

# JTEKT's Challenge for Carbon Neutrality

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*At the COP26 conference in 2021, it was officially agreed that the world would move toward the 1.5°C goal. Customer, investor, and shareholder demands for steps toward carbon neutrality are becoming stronger. JTEKT has officially announced that the entire JTEKT Group will aim to achieve carbon neutrality by 2035. This paper introduces the Task Force on Climate-related Financial Disclosures (TCFD) as the overall initiative. It then describes details of activities for energy usage rate visualization, development of innovative energy saving and hydrogen technologies, introduction of renewable energy, and energy saving product development for carbon neutrality.*

**Key Words:** carbon neutrality, global warming, renewable energy, hydrogen, electrification

## 1. Introduction

COP26 was held in Glasgow in the UK in November 2021, and the parties officially agreed on a target of less than a 1.5°C rise in temperatures from the Industrial Revolution. In order to achieve this target, the agreement includes ambitious measures to be taken by all countries towards achieving global carbon neutrality by the middle of the century, and towards the important waypoint of 2030. However when we look at the history of energy since the Industrial Revolution, we see that mankind has relied on and continues to rely on fossil fuel energy such as coal, petroleum, and natural gas. Aiming for carbon neutrality means achieving a total of zero in the amounts of greenhouse gases emitted and the amounts absorbed. It is necessary to proceed while recognizing that the energy situation and issues in each country are different. Because JTEKT has production sites not only in Japan but also in North America, South America, Europe, and Asia, we must identify the energy situation and issues in each region as we work to achieve global carbon neutrality. While achieving global carbon neutrality will not be easy, JTEKT in May 2022 announced its intention to become carbon neutral with zero global CO<sub>2</sub> emissions (Scope 1 and 2\*) by 2035. This report introduces the initiatives for reducing CO<sub>2</sub> emissions that are being implemented at JTEKT plants around the world. In this environment, measures to combat climate change and efforts to achieve carbon neutrality are being viewed as important in corporate activities as well. Demands for carbon neutrality from automobile OEMs grow larger with each passing year. In Europe, it has also been decided to strengthen vehicle life cycle assessment (LCA) regulations, and

presenting and reducing product CO<sub>2</sub> emissions are becoming a requirement for sales negotiations. Managing and reducing CO<sub>2</sub> emissions for individual products will be essential for the future survival of businesses. Under these conditions, corporate disclosure of information related to climate change is also important, and this paper will also introduce the information that JTEKT discloses.

- \*1: Scope: International standard used to classify CO<sub>2</sub> emissions
  - Scope 1: Direct CO<sub>2</sub> emissions from JTEKT (primarily gas)
  - Scope 2: Indirect CO<sub>2</sub> emissions from JTEKT (primarily electricity)
  - Scope 3: Other indirect CO<sub>2</sub> emissions (use of products, etc.)

## 2. Disclosure of Information Related to Climate Change (TCFD Disclosure)<sup>1), 2)</sup>

One requirement for corporations to disclose information related to climate change is information disclosure in the Prime Market and securities reports based on the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). The TCFD framework requires disclosure related to four items: governance, strategy, risk management, and metrics and targets. This section presents a simple introduction to the information disclosed by JTEKT in its securities reports.

### (a) Governance

A system for carrying out environmental management is important when carrying out business activities. JTEKT sets targets, discusses and decides policies,

and manages progress at the JTEKT Environmental Committee, which is chaired by the president. The results are applied to management strategies after discussion by the management team. Lower-level organizations conduct practical studies in each area and carry out company-wide CO<sub>2</sub> reductions as actions to combat climate change. These include energy conservation, resource circulation, production technology innovations, energy infrastructure, engineering and research, and reducing Scope 3 CO<sub>2</sub> emissions in the value chain and elsewhere. In order to achieve environmental initiatives that cover the entire group, we have established the JTEKT Group Environmental Committee, and are carrying out initiatives aimed at global carbon neutrality in cooperation with group companies in Japan and overseas.

