

Feature

025 Environment

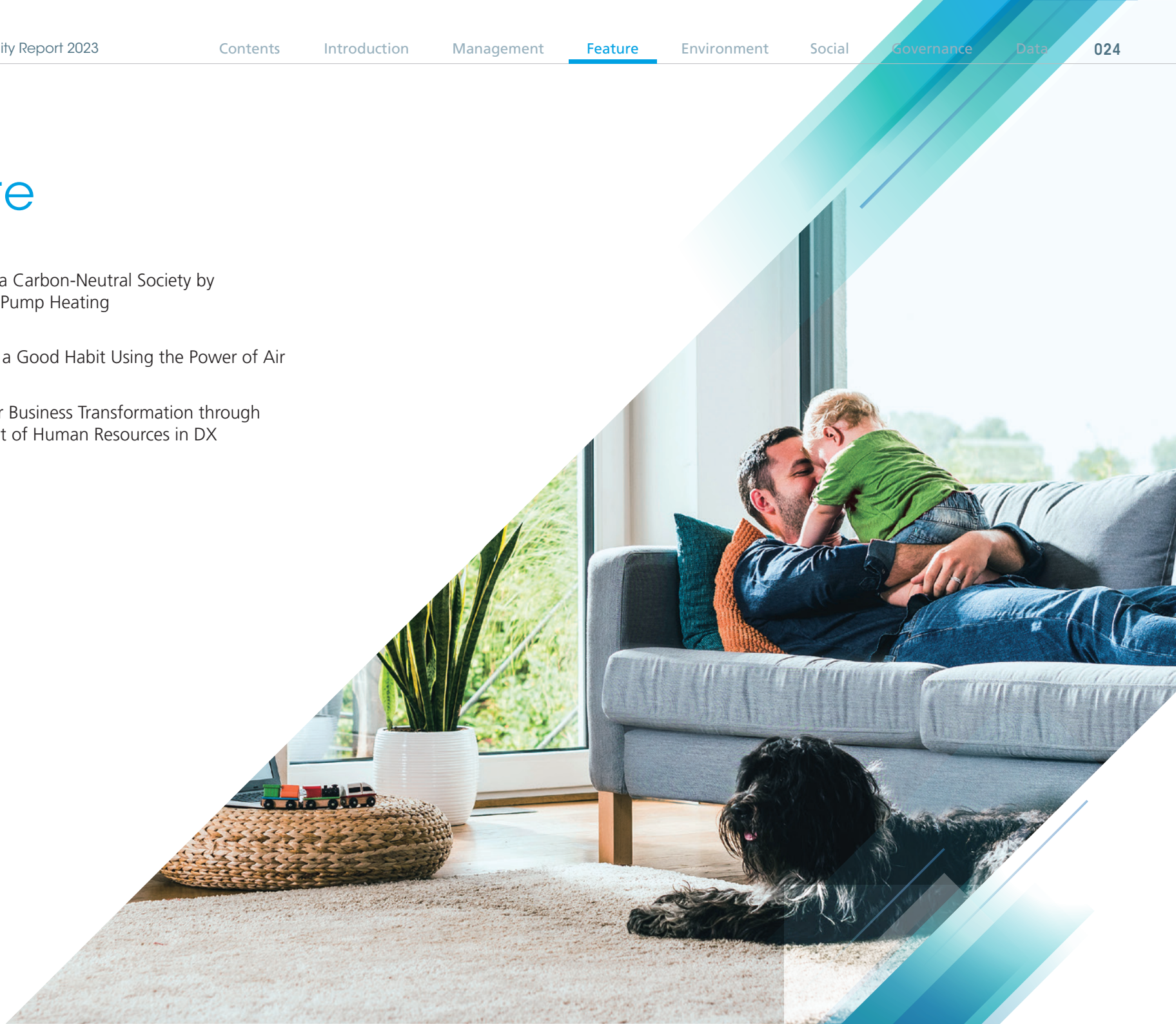
Contributing to a Carbon-Neutral Society by Promoting Heat Pump Heating

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Contributing to a Carbon-Neutral Society by Promoting Heat Pump Heating

Why is it important?

