Contact information regarding this pamphlet

Takasago Thermal Engineering Co.,Ltd.
International Business Headquarters

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CONTENTS
- Environmental Solutions
- Industrial Solutions
- Equipment / Systems
- Initiatives for a sustainable society
- AI/IoT Utilization
- Open Innovation
- Group Collaboration
- Contribution to SDGs
- Contribution to society through social harmony and creative solutions

Message from the President

Takasago Thermal Engineering Co., Ltd. will celebrate the 100th anniversary of its founding on November 16, 2023.

Over the years, our company has transformed itself repeatedly in response to changing times, in line with our Corporate Mission, which emphasizes “Contribution to society through personal harmony and creativity,” and, as a company that supports industrial and social infrastructure, we have continued to develop our business with a focus on air conditioning systems.

As we reach the milestone of our 100th anniversary, we have been rethinking the meaning of the company’s existence, and we have defined the purpose of the Takasago Thermal Engineering Group as being “Creating a brighter future for the world through environmental innovation.”

In accordance with this purpose, every Takasago employee will be moving forward together as an Environment-Creator®.

We have also formulated the Takasago Thermal Engineering Group Long-term Vision 2040. To help solve social issues with an eye on the future, we will be working toward the realization of the “Carbon transition within the building environment” and of the “Carbon neutral for the global environment.” The Takasago Thermal Engineering Group as a whole will be pooling its capabilities and constantly challenging itself as an Environment-Creator®, aiming to be a company that works together with its business partners to co-create environmental value.

May 2023

Management Philosophy

Purpose
With our revolutionary environmental innovations, we activate the Earth’s future.

Takasago Thermal Engineering synchronizes the air to various spatial environments, creating endless possibilities. Moreover, each employee is part of a tradition of pride and expertise built over the Company’s 100-year history, and we continue to expand the spirit of diversity and co-creation through harmonious relationships with others. We consistently pioneer paradigm-shifting environmental innovations. We are able to create optimized spatial environments not only on this planet, but also in space. We are profoundly dedicated to the wellbeing of our families, our fellow human beings, and all life on Earth.

Vision
Be an Environment-Creator™.

Origin
Contribute to society through social harmony and creative solutions.

Values
Provide value beyond expectations. Act with fairness, confidence, and pride. Build trust to create enduring relationships.

List of Overseas Group Companies

Company Outline

<table>
<thead>
<tr>
<th>Company name</th>
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- Takasago Thermal Engineering (Hong Kong) Co., Ltd.
- Takasago Vietnam Co., Ltd.
- PT. Takasago Thermal Engineering
- Takasago Thermal Engineering Co., Ltd. Myanmar Branch Office
- Takasago Engineering Mexico, S.A. de C.V.
- Integrated Cleanroom Technologies Pvt. Ltd.

Initiatives for a sustainable society

As “environmental solution professionals that can affect the global environment,” we create and promote technology and products that contribute to the development of a decarbonized and sustainable society. We will work together with society to achieve our goal for 2030, while ensuring that our activities contribute to the achievement of the SDGs.

Sustainable Development Goals (SDGs)

These are the Sustainable Development Goals (SDGs), which the world has agreed to strive to meet by 2030.

We aim to contribute to SDGs through our business activities.

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Takasago Global Network

Sustainable Development Goals (SDGs)

CONTRIBUTION TO SDGS

SDGs

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From a pioneer of HVAC systems to becoming an Environmental-Creator®
Our 100-year history leading into the future

The company started out as Takasago Heating Works Co., Ltd. in 1923, the year of the Great Kanto Earthquake, and has continued in operation through the Taisho, Showa, and Heisei eras into the Reiwa era. Today, under the name Takasago Thermal Engineering Co., Ltd., the company is still a pioneer in HVAC systems. As a company that supports industrial and social infrastructure, we have continued to take on challenges in advanced technologies as professionals trusted by customers and as pioneers of optimal systems and equipment.