(b) Strategy

JTEKT formulates environmental action guidelines every five years based on “Environmental Challenge 2050,” and incorporates them into the company objectives for each year in order to carry out activities. Based on the TCFD recommendations, we have created multiple scenarios, a 1.5°C (less than 2°C) scenario, and a 4°C scenario in which further climate change occurs and the physical impacts become significant, and have disclosed risk and opportunity analysis for each.

In the 1.5°C (less than 2°C) scenario, there is the risk of increasing operating expenses resulting from the introduction and strengthening of carbon taxes and other regulations, as well as the risk of reduced sales of products for internal combustion engine automobiles due to strengthening of automobile fuel efficiency and emissions regulations. In order to avoid these risks, we are taking steps such as reducing energy consumption in our production processes and developing new products.

(c) Risk management

Environmental risks are centrally managed by a company-wide level risk management system. Risks picked up by the JTEKT Environmental Committee and environmental management system (ISO 14001) are identified and assessed. An order of priority is assigned from the perspectives of the degree of effects, importance, vulnerabilities, and probability of occurrence. Avoidance, mitigation, or other countermeasures are decided, registered, and managed.

(d) Metrics and targets

Aiming to minimize environmental impact as presented in “Environmental Challenge 2050,” the JTEKT Group is working towards Scope 1 and 2 carbon neutrality by 2035. Interim targets are a 35% reduction from FY2013 levels in FY2025, and a 60% reduction in FY2030. We are aiming to achieve carbon neutrality including Scope 3 by FY2050.

**Figure 1** shows the roadmap to achieving this carbon neutrality. Global CO<sub>2</sub> emissions in FY2022 were

down 35.7% from FY2013 levels, achieving the 2025 target ahead of schedule. The Japanese government has established the target of a 46% reduction from 2013 levels in 2030. We are proceeding so that we will be able to achieve this target five years early in 2025.

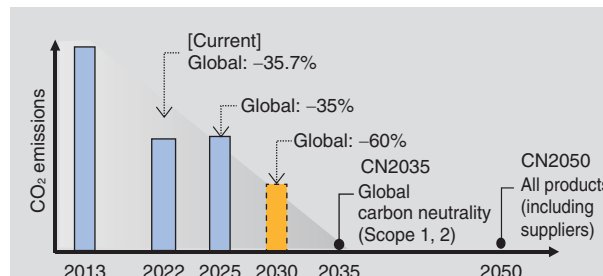


Fig. 1 Road map for JTEKT's carbon neutrality

### 3. Specific Actions for Carbon Neutrality

#### 3.1 Identification of Global CO<sub>2</sub> Emissions and Actions to Address Them

Following is an introduction of JTEKT's actions to achieve Scope 1 and 2 global carbon neutrality. **Figure 2** shows a map of global CO<sub>2</sub> emissions. When we look at global CO<sub>2</sub> emissions, the CO<sub>2</sub> emissions from Japan particularly stand out. This is because the CO<sub>2</sub> emission conversion coefficients when energy is used are different. Because Japan is dependent on fossil fuels, it has higher CO<sub>2</sub> emissions. Conversely, in Europe and South America, where the ratio of non-fossil fuels is higher, the emissions tend to be lower. However because even within Europe, the energy situation of each country is completely different, it is necessary to carry out management for each individual site. In the future, it will be necessary to consider which country to base production in from the perspective of carbon neutrality as well.

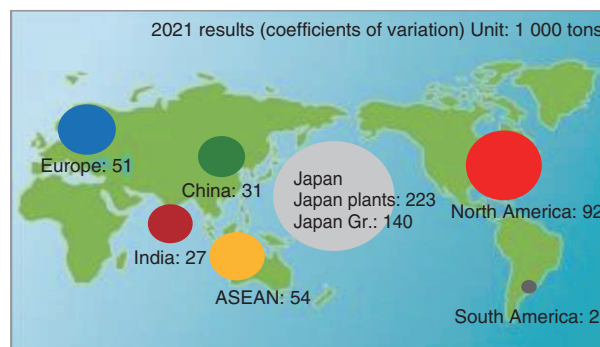


Fig. 2 JTEKT's global CO<sub>2</sub> emissions map

**Figure 3** shows the ratios of Scope 1 and 2 JTEKT emissions in each region. The ratio of Scope 1 and 2 is important when working for carbon neutrality. The reason is that Scope 1, which represents direct CO<sub>2</sub> emissions