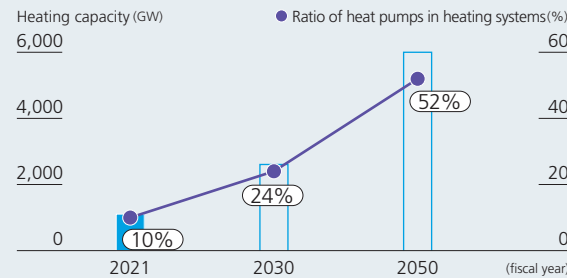
Since switching from combustion heating will help control global CO₂ emissions

At the 26th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 26) held in 2021, many countries around the world chose to increase their CO₂ emission reduction targets for 2030. As such, the conversion of heating systems are attracting attention as one way to achieve decarbonization. While temperature control is an important part of infrastructure for human health and productivity, it emits large amounts of greenhouse gases when used. It is important to have measures in place for both cooling as well as heating.

Looking at the global heating market, combustion heating, which is heated by direct burning of fossil fuels such as gas and oil, remains the current mainstream heat source because of its low initial cost and operational performance in cold regions. The global market share of heat pump heating systems remains at 10%. The IEA projects that switching to heat pump type heating systems, which require less energy to heat a room, could reduce CO₂ emissions by about 500 million tons by 2030.*

Daikin will contribute to global decarbonization by expanding its heat pump space and water heating business, as set out in the Fusion 25 Strategic Management Plan.

Heating demand forecast*



Note: Compiled by Daikin based on the IEA's *The Future of Heat Pumps* using projections from the NZE scenario (where emissions are reduced to net zero in 2050)

* Source: IEA *The Future of Heat Pumps*

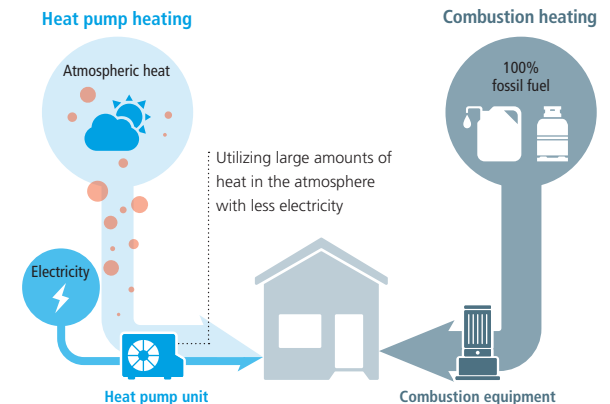
Daikin's Approach

Working to Promote Heat Pump Heating, Which Collects and Utilizes Heat from the Air

The heat pump is one of Daikin's core technologies. One advantage of heat pump technology is that it allows the collection and utilization of heat that is naturally present in the air. It also makes it possible to supply enormous amounts of thermal energy with low energy input. Heat pumps can significantly reduce CO₂ emissions compared with combustion-type systems.

In addition to the growing momentum toward decarbonization, rising energy prices and fears about the procurement of fossil fuels have led to a sharp increase in the number of countries adopting policies to encourage switching to heat pumps. Following this trend, Daikin has further strengthened its partnership with various stakeholders, including governments and industry groups, in establishing standards with the goal of promoting the technology. Daikin has strengthened its business, particularly in Europe and North America, with sales in our heat pump space and water heating business growing in fiscal 2021 greatly exceeding the previous year.

Heat Pump Heating and Combustion Heating Mechanisms



Daikin's Performance

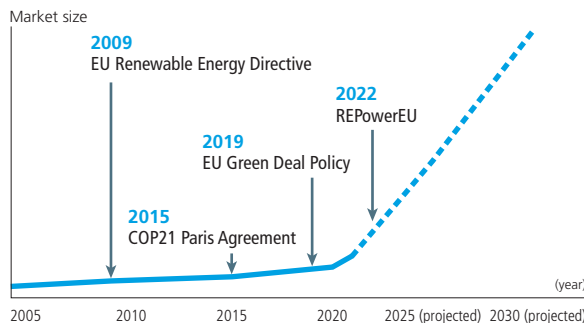
Transforming Heating Systems in Europe through Multifaceted Proposals

The switch to heat pump heating in Europe, where the climate is particularly cold and where heating and hot water supply account for a high percentage of household energy consumption, will lead to a significant reduction in CO₂ emissions. Since the release of Daikin Altherma, a heat pump space and water heater in 2006, we have continued to undertake various efforts to promote the shift toward heat pump heating.

