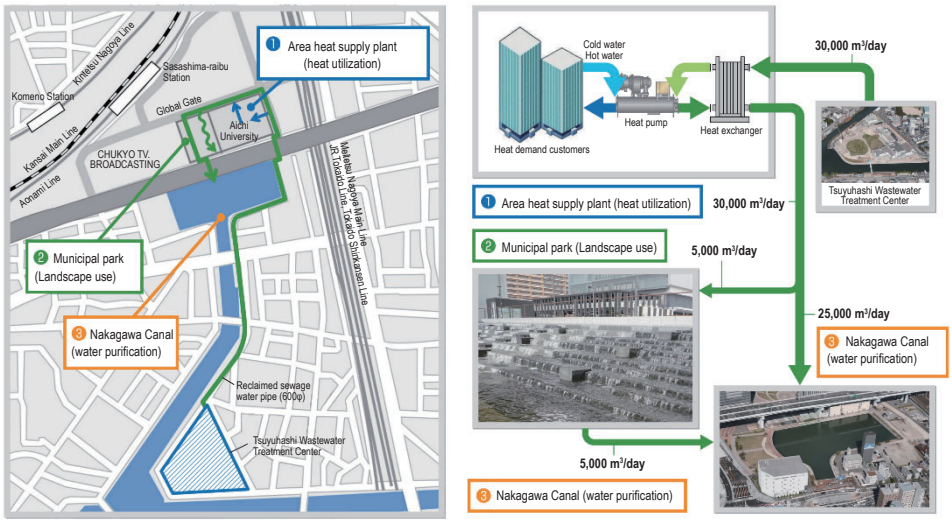
- Approximately 30,000 m^3/day of reclaimed sewage water is introduced and is used as heat source water for the water source heat pump in the winter and as cooling water for chillers, etc. in the summer.
- A water thermal storage tank (3,800 m^3) is installed, and by rated operation of the centrifugal chiller during the night, operating efficiency is improved and cooling water is manufactured.
- CGS (600kW x 2 units) are installed. Normally, they are utilized to supply generated power and the exhaust heat is used as a cold water/hot water heat source. In the event of a disaster, they can be used as a safety power source for the energy plant and Aichi University.
- Preheating of the central hot water supply for commercial facilities is performed using solar thermal collector panels.



Centrifugal chiller	800RT×1
Water source heat pump (heat recovery)	500RT×1
Water source heat pump	1,600RT×1
Exhaust-heat-input type gas-absorption water chiller-heater	1,000RT×1
Gas-absorption water chiller-heater	1,000RT×2,700RT×1
Steam boiler	2.5t/h×6
Water thermal storage tank	3,800m^3
Gas engine CGS	600kW×2
Solar thermal collector panels	120m^2

Effects or Remarks

◆ Use of reclaimed sewage water (unused energy)
- In conjunction with the complete renovation of the Tsuyuhashi Wastewater Treatment Center of Nagoya City Waterworks & Sewerage Bureau, reclaimed sewage water (30,000 m3/day) is discharged into the Nakagawa Canal ship pool adjacent to the area, and heat utilization was achieved in collaboration with the City of Nagoya.
- During the summer, operating patterns for maximum utilization as cooling water were devised and implemented.
- In addition to utilization as a heat source, water quality improvement and utilization as a city park landscape has also been achieved. For this multipurpose use and use of the upper space, the City of Nagoya received the Circulation Route Sewage Works Award Grand Prize from the Ministry of Land, Infrastructure, Transport and Tourism in 2019.



◆ Energy conservation effects

(1) Energy conservation performance
Including the energy conservation effect of reclaimed sewage water (approx. 10% annually), as a result of efforts for high-efficiency operation, the system COP of this plant has become approx. 1.1.

(2) Effects of electricity load leveling
During summer cooling load peak periods, water thermal storage tank, reclaimed sewage water, gas-absorption water chiller-heaters, etc. are used to supply more than 40% of cold heat. In addition, at customers to whom power is supplied, during summer peak periods almost 80% of the customer's power demand was supplied by CGS.

(3) Establishment of Energy Conservation Committee
The Committee consisting of Nagoya City Energy, the City of Nagoya, and customers analyzes and shares information on energy production and use conditions, and promotes energy conservation.