resulting from combustion of fossil fuels, requires hydrogen or other replacement fuels, CO<sub>2</sub> capture, and other actions, and there are high hurdles to CO<sub>2</sub> reductions. On the other hand, Scope 2 CO<sub>2</sub> emissions can be reduced by changing to renewable energy, nuclear energy, or other alternative power source. JTEKT is also engaged in electrification as a means of achieving carbon neutrality, and the ratio of Scope 2 emissions is approximately 80%. As you can see from Fig. 3, the region where CO<sub>2</sub> emissions are highest and the Scope 1 ratio is highest is Japan, and reducing CO<sub>2</sub> emissions in Japan is a major issue.

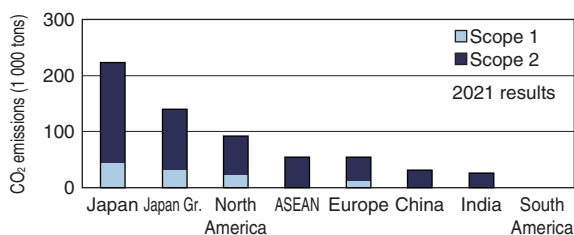


Fig. 3 JTEKT's CO<sub>2</sub> emissions by scope

As specific actions to reduce CO<sub>2</sub> emissions, we have carried out various items in a build-up approach as shown in Fig. 4. Because CO<sub>2</sub> emissions will vary largely depending on future business plans, it is necessary to estimate the future changes in CO<sub>2</sub> emissions at each site. The gap between these changes and the targets is the amount of build-up in CO<sub>2</sub> reduction that is necessary. JTEKT has categorized five CO<sub>2</sub> reduction items, namely everyday improvements, production technology innovations, introduction of renewable energy, use of hydrogen, and buying renewable energy certificates, and has created a roadmap for each region and site. It will be necessary to take specific actions based on the trends toward carbon neutrality in each region.

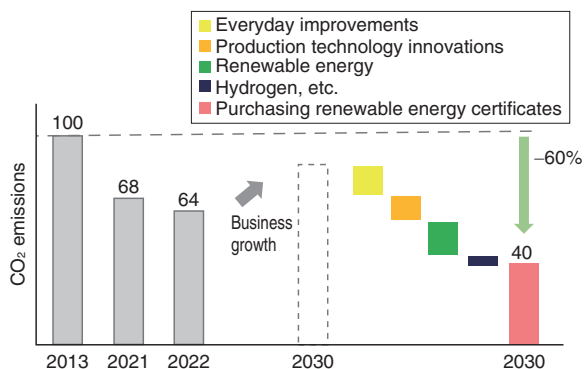


Fig. 4 Action for target

### 3. 2 Approach to CO<sub>2</sub> Reductions in Japan

Because CO<sub>2</sub> reductions in Japan are a major issue for JTEKT, we have carried out focused efforts. This section presents the JTEKT CO<sub>2</sub> reduction activities in Japan.

What is important in order to make steady and efficient improvements is making energy visible. Figure 5 shows the CO<sub>2</sub> emissions from each process at plants in Japan. By identifying the conditions of CO<sub>2</sub> emissions, it is possible to decide focused efforts for everyday improvements and production technology innovations. In the same manner, this also makes it possible to categorize the processes where there are issues at each plant. JTEKT shares common issues for carbon neutrality in process shop-axis activities, and is working to reduce CO<sub>2</sub> in cooperation with group companies.