One of the examples was our initiative to provide information and policy recommendations on the environmental performance of heat pump heaters to national governments and international agencies via dialogue in collaboration with industry groups. As a result, heat pumps became recognized by the EU as a technology that utilizes renewable energy in the 2009 Renewable Energy Directive. Since then, heat pumps have been recommended by the EU and member countries with the announcement of Green Deal Policy in 2019, and the rate of utilization has increased in the European market given the increasingly stringent regulations and incentives.

Furthermore, the EU announced REPowerEU in 2022, which sets the target of introducing a cumulative total of 10 million heat pump units within the next five years.

Diagram of Heat Up Heating Market Growth Influenced by European Environmental Policies



Daikin has paved the way for heat pumps to become popular by enhancing its product line up. For example, Daikin Altherma 3H HT improves the heating capacity in extremely cold regions as the only product in the industry capable of delivering hot water at high temperature without an electric heater in minus 15°C conditions. As some parts of existing combustion heating equipment can be used as they are, combustion heaters can easily be replaced by heat pumps.

At the same time, we are also strengthening our sales capacity. We have set up interactive showrooms in Europe, as well as rolled out a BtoBtoC business model that links Daikin with dealers and users through an online platform called Stand By Me. We support dealers throughout the life cycle, from model selection to maintenance, and propose solutions closely linked with customer needs.

Daikin reached the top share in the European heat pump heating market in 2019 and recorded more than 150% year on year growth in the number of heat pump space heaters sold in fiscal 2022.

Next Challenge

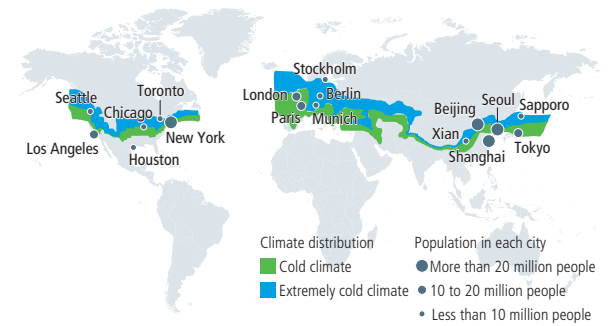
New Manufacturing/R&D Bases in Europe Pursuing Global Expansion

Heat pumps are expected to further reduce CO₂ emissions with the use of renewable energy sources. In this context, Daikin strives to contribute to the environment while expanding its business. In Europe, for example, we plan to begin operations of a new plant for manufacturing heat pumps in Poland in July 2024. Combined with our existing plant, this new facility will increase production capacity by four-fold in 2025 compared to 2021. In addition, in 2024 we will open a new research and development center, the EMEA Development Center, in Ghent, Belgium, to develop products tailored to regional characteristics, while keeping up with trends in Europe's advanced environmental policies.

Europe is not the only region looking to move away from combustion heating. There are cold and extremely cold regions on both continents of North America and Asia where growth of the heat pump heating system is

anticipated. Daikin will also develop products in North America, Japan, China and other parts of the world according to local needs and contribute to the reduction of global CO₂ emissions by further expanding the application of heat pump heating worldwide.

Areas with Expected Growth in Penetration Rate of Heat Pump Heating



Note: Compiled by Daikin based on ASHRAE CLIMATIC DESIGN CONDITIONS

The Spread of Heat Pumps is Essential as a Countermeasure to Climate Change

Laura Cozzi

Director of Sustainability, Technology and Outlooks, International Energy Agency (IEA)



Global sales of heat pumps grew by 11% in 2022, marking a second year of double-digit growth for the core technology as the world transitions toward secure and sustainable heating. At the same time, IEA analysis shows that their deployment must further accelerate if the world is to maintain a temperature increase of 1.5°C or lower.