◆ Awards
- 2019 Aichi Environmental Award (Aichi Prefecture): Silver Medal
  Achievement of top-class COP (system efficiency) through "Utilization of reclaimed sewage water" and "Best mix of electricity and gas usage"
- 2019 Cogeneration Award (Advanced Cogeneration and Energy Utilization Center JAPAN): Excellence Award (Consumer Division)
  Improvement of district energy conservation and disaster prevention preparedness through energy-saving combined heat source systems such as cogeneration and utilization of reclaimed sewage water.
- 2020 HPTCJ Award for Demand Side Management (Heat Pump and Thermal Storage Technology Center of Japan): Director of HPTCJ Award
  Achievement of district energy conservation and load leveling through the best mix of electricity and gas usage and utilization of reclaimed sewage water

Introduction to Other Companies - Notes for Introduction - Installation in Practice or Schedule

Notes for Introduction

◆ Collaboration with the City of Nagoya (Realization of urban planning)
Expansion of area energy usage and utilization of unused energy, etc. are included as policies in the City of Nagoya's "Second Action Plan for Low-Carbon City Nagoya Strategy". Sasashima Live 24 District is the most important base of Nagoya's redevelopment project, and supply of energy by our company helps promote the implementation plans of these policies.

◆ Utilization of subsidies
A subsidy for "The Leading Project for Promoting CO_2 Reduction in Housing and Building" from the Ministry of Land, Infrastructure, Transport and Tourism was received, and through construction with the highest level of environmental technology and high-efficiency energy systems, we have increased the regional energy conservation and environmental quality, and have become one of the nation's leading projects.

Records of Domestic and Overseas Introduction

In Sasashima Live 24 District, we started to supply heat to all customers from October 2017.

Contact: **Technology Division, Nagoya City Energy Co., Ltd.**
Tel.: +81-52-737-2100 ootani@nc-energy.co.jp URL: http://www.nc-energy.co.jp/index.html

						S3	ZEB/BEMS
BP15	Keywords	Y4	system or software	Z4	electricity	K	Real estate Goods Rental and Leasing

Nippon Steel Kowa Real Estate Co., Ltd./Nihon Sekkei, Inc./Akasaka Intercity Management Co., Ltd.

Initiative to Achieve Super High-rise Smart Wellness Offices in Akasaka Intercity AIR, and Energy Conservation that Transcends the Boundaries of Development Areas

Features

Exterior Building Appearance

- Realization of a new urban environment design that transcends the boundaries of development areas, centered on “green networks” and “area-based energy use”.
- For large scale redevelopment in regions adjacent to existing district heating and cooling areas, a favorable cooperative relationship has been established among the three parties consisting of redevelopment business operators, heat supply business operators, and energy service business operators. Through DHC area expansion type area-based energy use centered on cogeneration, energy conservation and urban development with disaster-resistant self-sufficient energy have been achieved for the entire surrounding area.
- The aim is to improve the health and comfort of working residents and create smart wellness offices by creating a super high-rise tenant building with high competitive power and added value.
- Business operators, facility managers, engineers, contractors, and automatic control manufacturers participate in commissioning. In addition, verification of overall performance and implementation of operational improvements are conducted in coordination with both energy service business operators and heat supply business operators.