Looking toward the future, Takasago Thermal Engineering Group will continue to evolve as an Environmental-Creator® that swiftly and flexibly responds to customers’ needs, and which aims to help build a sustainable society. We will be working toward the realization of saving energy through the “Carbon transition within the building environment” and of CO2 net zero emission through the “Carbon neutral for the global environment,” focusing on the provision of general air conditioning systems that create comfortable, optimal spatial environments, and industrial air conditioning systems that meet the needs of high-end precision manufacturing.

History of Green Air®

1923 Establishment
1927 Temperature and humidity adjustment system for artificial silk factories
1928 First domestic cooling tower
1930 Takasago Ebara turbo refrigerator completed
1932 Silk factories humidification
1937 Silk factories temperature and humidity adjustment
1938 Vertical laminar flow clean room
1940 4°C super low temperature system
1942 Full-scale hotel construction started
1950s New fan coil units adopted
1959 Vertical pipe shaft construction method for high rise buildings
1960s Other prefabricated construction methods adopted
1971 PMAC cassette system developed
1982 SECTA (saving energy computer of Takasago) P-1000
1983 DELTA (highly-accurate control technology) B-4600
1987 Failure predictive maintenance system for bearing, SIGMA T-3200
1990s
1994-1995 District heating and cooling facilities that make effective use of unused energy source constructed
1995 Super ice system (ice thermal storage) adopted
2000s
2003 Free cooling system adopted (Energy Center at the South Exit of Sapporo Station)
2010s
2014 Treatment of spiral RO membrane and UF membrane
2015 Energy produced locally for local consumption
2020 Adsortent thermal storage system Mega Stock®

Green solutions

2010 Ozone wastewater treatment system
2012 Hydrogen energy system
2014 MFA® (total system for measurement, analysis, and evaluation)
2015 GODA® (data collection and analysis tool to achieve energy operation)
2017 GODA® CLOUD
2018 Gdoc® (centralized monitoring and control system)

Technology

1982 TACT (saving energy computer of Takasago) P-1000®
1983 DELTA (highly-accurate control technology) B-4600®
1987 Failure predictive maintenance system for bearing, SIGMA T-3200®
2005 MAV® system for bearing, SIGMA T-3200®
2005 GODA® (data collection and analysis tool to achieve energy operation)
2005 TAKASAGO HVAC system for fume hoods (i-Fume™)
2006 Chemical filter (TGR®)
2007 Super low dew point clean air supply system (CDASS®)
2009 BARRIFLOW®/ BARRIHOOD®
2010 Data center operation service (Green Air® IDC)
2011 Wall outlet-type air conditioning system for data centers (IDC-SFLOW®)
2012 Nitrogen dioxide gas sterilization (SIS-HF®)*
2014 MFA® (consolidated equipment management tool)
2015 GODA® CLOUD
2018 Gdoc® (centralized monitoring and control system)

Green Air Technology Profile 2023
Adopted as a microgrid in Atsuta, Ishikari City

Ishikari City in Hokkaido has declared that they aim for a zero-carbon city. Our hydrogen generation system has been utilized for the microgrid project in Atsuta, which is located in the northern part of the city. The uniqueness of this project is that hydrogen is generated and stored by electrolyzing water with electricity generated by solar power, a renewable energy source. In the event of a disaster in the area, the stored hydrogen and other resources can be used to generate electricity for 72 hours and supply it to public facilities that will serve as disaster evacuation shelters. It is truly a sustainable, low-carbon microgrid that uses hydrogen (green hydrogen) energy coming from renewable energy as an energy source.

The microgrid in Atsuta, Ishikari City

- The microgrid uses solar power generation (163 kW) to supply electricity to five public facilities in Atsuta, Ishikari City.
- In order to utilize solar power electricity to full potential, battery storage (50kW/168kWh) and a hydrogen system (water electrolyzer and fuel cells) are also built as a storage system.
- The microgrid is designed to use direct current within the grid to reduce electricity losses.
- In the event of a disaster, the microgrid is automatically controlled to shift to autonomous operation and sends electricity to the designated evacuation shelters for 72 hours or more.