Feature

Value with Air

Making Exercise a Good Habit Using the Power of Air

Why is it important?

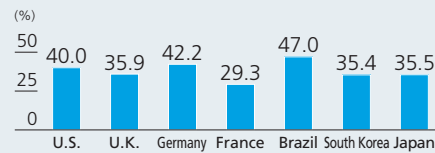
Insufficient Physical Activity Has Become a Worldwide Social Issue Today

The insufficient physical activity of people today has become a social issue amid enhancements in transportation and telecommunication infrastructure and the increase in intellect-based jobs. This has raised the risk of non-communicable diseases such as cancer and diabetes, while estimates put the economic impact of medical costs at around 54 billion US dollars worldwide.

The World Health Organization (WHO) has established a goal to reduce the number of people with insufficient physical activity by 15% by 2030. It recommends that adults get 30 minutes of moderate to high intensity exercise at least five days a week, such as brisk walking, and do weight training at least twice a week. The WHO also urges people to avoid sitting continuously for long periods of time.

Following such a regimen, however, is no easy task, as more than one in four adults are believed to be insufficiently active. Why is it that people find it difficult to exercise? In Japan, the Sports Agency conducted a survey that found reasons include being too busy due to work or family obligations, or various other distractions. This necessitates measures to reduce these reasons, prevent NCDs and improve well-being.

Percentage of Adults with Insufficient Physical Activity



Note: Prepared by Daikin based on *Worldwide trends in insufficient physical activity from 2001 to 2016* by The Lancet Global Health.

Daikin's Approach

Developed a Hypoxic System Even for Offices from the Standpoints of Location and Air Environment

Today, office workers are susceptible to insufficient physical activity because they spend long hours performing desk work. Daikin, which supplies air conditioners to a large number of office buildings, is looking to support the health of the people that work in these buildings by using the power of air. In April 2022, we commercialized a hypoxic system* that can be installed in offices as a solution for people who are too busy and cannot get to a gym or who cannot commit continuously to exercise, even if they know they are not active enough.

A challenge in development was how to come up with a solution that enables someone to continue exercising without spending too much time during their busy daily life. One perspective behind the solution was location. Creating a place to exercise inside an office will reduce the amount of time spent traveling to a gym. Employee health is an important issue for companies and creating opportunities for exercise at work will lead to the health and productivity management practiced today.

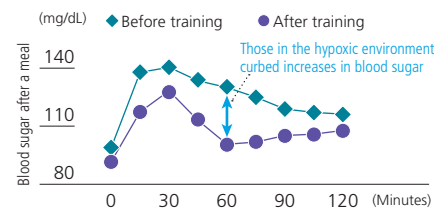
Another perspective was the air environment when exercising. To increase the effectiveness of exercise, we decided to tackle the challenge of hypoxic spaces, gaining a hint from athletes who train at high elevations. Harnessing our oxygen concentration control technologies cultivated from the development of medical-use oxygen concentrators, we created a hypoxic system that can be installed in offices.

The system offers simple installation work and can control the indoor oxygen concentration level within a range of elevations between 1,200 and 3,900 meters. Recent research has found that exercising under hypoxic conditions similar to a high elevation results in better health compared to exercise in normal oxygen levels, including making it difficult for blood sugar to spike, promoting release of growth hormone, and expanding the size of blood vessels.

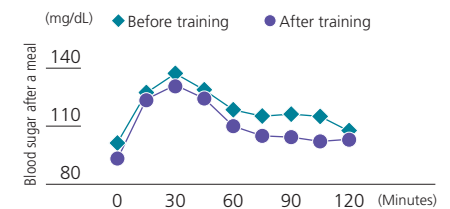
*This product is not a medical device.