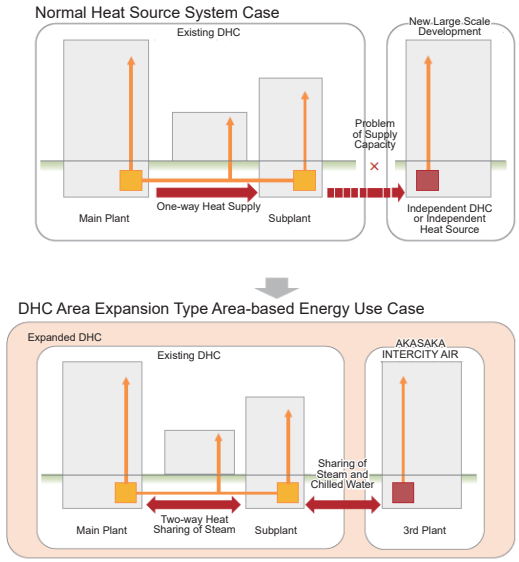
Basic Concept or Summary

■ DHC area expansion type area-based energy use

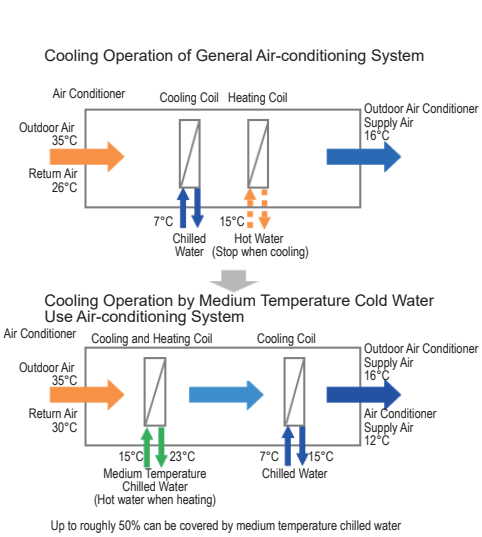
Cogeneration is installed in the building as an energy supply system with the aim of urban development with self-sufficient energy. Additionally, for large scale redevelopment in regions adjacent to existing district heating and cooling areas, area-based energy use by DHC area expansion has been introduced. Electricity and exhaust heat hot water from the cogeneration system are supplied to cover the base load of hot and chilled water used on the building side, and exhaust heat steam is supplied to district heating and cooling. Heat sharing is conducted for steam among three plants, and for chilled water among two plants. High-efficiency equipment can be operated efficiently in accordance with loads, and high-efficiency heat can be supplied to existing buildings in the vicinity which had been supplied by existing plants.

■ Medium temperature chilled water use systems in coordination with existing DHC

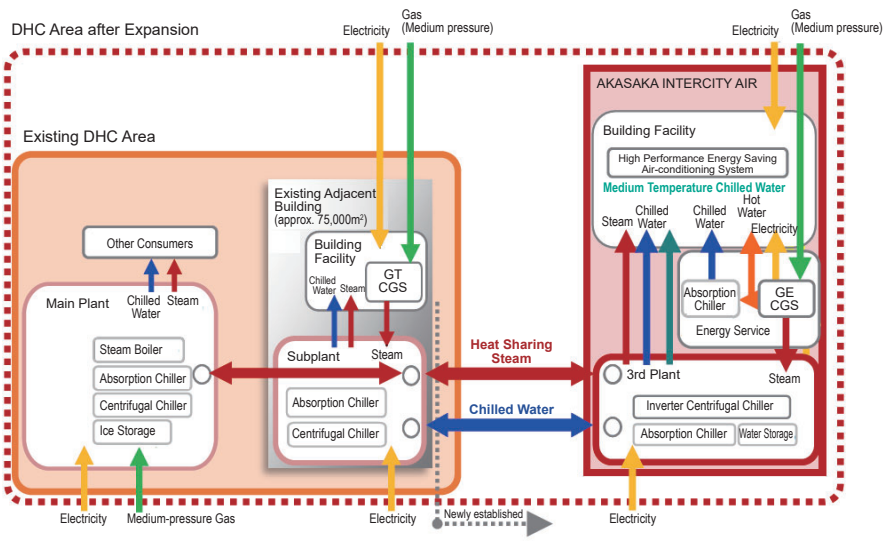
In order to achieve ultra-high efficiency operation of chillers, a high-efficiency supply of medium temperature chilled water in an existing DHC district has been achieved for the first time in Japan, through coordination with building-side medium temperature chilled water use systems. In this method, air conditioner coils are cooled in two stages by medium temperature chilled water and chilled water. They are precooled by 15°C medium temperature chilled water to 18 - 20°C, and then further cooled by chilled water to 16°C for outdoor air conditioners and 12°C for air conditioners. Outdoor air conditioners for stores are cooled only by medium temperature chilled water to 20°C, and air is supplied.