Initiatives on hydrogen innovations

Development of the hydrogen generation system through our R&D

Takasago Thermal Engineering has developed a wide range of energy conservation technologies and construction technologies for the last century as an HVAC engineering company. We would like to introduce here our activities toward achieving carbon neutrality. We have been working on the advancement of HVAC technologies and development of heat source for HVAC to achieve optimization of energy efficiency used in buildings. We have emphasized the development of generation and utilization technologies of hydrogen, which can be used for electricity and fuel as well as cold energy, in order to diversify energy uses.

Through these initiatives, in April 2020, we commercialized the small solid polymer water electrolyzer that can produce 1-5 Nm3 of hydrogen per hour.
A reduction in the burden on the environment is achieved by using characteristic Green Air® technology from the planning, design and construction of air conditioning equipment through to its operation, management and renewal work. We make efforts to create environments in a way that will satisfy customers by simultaneously pursuing both an increase in comfort and a reduction in the environmental burden.

### List of environmental burden reducing technologies using Green Air® technology

- **Development of a city with locally produced and locally consumed energy**
- **Super ice system for high freshness: SIS-HF®**
- **Swirling induction type TAKASAGO HVAC system: SWIT®**
- **Drainless flushing system**
- **Green Air® IDC**
- **IDC-SFLOW®**
- **Medical clean booth: BARRIFLOW®**
- **Medical clean hood: BARRIHOOD®**
- **Hydrogen energy system**
- **Gathering operation data and analysis: GODA® CLOUD**
- **Total system for measurement, analysis, and evaluation: MAT®**
- **Green Air® service**
- **Energy management system: GDoc®**

### General air conditioning

- **To air condition a large space**
- **To help prevent the spread of infectious viruses**
- **To have both comfort and energy conservation**
- **To consider electricity regarding BCP and energy saving**
  - **Chemical washer: T-GET® C**
  - **Micro gas engine cogeneration system: /uni03BCCGS-F50**

### Others

- **To reduce energy consumption in a clean room**
  - **TCR-SWIT®**
- **To further save energy and reduce costs in clean rooms with FFUs**
  - **T-OH-FFU**
- **To remove contaminants while reducing energy consumption**
  - **Chemical washer: T-GET® C**
- **To produce a DRY ROOM® with reduced energy consumption**
  - **DRY ROOM® technology**
  - **Energy-saving type dehumidifier: WIND® series**
- **To use water resources efficiently**
  - **Drainage flushing system**
- **To consider electricity regarding BCP, re-heating of CR and energy saving**
  - **Micro gas engine cogeneration system: jCQS-F50**
- **To consider electricity regarding BCP and energy saving for hospitals and hotels**
  - **Medical clean booth: BARRIFLOW® II / Medical clean hood: BARRIHOOD®**
- **To store renewable energy**
  - **Hydrogen energy system**
- **To consider electricity regarding BCP and energy saving for hospitals and hotels**
  - **Micro gas engine cogeneration system: jCQS-F50**
- **To visualize the situation of operation**
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### To operate a data center with reduced energy consumption and reduced CO₂ emissions

- **Green Air® IDC**
- **IDC-Snow®**

### To use water resources efficiently

- **Side stream cooling equipment**
- **Drainage flushing system**

### To further save energy and reduce costs in clean rooms with FFUs

- **T-OH-FFU**

### To consider electricity regarding BCP, re-heating of CR and energy saving

- **Micro gas engine cogeneration system: jCQS-F50**

### To reduce energy consumption in a clean room

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### To use water resources efficiently

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Environmental Solutions

Converting to environmentally friendly energy

We optimize energy solutions achieved from our thermal engineering technologies. Starting with the ZEB technologies adopted in our Innovation Center, the needs for utilization of community-sourced energy such as environmentally friendly energy using wood biomass and herbaceous biomass, which can contribute to achieve carbon neutrality, as well as local resources such as sewage sludge, will increase in the future. For our clients to achieve optimization, we provide extensive and comprehensive feasibility studies followed by implementation, right through to operational support of the proposed environmental solutions.