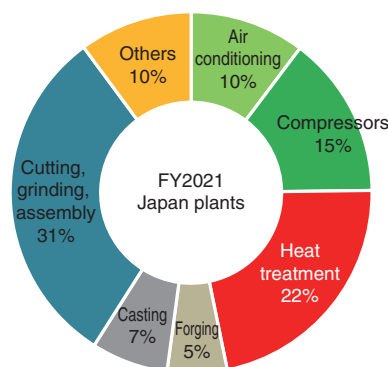


Fig. 5 Domestic plant process CO<sub>2</sub> emissions ratio

As an improvement activity using this visualized data, from 2016 we have further subdivided CO<sub>2</sub> emissions for each process according to the line, and are working to reduce waste and make improvements when lines are not operating (Fig. 6). By checking the data for each line in real time, it became possible to discover waste which had been overlooked before. This also allows the amounts of CO<sub>2</sub> reductions resulting from productivity improvements in production sections to be identified, enabling maintenance and management after improvements are implemented. Visualization is a necessary step in order to carry out this kind of far-reaching energy conservation activities. As a result of these activities, we have been able to achieve large reductions in intensity and CO<sub>2</sub> emissions, and in 2020 we received the Agency for Natural Resources and Energy Commissioner's Award. At present, we are sharing these kinds of domestic initiatives globally, and have created a strategic investment framework for achieving carbon neutrality throughout the company as we are accelerating our energy conservation activities.



Fig. 6 Improvement activity by energy visualization

### 3. 3 Production Technology Innovations

As a result of global energy conservation activities, CO<sub>2</sub> emissions in FY2022 were down 35.7% (583 600 tons-CO<sub>2</sub>/year) from FY2013 levels. Further reductions in CO<sub>2</sub> emissions will require innovations in production technologies. As you can see from Fig. 5, the energy ratio is particularly high in preliminary processes such as forging, casting, and heat treatment. These preliminary processes are a major issue for reducing CO<sub>2</sub> emissions in the parts manufacturing industry. This section presents a simple introduction to cases of production technology development in the JTEKT Group that are published in this journal.

The first case is an innovation technology for the forging process: “Development of Warm Sizing Method for CVJ Outer Races” (printed on page 15). The development of a warm sizing method for the CVJ outer race achieves the same dimensional accuracy as cold sizing performed after warm forging, but with only a warm forging process. This reduces CO<sub>2</sub> emissions by 16% as a result of reducing the number of processes.

The second case is an innovation technology for the heat treatment process using a JTEKT thermo system: “Activities for Carbon Neutrality in Heat Treatment Furnaces” (printed on page 21). We have developed energy-saving heat treatment technologies including the use of a developed high-performance heat insulation material known as Super Moldatherm, automatic conversion furnace turn-down that reduces the controlled atmosphere gas for heat treatment, and control technology that reduces oil tank energy consumption when equipment is idling, and are installing them in JTEKT heat treatment equipment.

The third case is an energy-saving technology used in the hydraulic units for machine tools, created by JTEKT Fluid Power Systems: “Energy Saving Efforts in Hydraulic Systems for Machine Tools” (printed on page 27). Changing the hydraulic unit control to inverter drive results in a large reduction in electric power consumption, and we plan to deploy this innovation globally.

In this manner, working to minimize energy consumption while developing and introducing innovative

energy-saving technologies is necessary in order to achieve further CO<sub>2</sub> reductions. It is also effective as a countermeasure to current high energy prices and future carbon taxes. By deploying these developed technologies around the world, JTEKT can contribute to the creation of a carbon neutral society.

### 3. 4 Development of Hydrogen Technologies

Means of achieving carbon neutrality in Scope 1 energy produced by gas combustion include electrification, use of hydrogen, and CO<sub>2</sub> capture technologies. This section presents JTEKT's technical development aimed at the use of green hydrogen.

As explained before, the energy consumption rate is high in preliminary processes, and this is also true of aluminum casting processes. Burner combustion when aluminum is melted uses large amounts of city gas, and emits large amounts of CO<sub>2</sub>. For this reason, JTEKT is developing an aluminum melting furnace that uses hydrogen burners at our plants.

In addition to technologies for the use of hydrogen, we are also developing on-site hydrogen infrastructure technologies for generating, storing, and transporting hydrogen at the plants. Green hydrogen will be generated by water electrolysis using renewable energy from solar power generated at the plants, and this hydrogen will be combusted in the burners to reduce Scope 1 CO<sub>2</sub> emissions.