Trend in Change in Blood Sugar After Eating Before/After 4-Week Training Period

Persons working out in a hypoxic environment



Persons working out in a normal oxygen environment



Note: Prepared by Daikin based on *Whole body, regional fat accumulation, and appetite-related hormonal response after hypoxic training* authored by Takuma Morishima, Toshiyuki Kurihara, Takafumi Hamaoka, and Kazushige Goto.

Daikin's Performance

Proposing Environments that Make Continuous Exercise Accessible and More Effective

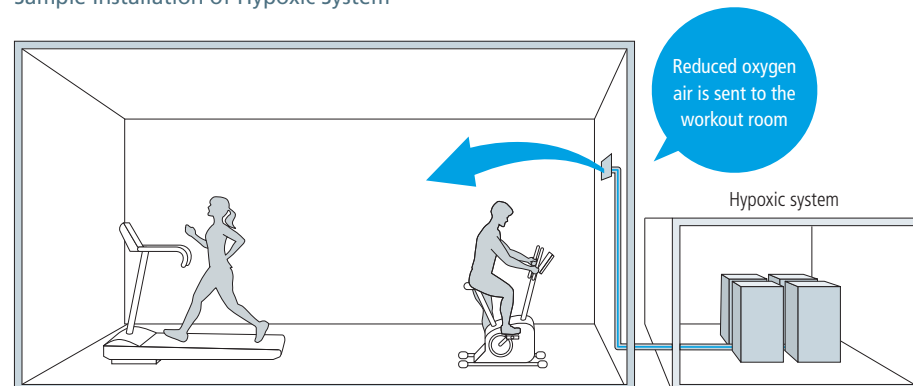
Behind the commercialization of the hypoxic system for offices is Daikin's unique technological capabilities and know-how.

Hypoxic systems have also been introduced in gyms, but these are noisy and large, making them difficult to install in offices and other places with limited available space. Daikin has overcome these problems by applying the technology of in-home medical equipment requiring compact design and quiet operation. In particular, we have achieved a level of sound so low that it would not interfere with sleep.

Furthermore, our system also offers the same quality and reliability as medical devices. Multiple hypoxic units based on oxygen concentrators can be connected to achieve the desired performance. This also offers redundancy where if one unit fails, the system can be supplemented by other units to provide a stable hypoxic space. It is also possible to propose the optimal system according to customer needs based on the space and the intensity of exercise.

Daikin has set up a hypoxic room in point 0 marunouchi, a members-only co-working space in which Daikin participates, and since April 2022, we have been using this space to conduct real life testing. Subjects who exercised for 30 minutes one or more times per week showed a decrease in body fat, visceral fat, and blood pressure. In addition, in a questionnaire conducted in July 2022, 86% of the subjects responded that the hypoxic room made them more motivated to exercise.

Sample Installation of Hypoxic System



Next Challenge

Bringing Well-being to More and More People

Daikin's hypoxic system can be installed in various places in a building, from small rooms to large spaces, as long as a certain degree of airtightness is ensured. Going forward, we plan to expand our proposals to include not only company offices, but also schools and local governments.

Maintaining health and reducing the risk of disease will also lead to lower medical costs, an issue faced by many local governments. To help solve this problem through hypoxic spaces, Daikin plans to evaluate the effectiveness of the system in parallel with its ongoing real life testing. In addition to medical verification on the effect of improved sleep quality and lowering blood sugar levels by improving glucose metabolism, we intend to obtain evidence on health benefits such as increased muscle strength and anti-aging in collaboration with various universities.

In the future, we will also work to improve people's living habits by linking users' vital sign data with sleep and eating habits to provide optimal exercise regimens.

Daikin will help people to stay healthy and active both physically and mentally, including improving intellectual productivity by utilizing oxygen concentration control technology.

Daikin will continue to pursue the possibilities of air for the well-being of all people.

Focus on the Power of Air and How it Benefits People's Health

Kazushige Goto

Professor
Faculty of Sport and Health Science, Ritsumeikan University



Many studies have proven that exercise is an effective way to improve health; yet, making exercise a habit can be difficult given today's busy lives. I have high expectations for the social implementation of Daikin's groundbreaking concept of using the power of air to improve health.