- Concept of a carbon neutral system using biomass boiler
- Development of a city with locally produced and locally consumed energy: regional revitalization and local energy from biomass

For Japan, a country which has low self-sufficiency for energy, circulation of local topics is an important topic. Shifting from fossil fuels to utilization of autonomously distributed electricity and heat sources using biomass will not only contribute to progress towards a decarbonized society, but also improve community resilience and promote revitalization of local economies.

We hope our thermal engineering technologies will create new coordination among businesses and local municipalities for opportunities and trigger the promotion of municipal development through locally produced energy for local consumption.

- FY2018, 1 project received cost grants, as promotion projects, for the feasibility studies into the commercialization of locally produced energy for local consumption by employing regional resources by the Ministry of Economy, Trade and Industry
- FY2018, 2 projects received project grants for the locally independent systems using biomass energy verification by the Ministry of Economy, Trade and Industry
- FY2019, 1 project received a project grant for the distributed energy infrastructure master plan drafting by the Ministry of Economy, Trade and Industry

Creating new services that synergize with our technologies through data analysis

While rapid IoT introduction is ongoing in various areas, the IoT wave is gaining momentum in the area of building equipment as well. We utilize IoT devices such as sensors to collect operations data for building equipment and environmental data for indoor spaces on our smart platform, and offer the optimal facilities operations based on analysis of the results. Furthermore, from the diverse data that has been accumulated, we are working on creating new services that utilize next-gen environmental control systems and facilities operations systems as well as artificial intelligence to accelerate the development of these services for practical use.

- [Use cases]
  - Visualization of thermal environment
  - Online efficiency assessment for heat source equipment
  - Facilities operations data analysis through machine learning
  - Assessment of operation and failure detection of equipment systems

Hydrogen energy system

This electricity storage equipment supplies a variety of energy types by using hydrogen energy, which is attracting attention as one of the technologies available to solve environmental problems.

It is suitable to convert output, absorb excess electricity, supply energy in emergencies including blackouts, and supply carbon neutral fuel, all from renewable resources which are expected to be used more and more on a global scale in the future.

- The production and storage of hydrogen using power from renewable energy, hydrogen is used on an as-needed basis.
- There is no heat loss due to involuntary discharge, so long-term power storage ranging from months to years is possible.
- The role fossil fuels have been playing can be replaced by hydrogen.

- Introduction image of a water electrolysis-based hydrogen production system "Hydro Creator®”
Constructs a high-precision environment in an ultra-short execution period while also providing energy and cost savings

TCR-SWIT® is a next-gen clean room technology which makes it possible to achieve both effective indoor environment maintenance and energy savings in large-scale clean rooms. The special features of TCR-SWIT® have been technically tested and verified in an ultra-precision air-conditioned clean room of ISO Class 5. We demonstrated that thermal environments and cleanliness can be maintained with less air flow by means of excellent ventilation efficiency. We have an established track record of commercial installation in a semiconductor manufacturing process (front-end) clean room (ISO Class 5 ultra-precision air conditioning).

TCR-SWIT® installation example

Constructing a TCR-SWIT® experimental and testing site

We constructed an experimental and testing site for TCR-SWIT® in the Takasago Thermal Engineering Innovation Center. It is the one and only experimental site in the world where you can switch between a TCR-SWIT® method and FFU method in the same room and visualize the original dehumidification flow and the humidification flow. Since we opened the site, many clients from various fields came to experience the HVAC system of TCR-SWIT® and it has received positive feedback.

TCR-SWIT®: Takasago Clean Room Swirling Induction Type

 Specifications (example)
- Module: 1,200×1,200
- Surface air velocity: 0.4 m/s
- Power consumption: 4.0 W/CMM

TCR-FFU

Further energy saving and reducing costs in clean rooms with FFUs

Utilization of brushless DC motors
We have achieved energy conservation in clean rooms with the use of highly efficient brushless DC motors. The number of rotations of DC motors can be set in increments of each 10 rpm, achieving even more energy conservation during operation.