Conceptual Image of DHC Area Expansion Type Area-based Energy Use



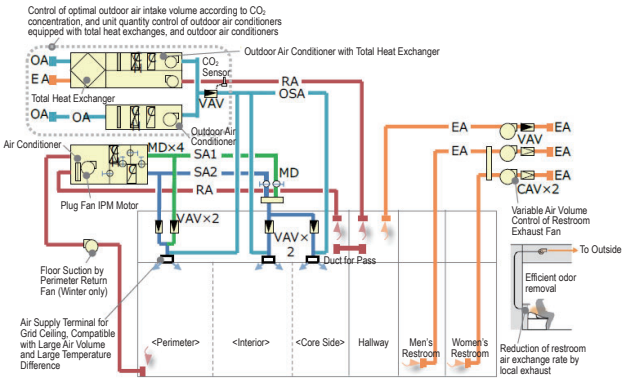
Conceptual Image of Medium Temperature Chilled Water Use



Energy Supply System

■ High performance energy saving air-conditioning systems to support smart wellness offices

Offices on typical floors are equipped with high performance energy saving air-conditioning systems to support smart wellness offices. These systems use a CO_2-saving air-conditioning design method that increases the ratio of medium temperature chilled water use and optimizes equipment capacity, and consist of: a 3-zone air-conditioning system created to meet tenant needs and reduce waste; a functionally differentiated multi-duct air-conditioning system that can respond to various requirements by differentiating and freely combining ventilation/humidity adjustment functions and temperature adjustment functions; an ultra-large supply air temperature difference variable air volume intermittent air-conditioning system with a supply air temperature difference of approximately 19°C; an air-conditioning system with optimal outside air volume control conducted by outdoor air conditioner sharing; and a unit toilet lining exhaust system with motion sensor control.



High Performance Energy Saving Air-conditioning System

■ Selectable-environment tenant eco-support system

An energy use monitoring system which allows tenants to visualize energy consumption via devices such as PCs or smartphones through tenant-service servers has been introduced to support energy conservation. With plans that charge air-conditioning fees according to the amounts of heat and electricity consumed, it is a selectable-environment type system that can return the reduction effects of energy-efficient operation by tenants back to those tenants as cost benefits.

■ Compatible with 200-hour continuous operation of emergency generators by using disaster-resistant medium-pressure gas

As a power supply measure in case of power outages, cogeneration and a dual fuel gas turbine that can use two types of fuel have been introduced. In addition to cogeneration and storage of heavy oil A sufficient for 72-hour operation, it also uses disaster-resistant medium-pressure gas, and can supply roughly 70% of electric power during 200 hours of continuous operation.

Effects or Remarks

■ Primary energy consumption rate and ZEB evaluation

Adjustment and operational improvement, and ZEB evaluation of area-based energy use, are carried out by commissioning in the operation stage. As a result of these efforts, the primary energy consumption rate in FY2019 was 1,093 MJ/m^2-year, and the corrected value from plant efficiency conversion, which reflects the effects of area-based energy use and medium temperature chilled water use, was 965 MJ/m^2-year, fulfilling the ZEB Ready standard which specifies a 50.0% reduction from reference levels (achieved 54% reduction).

■ Major awards received

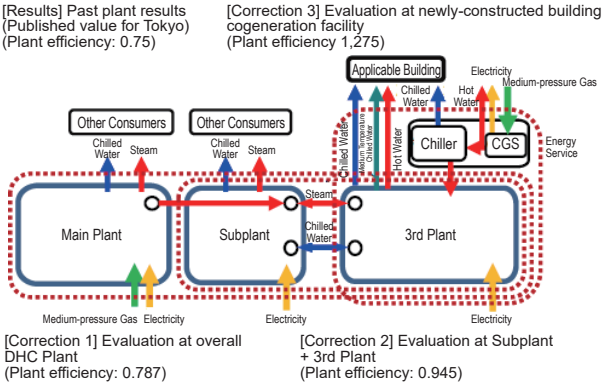
- 17th Environmental and Equipment Design Awards, City and Landscape Design Division, Grand Prize (Association of Building Engineering and Equipment)
- 8th Sustainable Architecture Awards, Large Scale Architecture Division, Review Committee Honorable Mention (Institute for Building Environment and Energy Conservation)
- 2019 Cogeneration Awards, Consumer-use Division, Chairman's Award (Advanced Cogeneration and Energy Utilization Center JAPAN)
- 58th Society of Heating, Air-Conditioning and Sanitary Engineers Awards, Building Equipment Division, Technology Award (The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan)
- 8th Carbon Neutral Awards, Kanto Branch, Honorable Mention (Japanese Association of Building Mechanical and Electrical Engineers)