For example, if we can make exercise in a hypoxic environment commonplace, such as by making office spaces a hypoxic environment timed for when blood sugar levels spike after lunch, we should be able to reduce these spikes and improve blood vessel function. Additionally, exercise in a hypoxic environment has the potential over the long term to reduce the risk of diabetes and high blood pressure, and help to improve worker health and productivity. I am really impressed with Daikin's initiative to create an innovative, new tomorrow using advanced technologies.



Feature
Human Resources

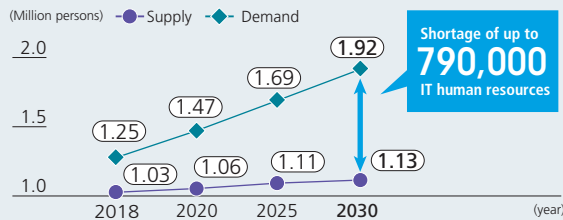
Accelerating Our Business Transformation through the Development of Human Resources in DX

Why is it important?

We Require Human Resources to Accelerate DX as a Management Issue

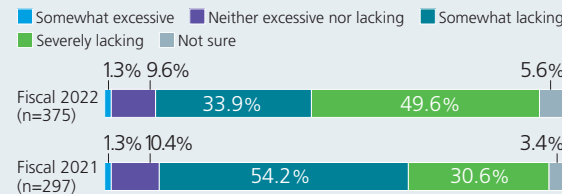
With revolutionary advances in digital technology, digital transformation (DX) has become today's key challenge. DX refers not only to the adoption of information systems or utilization of data, but also transformation of business models and work processes using digital technology, including AI and IoT, as well as the enhancement of an organization's value and competitiveness. The Government of Japan is also promoting DX among businesses and local governments. With plentiful talent capable of delivering DX, there is fierce competition for personnel hiring among Japanese companies. Many businesses recognize this challenge. In fiscal 2022, 83.5% of companies surveyed by the Ministry of Economy, Trade and Industry responded that they face a shortage of human resources in DX. Daikin also strives for business transformation; thus, the acquisition of talent to lead this change is a critical issue.

Estimated Shortage of IT Human Resources in Japan



Note: Compiled by Daikin based on Survey on Demand for IT Human Resources (Upper Scenario) (April 2019) by Japan's Ministry of Economy, Trade and Industry

Sufficiency of Human Resources for Promoting DX in Japanese Companies



Source: White Paper on DX 2023, Information-technology Promotion Agency, Japan (IPA)

Daikin's Approach

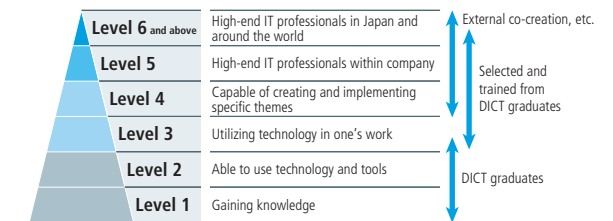
Fostering Human Resources in DX In-House with Collaboration from Osaka University

At Daikin, we believe that to utilize digital technology, it is not only important to have IT knowledge but also to pursue effectiveness by integrating knowledge with frontline experience. As such, Daikin launched the in-house Daikin Information and Communications Technology College (DICT) in December 2017. With the full cooperation of Osaka University, and under the guidance of expert instructors, Daikin is fostering human resources in DX in-house who can engage in business with an understanding and command of digital technology and can implement specific themes.

Over the course of two years, DICT trains personnel selected from new employees of all job types, as well as offers lectures for all job ranks including managers and executives, with a systematic plan to expand human resources in DX that are essential to the realization of the Fusion 25 strategic management plan.

As of the end of fiscal 2022, a total of 1,300 employees have completed courses at DICT. These graduates are now involved in creating new businesses and improving work process efficiency centered on digital technology.