Utilization of aluminum casing
Aluminum is more lightweight than galvalume steel sheets. Lighter weight makes it easier to increase the size of each FFU and reduce total number of FFU installed, and further saves energy and reduces costs.

TCR-SWIT® verification testing (applied to ISO Class 5)

TCR-SWIT® method 60 times/h

TCR-SWIT® method 20 times/h

TCR-SWIT® experimental and testing site

Visualizing the air flow

TCR-SWIT® in the Takasago Thermal Engineering Innovation Center. It is the one and only experiential site in the world where you can switch between a TCR-SWIT® method and FFU method in the same room and visualize the original dehumidification flow and the humidification flow.

● Further energy saving and energy costs in clean rooms with FFUs
- Utilization of brushless DC motors
- Utilization of aluminum casing

Energy-saving type dehumidifier: WINDS® series

MAJOR CALCULATION CONDITIONS:
- DEHUMIDIFICATION METHOD:
- Dry point temperature: Approx. -50°C
- Dew point temperature: Approx. -30°C
- Temperature rise: 85°C

Base configuration of the DRY ROOM®

DRY ROOM® technology

■ Achieving low-cost and energy-efficient DRY ROOM® facilities with appropriate equipment configuration and optimal operational control

Moisture in the air is an impediment to yield improvements in the manufacturing processes for the increasing production of rechargeable lithium-ion batteries and next-gen secondary batteries, which are expected to be widely used in the future. This manufacturing is therefore performed in a DRY ROOM™ which has the moisture in the air removed in a controlled low dew point environment. The manufacturing cost for the dehumidified air used in the DRY ROOM™ is higher than that for the conditioned air used in ordinary air conditioning. There are therefore increased demands for energy conservation in large-scale mass production factories. In order to respond to these demands, we optimized the configuration of the dehumidification equipment to achieve optimal operation controls to deal with the periods when the dehumidification load is low, for example, during the winter months.

Specifications (example)
- Airflow rate: 30.7 CMM×150 Pa
- Effective height 2m
- Power consumption: 4.0 W/CMM
- Surface air velocity: 0.4 m/s
- Module: 1,200×1,200
- Power consumption: 4.0 W/CMM
- 140°C
- 80°C
- 40%
Industrial Solutions

Energy Management

Chemical washer: T-GET®C

Chemical washer is an air washer installed on outdoor air handling units in order to prevent gaseous pollutants contained in the outdoor air from infiltrating the clean room. Compared to the conventional units, T-GET®C can minimize the air pressure loss by 60% and unit length by 50%, which in turn makes it possible to reduce blower force and space required for installation.

- Removal performance

Removal performance (annual average value)

Ammonia ions NH₃⁻: 90%

Sulfate ions SO₄²⁻: 85%

Green Air® IDC and IDC-SFLOW®

IDC-SFLOW® is an air conditioning system for IDCs, which consists of wall air outlets, flow control mechanisms (cold aisles), and shielding plates for hot aisles. Air supply is provided via the flow control mechanism, which means the wind speed on the air supply surface on the racks is equalized to a low flow.

- Features (compared to common wall outlet type air conditioning systems)

1. High energy conservation: Reduces the flow back of the rack exhaust heat, and the air supply temperature can be set quite high.
2. Adjustment is easy: Air flow adjustment depending on the heat generation status is unnecessary.
3. Good operability: The wind velocity is reduced near the air outlets in the cold aisles.

Comprehensive assessment technology for IDCs and operation task service for the entire life cycle of IDCs: Green Air® IDC

Green Air® IDC employs our comprehensive assessment technology for service of operations tasks in order to optimize an IDC's overall performance throughout its life cycle.

- The industry-leading original device to remove soluble gas: Chemical washer

- Features (compared to common wall outlet type air conditioning systems)

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1. Green Energy Management Doctor, GDoc®, is software that provides optimization for facility operators over the entire building life cycle. GDoc® is equipped with an AI (artificial intelligence) rule engine that is capable of extrapolating optimal control setting values based on measured values and operations knowledge.