■ Adoption of subsidized projects

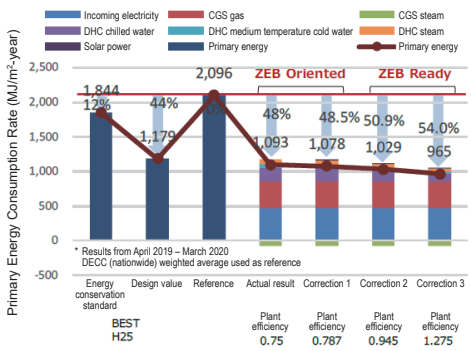
- Ministry of Land, Infrastructure, Transport and Tourism, FY2013 Promotion Project for Urban Development with Self-sufficient Energy
- Tokyo Metropolitan Center for Climate Change Actions, Tokyo Environmental Public Service Corporation
  Project for Promotion of Energy Creation and Energy Management at Office Buildings and other Sites

■ Environmental certifications

- CASBEE Smart Wellness Office Evaluation Certification Rank S



Boundary Setting Pattern for ZEB Evaluation



Comparison and ZEB Evaluation of Primary Energy Consumption Rate

Introduction to Other Companies
- Notes for Introduction
- Installation in Practice or Schedule

Notes for Introduction

- Introduction of cogeneration which applies energy service businesses
  Reduction of construction costs and improvement of project planning for redevelopment projects, and introduction and operation of high-efficiency cogeneration systems
- Cooperation in redevelopment, heat supply, and energy service businesses
- Utilization of environment-related subsidies
  Application to promote leading initiatives, improve business balance, and implement commissioning after completion

Records of Domestic and Overseas Introduction Akasaka Intercity AIR

Contact: **Nippon Steel Kowa Real Estate Co., Ltd.**
Shota Osame +81-80-1983-5449 shota.osame@nskre.co.jp URL: https://www.nskre.co.jp/

Chugoku Electric Power Transmission & Distribution Co., Inc.

“The Oki Hybrid Project”: Expanding the introduction of renewable energy, cooperating with the community, and utilizing Japan's latest technology

Features

- ◆ Leading effort for introducing the first "hybrid storage battery system" in Japan
  - In order to deal with both "short term fluctuations" and "long term fluctuations" caused by renewable energy at the lowest cost, we had constructed a "hybrid storage battery system" that combines 2 different types of storage batteries, the first effort of its kind in Japan.
  - We have achieved the supply-demand operation that automatically controls the batteries and internal combustion generators from the Energy Management System (EMS), all on a commercial-use power system.
- ◆ Efforts united with the community
  - We have introduced a large-scale mega solar farm cooperating with the local government,.

Basic Concept or Summary

1. Basic Concept

In remote islands such as Oki Islands, which are not connected by transmission lines to mainland Japan, the fluctuation caused by renewable energy is significant, because of the small scale of electricity usage. Therefore, in order to expand the introduction of renewable energy in remote islands, measures to adjust the fluctuation caused by renewable energy, such as batteries, are required.

This project is a plan adopted for subsidization by the Ministry of the Environment in FY 2014*, which aims, for the first time in Japan, to introduce a hybrid storage battery system combining 2 different types of batteries, NaS and Li-ion batteries, to accept a total of 11,000 kW of renewable energy, exceeding the Oki Islands' annual minimal demand (10,000 kW).

* FY 2014 battery demonstration project for promoting the introduction of renewable energy on remote islands

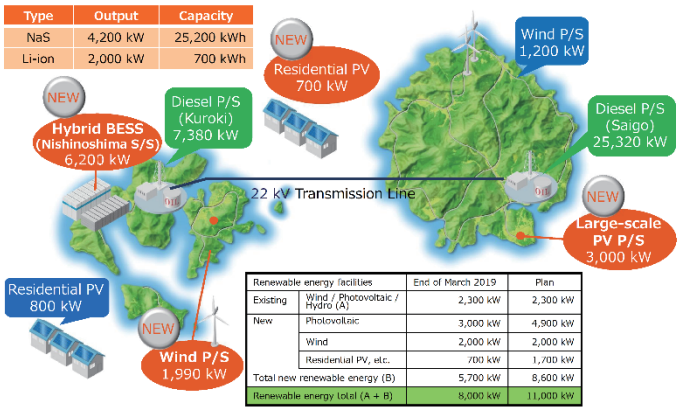


Figure 1 Overview of major power facilities in the Oki Islands

2. Oki Hybrid Project

(1) The Hybrid Storage Battery System

There are 2 types of fluctuations caused by renewable energy, the "short term fluctuations" due to the fluctuation of the solar radiation or the wind velocity, and the "long term fluctuations" due to the position of the sun, requiring measures for both phenomena.