Development Steps at Daikin for Human Resources in DX



Source: Compiled by Daikin based on skill standards of the Information-technology Promotion Agency, Japan (IPA)

See below for our development of human resources in AI
[079 Social Human Resources Fostering Human Resources](#)

Daikin's Performance

Promoting Digital Transformation by Adding DICT Graduates to Workplaces

Graduates who completed courses at DICT are placed in various departments, from sales to development, manufacturing, and corporate, to take on the challenge of resolving issues while gaining work experience in the field. They look for better solutions not only through working collaboratively within the workplace but also identifying the essence of issues through active dialogue with various stakeholders such as suppliers. With the active participation of talent with this specialized knowledge, we have gradually been overcoming various challenges and seeing the results of digital transformation that we were not able to obtain in the past. In addition to the direct results of utilizing tools and systems, this change also enabled mutual learning and improved motivation toward transformation among colleagues through projects.

Example 1: Development of a Tool That Can Easily Connect VRV to a Building Management System

The field of instrumentation* of multi-split air conditioners for buildings is critical for Daikin's solution business since we remain in contact with customers after product delivery. Geared toward our full-fledged entry to the market, Daikin developed a tool for easy connection between a BMS* of partner companies with our VRV (multi-split air conditioner for buildings) system. This tool eliminates manual labor for connections and makes it possible to reduce work hours by 30 to 50%. The addition of people capable of operating the latest digital technology also motivates younger employees, which also enhances our overall capabilities including the ability to propose technologies.

Through this development project, graduates deepened their appreciation of the cycle, sales channels and frontline knowledge of the solutions business, and acquired analytical skills, practical DX abilities and project promotional skills. The developed tool will be introduced in the Asia/Oceania region, particularly for medium-scale BMS in Singapore, where the market is expected to grow steadily. In addition, it will also be implemented to enhance service solutions globally.

* Instrumentation refers to the control and monitoring of building equipment operations, including air conditioners, lighting, and security devices. Building Management System (BMS) is a system of integrated management of instrumentation.

Example 2: Establishment of a Management System That Can Reduce Production Losses and Improve Processes

To standardize production processes, we use AI to analyze the detailed movement of workers on camera to visualize the work hours by model type under production and by each worker. We combine this data with equipment data and operate a production management system that allows us to review the process according to the situation. We are running a production management system capable of reviewing work processes according to the situation by integrating this data with equipment data. The combination of various digital technology, such as this and strong ability for improvement on-site, allowed us to implement measures even promptly and accurately when the supply of parts, production units and personnel fluctuated sharply due to the COVID-19 pandemic, and led to a reduction of work hours by about 3,700 hours a year. Seeing the results in real time also improves employee motivation and further stimulates improvement activities.

The key to this development was that we reflected the experience level of skilled workers, which was difficult to quantify, in the system. The success with the development of a high-quality tool based on research on the frontline going beyond tabletop learning contributed drastically to improving on-site productivity, and also elevated the skill level and adaptability of the graduates. Going forward, this system will be introduced in plants in Japan and overseas.

Next Challenge

Expanding the Range of Talent and Further Elevating Their Level

Daikin believes that human resources in DX will become even more important in the future. Therefore, we will continue to provide training and skill support.

Our target is to provide training to 1,500 employees, including both existing and new employees, by fiscal 2023. In order to expand advanced human resources in DX who can take the lead in creating and executing their own project theme, starting in fiscal 2023, Daikin plans to establish opportunities for regular communication with executives to foster management perspective as well as to improve business knowledge and understanding through cross-functional projects.

Through these efforts, we hope to not only improve internal job efficiency but also spur on innovations that will help to resolve energy and environmental issues and further develop industries and technologies.

Further Promotion of DX for Advanced Problem Solving

Yasushi Yagi

President of DICT, Professor of The Institute of Scientific and Industrial Research, Osaka University



DICT is a place to systematically learn how to apply knowledge for problem-solving. It provides training that emphasizes critical thinking, practical application, and execution. Daikin's human resources in DX will be responsible for addressing social issues and serve as the key to sustainable growth. I hope that they will adopt new and improved technology and evolve into someone who can contribute to society in the era of digital transformation.