The software comes in three kinds, premium (optimizing control setting values for a heat source equipment), DHC (district heating and cooling, output/start/stop schedules of a heat source equipment), and Building Automation (BA) System (centralized monitoring system).

(1) GDoc® premium

1. A real-time control system using the rule engine (AI)

With the built-in rule engine, GDoc® premium is able to generate control setting values for the heat source equipment and heat conveyance to help save energy and reduce costs while maintaining the given conditions and also taking external air conditions into account.

Control logic can be established using a standardized optimization module, supporting operational improvement based on existing facilities, device and system enhancement, and flexible program tuning.

With the addition of interactive building energy management system (BEMS) feature as an option, GDoc® premium provides visualization of the energy consumption, and system performance and maintenance information of the HVAC system. GDoc® premium provides optimization of facility operations over the entire building life cycle.

(2) GDoc® DHC

1. A heat source automatic operation control system for large heat storage tank facilities

GDoc® DHC is a heat source automatic operation control system for those who own large heat storage tanks such as a district heating and cooling plant. The system calculates the appropriate amount of heat storage based on the load forecast and automatically outputs the heat source start/stop schedules required to achieve the target heat storage.

The system is built with rules based on operational information from experts, which means it can flexibly respond to complex heat source operations. GDoc® DHC contributes to both stable operation of plants and labor saving.

(3) GDoc® BA System

1. A centralized monitoring system with an open network that achieves optimal control by connecting with the rule engine (AI)

GDoc® BA System is a centralized monitoring system that can connect to various control systems due to the use of the open network. It provides a suitable system according to each customer’s needs. Combining this open system with GDoc® premium of the GDoc® series achieves optimal control through the rule engine (AI) as well as the monitoring control feature, contributing to energy conservation and cost savings over whole life cycles of buildings.

Green Energy Management Doctor, GDoc®, is software that provides optimization for facility operators over the entire building life cycle. GDoc® is equipped with an AI (artificial intelligence) rule engine that is capable of extrapolating optimal control setting values based on measured values and operations knowledge.

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Gathering operation data and analysis: GODA® CLOUD

GODA® CLOUD is a cloud-based energy analysis tool that analyzes on-site energy usage and operating data of HVAC systems, etc., in order to promote more efficient energy conservation management.

Operation data is collected from on-site central monitoring equipment and inputted into a dedicated database in the cloud. Data analysts are able to directly and assist on-site operators without having to be on-site themselves by remotely checking and analyzing the data. Operations improvement is performed by sharing information with on-site operators, facilitating energy conservation and life cycle cost reductions.

● Using the measured values to analyze equipment, system performance, and energy usage
● Obtaining operational data through surface measurement

Usage model for remote assistance in energy conservation tuning

- Analysis content shared among parties
- Communicating improvement results in graphs and numbers
- Shared operation methods, implementation of knowledge

On-site facility → Operation data output → Centralized monitoring platform → Data center → Online data sharing → Data analyst

Compensating for lack of analysts by cloud data collection

"Operations improvement" will be achieved via remote analyst guidance even without an on-site analyst.

Total system for measurement, analysis, and evaluation: MAT®

MAT® is a technology that enables the monitoring of a facility’s operational status and the assessment of its performance using virtual design values while maintaining the facility’s normal functionality.

Using specifically developed precision-verified surface measurement technology (measuring temperature, flow, and electric current), MAT® is able to utilize accurate data with measurement error factors removed, facilitating analysis and assessment of facility performance. By enabling a system’s users to grasp the actual state of facility performance and energy consumption, MAT® helps them achieve more efficient operations and determines when equipment needs updating.

- Obtaining operational data through surface measurement
- Using the measured values to analyze equipment, system performance, and energy usage
- Supporting comparison of analysis results with standard values

SIS-HF®: Super Ice System for HIGH FRESHNESS

SIS-HF® uses the ice-making technology used for heat storage that we acquired through HVAC systems development. The system aims to achieve effective use of declining aquatic resources and increase profits for fishers by transporting very fresh aquatic products as is. The SIS® series has been implemented by many Japanese fishery companies.