This project was adopted in a NEDO project as a project for development of technologies for constructing a hydrogen society. In cooperation with contractors Toho Gas Co., Ltd. and Meichu Co., Ltd., we are working together and developing technologies aimed at creating a future hydrogen society. Figure 7 shows an image of a project from basic technical development to verification at a plant. We have been fully engaged in basic technical development since FY2022, and are applying the knowledge we have gained from evaluations to verification equipment. In the second half of FY2025, we are planning to begin mass production verification using hydrogen.

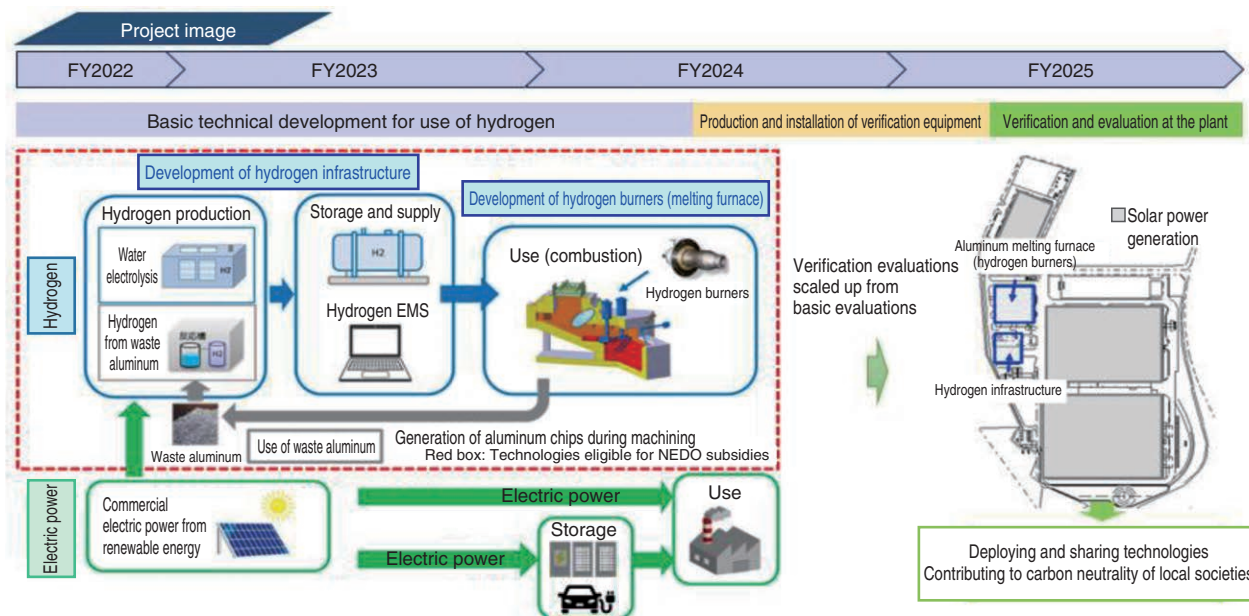
This section presents our initiatives at the current basic technical development phase. In the development of an aluminum melting furnace that uses hydrogen burners, we produced a simplified furnace for burner pre-evaluation as shown in Fig. 8, and are comparing and evaluating melting capacity and melting quality using conventional city gas burners and hydrogen burners. We are evaluating by continuously melting 300 kg of aluminum ingots while checking the differences between the city gas and hydrogen flames, and adjusting the burner output combustion to produce a melting capacity of 100 000 kcal/h.

**Figure 9** shows the results from a continuous melting evaluation. From **Fig. 9**, you can see that the hydrogen burners deliver equivalent or better melting performance compared with city gas burners.

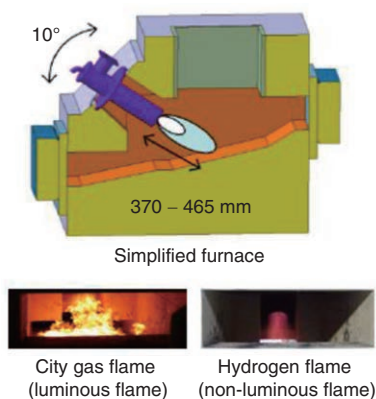
We also verified that there is no problem with previous quality concerns related to the hydrogen absorption amount and amount of oxide scale. A schedule has been established for the adoption of hydrogen burners. We are planning to develop an evaluation melting furnace which includes molten metal holders utilizing the developed technologies.