In this project, we have constructed a hybrid storage battery system, which absorbs the short term fluctuations by high power Li-ion batteries, and the long term fluctuations by large capacity NaS batteries.

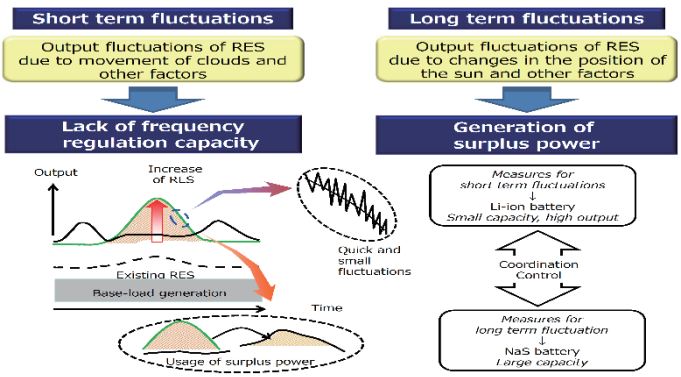


Figure 2 Hybrid BESS (Battery Energy Storage System)

(2) The Energy Management System (EMS)

We have connected the batteries, diesel power stations, and renewable energy facilities to an Energy Management System (EMS) via a communication network, achieving supply-demand operation that automatically controls the batteries and internal combustion generators from the EMS, gathering data such as the power demand and system frequency, all on a commercial-use power system.

The functions of the EMS are “Forecast of renewable energy generation and demand”, “Charge/discharge control of batteries”, “Control of the internal combustion generators”, and so on, and coordinated control between storage batteries and internal-combustion power is executed by means of unmanned automatic operation.

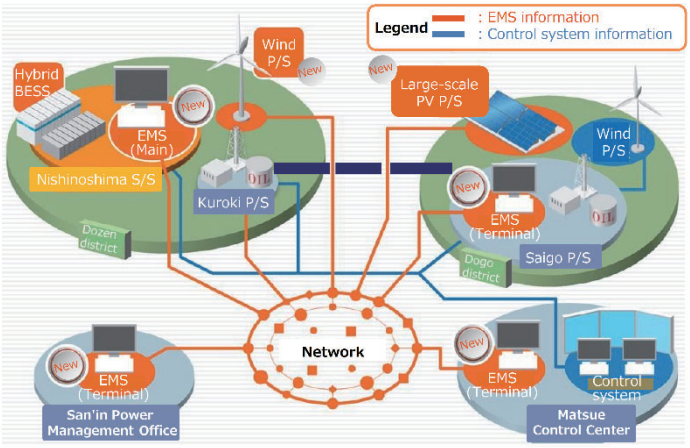


Figure 3 Configuration diagram of energy management system (EMS)

(3) Efforts united with the community

- Cooperating with the local government, we held open recruitment for a renewable energy company at the former grounds of the airport and introduced a large-scale mega solar farm.
- By constructing the special website and promotion hall, we had not only introduced this project but also promoted the Oki Islands, with the approach of "the fusion of the latest technology and nature".

Effects or Remarks

- Improvement of the power supply stability
  While ensuring the quality of electricity, we have expanded the introduction of renewable energy from 2,300kW (before the project) to 8,000kW (as of March, 2019).
- Reduction of environmental impact
  Reduced fossil fuel diesel power generation consumption, therefore reducing CO_2 emissions.
- Activation of the local community
  This project is the first challenge of its kind in Japan, and had led to increase in the number of visitors to Oki.
- Awards
  2019 “New Energy Award” - “Agency for Natural Resources and Energy Commissioner’s Award (Renewable Energy Introduction Sector)”

Introduction to Other Companies - Notes for Introduction - Installation in Practice or Schedule

Records of Domestic and Overseas Introduction

Technical knowledge accumulated through this project is expected to contribute to solutions for remote islands for both domestic/overseas cases.

Contact: **Chugoku Electric Power Transmission & Distribution Co., Inc.**
“The Oki Hybrid Project”
URL: https://www.energia.co.jp/nw/safety/facility/okihybrid/