Drainless flushing system

This water treatment system makes it possible to perform flushing without draining water from the system by removing suspended matter such as welding debris and, at the same time, purifying the water in the pipeline. This method is environmentally friendly as pollutants, such as zinc, contained in the flushing water are not released into the environment.

- Environmentally friendly water treatment system that does not discharge contaminant matter
- Greatly reduces the work needed for supplying and draining water, etc., for system flushing
- Reduces the flushing process control work and the overall costs

■ A system that flushes without any water drainage, reducing the burden from pollutants on the environment

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Hybrid outdoor air handling unit (in development)

A dual-pipe HVAC system that enables dehumidification and humidification in mid-temperature water

NIPPON PMAC Co., Ltd.

A hybrid outdoor air handling unit can achieve an indoor environment equivalent to a four-pipe/six-pipe system by using a dual-pipe system with a built-in heat pump. Combining the system with mid-temperature chilled water coils enables energy saving with minimum refrigerant use.

The efficiency of the heat source increases by operating the system in mid-water temperature (15–35°C). For example, if the generation temperature of cold water is raised from 7°C to 15°C, a 20% increase in efficiency can be expected.

We are actively developing the hybrid outdoor air handling unit to make it a latent heat processing system that can dehumidify/humidify as well as adjust both temperature and humidity so that we can achieve improvements in productivity and comfort by a latent heat/sensible heat separated HVAC system.

Micro gas engine cogeneration system: μCGS-F50

The world’s best power generation efficiency: 50kW output, over 40% power generation efficiency, over 90% overall efficiency achieved

μCGS-F50 was developed to provide solutions for the challenges that conventional micro CGS (cogeneration systems) were facing. In short, (1) it has achieved improvement in the efficiency of power generators; (2) expansion of uses and extension of operation hours through improvements in the utilization rate of exhaust heat; (3) improvement in maintainability as well as ensuring redundancy. Here are the characteristics as follows.

● High efficiency of over 40% power generation efficiency has been achieved.
● Reduction of surplus exhaust heat by reducing heat-to-electricity ratio.
● With BCPs purpose in view, our uniquely developed mixer easily switches fuel types (semi-auto switching: LPG/city gas/biogas).

The development is backed up by NEDO’s aid project JPNP12004: FY2020 “Innovative program with strategic energy saving technologies/development for practical use/development of μCGS to achieve the world best generating efficiency” (aid granted to YGK Tsusho, Co-researchers: Takasago Thermal Engineering Co., Ltd. and TMES Corporation). The project finished in FY2022, and the product will be on sale from this fiscal year.

Medical clean booth: BARRIFLOW® III

BARRIFLOW® III is a booth to be used for medical examinations, and it reduces the risk of droplet infection (instant infection) caused by coughs and sneezes for healthcare professionals. BARRIFLOW® III consists of a fan filtering unit, which removes viruses, etc. that float in the air, and a specially shaped vinyl curtained booth that shuts out coughs and sneezes, achieving both the safety of healthcare professionals and ease of medical examination.

● Air flow control suitable for medical examination
● Deterrence of droplets was validated through visualization of air flow and measurement of particles
● Used in hospitals and clinics for medical practice such as medical examination and sample collection

● Can be compactly folded unless being used (preparation for BCP)

Medical clean hood: BARRIHOOD®

BARRIHOOD® is a booth used to isolate an infected patient or a patient who may be infected. By covering the top half of the body with a negative pressure hood, the patient lying down can feel at ease without feeling cooped-up. The hood was designed based on the concerns of medical professionals, and is structured in a way that it does not inhibit the connection of an IV or dialysis machine.