At the same time, in the development of on-site hydrogen infrastructure technologies, we are planning to install an evaluation proto-infrastructure on a 1:50 scale of plant verification during FY2023.

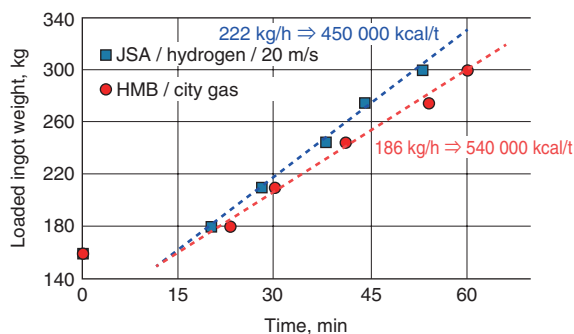
In the area of technologies for creating hydrogen, in addition to generating hydrogen by water electrolysis, we are evaluating the generation of hydrogen using aluminum chips in consideration of the potential of circulation within the plants, and are developing a storage system that requires less energy by using the pressure produced by a reaction. We are planning an evaluation of hydrogen burners using hydrogen generated with this proto-infrastructure equipment, and are proceeding with basic technical development aimed at plant verification.



**Fig. 7** Hydrogen utilization in JTEKT



**Fig. 8** Burner pre-evaluation by simplified furnace



**Fig. 9** Continuous melting evaluation of city gas and hydrogen

### 3. 5 Introduction of Renewable Energy

While minimizing energy consumption is important, in order to achieve carbon neutrality, the conversion to green energy that does not emit CO<sub>2</sub> is necessary. This section describes three conversion methods for Scope 2. The first is the introduction of on-site renewable energy, and using the roofs, parking areas, and empty spaces at JTEKT plants to generate electricity. The second is the construction of renewable energy power plants in cooperation with power producers at sites not located on JTEKT properties, and utilizing off-site PPA\*<sup>2</sup> to purchase the electric power generated at these plants or VPPA\*<sup>3</sup> to virtually purchase environmental value. The third is either purchasing renewable energy from power companies, or purchasing non-fossil fuel energy certificates. **Figure 10** shows the changes in the amount of on-site renewable energy introduced at JTEKT. In FY2022, we introduced more than 32 MW of renewable energy globally, and are generating more than 36 GWh of renewable energy annually, reducing CO<sub>2</sub> emissions by more than 13 000 tons. The introduction of on-site renewable energy is progressing faster at overseas sites than at sites in Japan. The reasons for this are less strict roof load restrictions overseas and the existence of subsidy systems. In order to resolve the issue of roof loads in Japan, the development of thin-film solar power generation systems is proceeding, and it is expected that the amount of on-site renewable energy introduced will grow in the future.

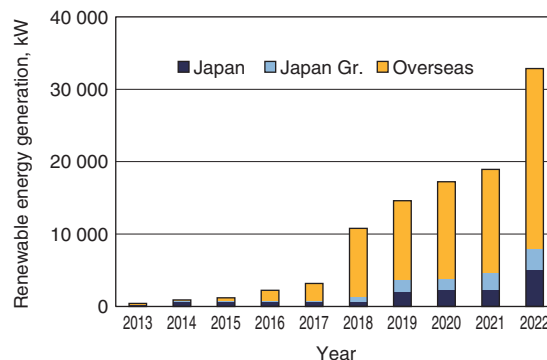
However the amount of power covered by on-site generation is only around 10% of plant's total power consumption. For this reason, purchasing off-site electric power is also necessary. In terms of expanding the use of renewable energy throughout the world, cooperating with renewable energy power producers and increasing the number of electric power plants contributes to the environment, and it is expected that off-site PPA and VPPA will increase. We will also need to purchase renewable energy electric power and renewable energy certificates as needed. As shown in **Fig. 11**, it is necessary to create a renewable energy roadmap to match the carbon neutrality targets with consideration for a balance of the above. JTEKT has announced that we will use 15% renewable energy in 2025, however we are proceeding with the introduction of off-site renewable energy and are planning to raise this target level.

\*2: Off-site power purchase agreement (PPA)

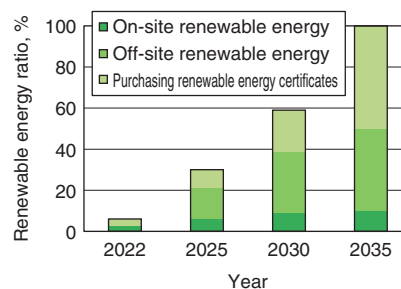
With this model, a direct electric power contract is concluded between the PPA power producer that generates renewable energy off-site and the consumer.

\*3: Virtual power purchase agreement (VPPA)

With this model, the consumer purchases virtual environmental value from the PPA power producer that generates renewable energy off-site.



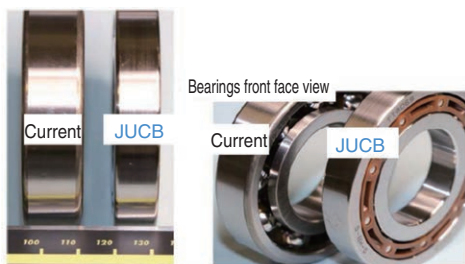
**Fig. 10** Transition to renewable energy



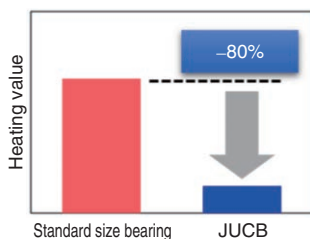
**Fig. 11** Renewable energy roadmap

### 3. 6 Development of Environmentally Friendly Products

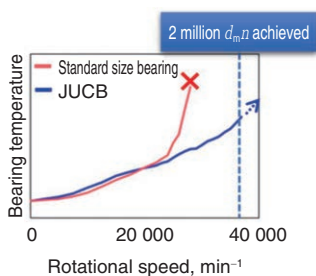
JTEKT has previously developed environmentally friendly products including electrification of steering and lowering the torque of bearings. As automobiles are transitioning from internal combustion engine vehicles to BEV and FCEV, we are developing more environmentally friendly products toward our goal of carbon neutrality. These include bearings and hydrogen-resistant bearings for BEV<sup>3</sup>, steering systems compatible with next-generation vehicles, and drive products, however the example that will be introduced here is the JTEKT Ultra Compact Bearing® (JUCB)<sup>4</sup> that was released in October 2022. The JUCB is a bearing with a width that has been reduced to the absolute limit, contributing to smaller unit sizes and lighter weights (**Fig. 12**). Compared to standard size bearings, the JUCB can reduce temperature rise during high-speed rotation by 80% (**Fig. 13**) and achieves high-speed performance on the world's top level of  $d_m n$  2 million (**Fig. 14**). This allows it to contribute to the smaller size and lighter weight of a wide range of drive units, such as the e-Axle. JTEKT must work to develop these kinds of environmentally friendly products.



**Fig. 12** JTEKT Ultra Compact Bearing



**Fig. 13** Heating value during high-speed rotation



**Fig. 14** Evaluation result of rotation test

#### 4. Conclusion

This report introduced JTEKT initiatives for carbon neutrality, including information disclosure in securities reports based on the TCFD recommendations, and efforts for reducing CO<sub>2</sub> emissions at JTEKT plants around the world. In order to be active globally, it is important to identify CO<sub>2</sub> emissions for each Scope, create a roadmap for achieving carbon neutrality, and make clear the issues in each region. This requires company-wide administration functions which can manage all this. This report also introduced specific CO<sub>2</sub> reduction initiatives, using examples in Japan as a reference, including visualizing energy usage, production technology innovations, development of hydrogen technologies, and introduction of renewable energy.

In the future, JTEKT must carry out CO<sub>2</sub> reductions while cooperating with suppliers to achieve carbon neutrality including Scope 3, and accelerate the development of energy-saving products. The challenge of creating a carbon neutral society still lies ahead of us.

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\*JTEKT Ultra Compact Bearing and JUCB are registered trademark of JTEKT Corporation.



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