● Isolation (shut out) was validated with influenza virus
● Compact, practical, economical, and easy to store
● Can be used as an isolation hood for an outpatient waiting room by switching the hood
● Used for individual isolation in medical wards, dialysis facilities, and healthcare facilities for the elderly

● Can be compactly folded unless being used (preparation for BCP)

When the negative pressure is applied

Comparaison of function with and without BARRIFLOW:

Number of particles reaching to the mannequin

Installed on a bed

Individual isolation in a large room

Inside a BARRIFLOW

Outside a BARRIFLOW (limit of detection is less than 3)

When the function is disabled:

About 25,000 particles

When the function is enabled:

5 particles

Winners of the 19th “Environmental Facilities Design Award Encouraging Prize”
by the Association of Building Engineering and Equipment


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Green Air Technology Profile 2023

Green Air Technology Profile 2023
Achieving both comfort and energy conservation with a 40% reduction in HVAC energy use

SWIT® is a displacement ventilation enhanced entrainment effect type HVAC system which uses the natural principle that warm air rises and cold air falls. The contaminated hot air is moved up to the ceiling and the environment in the working area is kept clean and comfortable. SWIT® can condition the air with less air flow than a mixed air conditioning system as well as with the air flow temperature close to the room temperature. This makes it possible to build an HVAC system that conserves energy at a low cost. SWIT® is suitable for large spaces and places with high heat generation loads, high outdoor air loads, and high dust emissions.

Contribute toward carbon neutrality and improve installation productivity

- Purpose of development
  - In response to the increased demand for copper due to the popularization of items including electric vehicles, we will convert refrigerant piping from copper to aluminum in order to contribute to achieving carbon neutrality.
  - Aluminum pipes are about 1/3 the weight of comparable copper pipes. The support spacing for aluminum pipes can be 1.5 times bigger than copper pipes, and because of brazing, nitrogen purging is not required, resulting in an approximate 20% reduction in installation time compared to copper pipes.
- Activity report in the Aluminum Plumbing Equipment Association (APEA)
  - Following the standardization of aluminum refrigerant piping by APEA, Panasonic Corporation issued a press release announcing the industry’s first manufacturer’s warranty for commercial electric air conditioning equipment installed with aluminum refrigerant piping.

Aluminum refrigerant piping system

- An example of installed piping

- Website of the Aluminum Plumbing Equipment Association (APEA)

Experimental and testing site

- Experimental and testing site for TCR-SWIT® and IDC-SFLOW® inside the center.

SDGs

- The Takasago Thermal Engineering Innovation Center (hereinafter referred to as “the center”) opened in 2020 under the concept of “sustainable construction that reduces the impact on the global environment and improves intellectual productivity at the same time.” The office utilizes our own technology in the HVAC system and is open for observation.

- Topic: Takasago Thermal Engineering Innovation Center

- As a facility to create energy, the center houses a solar power generator of 200kW as well as two wood biomass gasification generators of 46kW (100kW in heat quantity). Furthermore, the center has adopted lithium-ion batteries of 430kWh + 2,965kWh along with a NAS battery of 1,200kWh. This Tesla-made lithium-ion battery is the first lithium-ion battery of its size to be introduced in Japan (installed in March 2021). By utilizing renewable energy and storage batteries, the center aims for “Nearly ZEB,” which reduces 75% or more of actual yearly energy consumption for the entire site.

- Improve intellectual productivity: The highest Rank S achieved for CASBEE - Wellness Office

- The center satisfies people’s desire for green offices by keeping a constant humidity and temperature while at the same time utilizing personal smartphones to achieve people-friendly air conditioning.

- The center was awarded the highest rank of S for CASBEE - Wellness Office promoted by the Institute for Building Environment and Energy Conservation. The center also obtained BELS and LEED® certifications.

- Status of obtained environmental performance assessment metrics

- Experimental and testing site

- The center opened an experimental and testing site for TCR-SWIT® and IDC-SFLOW® inside the center. Since it opened, many clients from various fields have visited the facility and the center has received positive feedback.

- Experimental and testing site for TCR-SWIT® is introduced on P.13.

- Experimental and testing site in the 2nd floor lab wing