JISF members entrusted with technology development project for realizing zero-carbon steel

Nippon Steel Corporation, JFE Steel Corporation, and Kobe Steel, Ltd., which are members of the Japan Iron and Steel Federation (JISF), and the Japan Research and Development Center for Metals (JRCM), a general incorporated foundation, were entrusted with a technology development project for realizing zero-carbon steel on June 11, 2020. The New Energy and Industrial Technology Development Organization (NEDO), a national research and development agency, had publicly invited applications for the project.

In connection with the long-term strategy under the Paris Agreement, the JISF established and announced its long-term vision for climate change mitigation, called "A Challenge towards Zero-Carbon Steel," in November 2018, ahead of the establishment of the Japanese government's long-term strategy against global warming. In this way, the JISF has offered a specific direction for achieving the Paris Agreement's long-term goals and clarified challenges that need to be taken on to ultimately achieve zero-carbon steel. In January 2020, this long-term vision of the JISF was adopted as one of the detailed action plans aimed at establishing innovative technologies to deal with climate change by 2050 under the Japanese government's "innovative environmental innovation strategy."

For unprecedented research and development with the purpose of realizing zero-carbon steel, this project aims to extract several prospective innovative technologies that focus mainly on decarbonization in steel production and to prepare a technology development roadmap for the steel industry of Japan.

In this manner, the JISF has determined to lead the world in undertaking technology development for the purpose of realizing zero-carbon steel by bringing forward initial plans under the above-mentioned vision and as a next step following the COURSE 50 initiative.

For the background of this project and the details of the JISF's efforts, please refer to Appendix. Meanwhile, the size of the project is expected to be about 200 million yen, and the implementation period is expected to be about two years (until the end of fiscal 2021).

(Appendix)

Background of this project and details of JISF's efforts

Necessity for innovative technologies that help reduce CO2 emissions in Japan's steel industry

On a global scale, the steel industry accounts for a large percentage of carbon dioxide (CO2) emissions (about 9%). To prevent global warming caused by CO2 emissions, it is extremely important to reduce CO2 emissions in the production processes of the steel industry.

In Japan, the steel industry emits about 180 million tons of CO2 per year (fiscal 2013), accounting for 14% of total CO2 emissions in Japan (after allocating emissions from power generation by electric power suppliers). The steel industry is the largest emitter of CO2 among all industries in Japan. On the other hand, Japan's steel industry has made thorough efforts to improve energy conservation since the 1970s. As a result, Japan's energy efficiency in steel production is currently the highest in the world, according to the Research Institute of Innovative Technology for the Earth (RITE). Because of its past efforts for energy conservation, the steel industry of Japan has a low potential for CO2 emission reduction based on energy conservation. In addition, the process of reduction of iron ore with carbon in a blast furnace must emit CO2. Therefore, innovative technology development is necessary to reduce CO2 emissions further.

Developing innovative technologies through COURSE 50, etc.

In the steel industry of Japan, for the purpose of reducing CO2 emissions while maintaining high productivity and energy efficiency, which are the most important characteristics of a blast furnace, blast furnace manufacturers and other companies have since fiscal 2008 participated in "development of process technologies to reduce iron ore with hydrogen, etc." under the project "Environmentally Harmonized Process Technology Development," which has been entrusted by the NEDO. These companies are endeavoring to develop innovative technologies aimed at reducing CO2 emissions in a blast furnace by 30%. Specifically, they aim to reduce CO2 emissions in a blast

furnace by partially replacing coke, which is a carbon-based reductant, with hydrogen generated within the steel plant and separating and recovering CO2 generated inside the blast furnace(COURSE 50: CO2 Ultimate Reduction System for Cool Earth 50 (COURSE50) Project). Furthermore, as for "development of process technologies to use ferro-coke" under the same project, technology development is underway to reduce CO2 emissions in a blast furnace by using ferro-coke. These technologies are being developed with the goal of achieving practical application by around 2030.

Necessity for developing super-innovative technologies in order to achieve the Paris Agreement's long-term goals

The above-mentioned efforts are, however, insufficient to reduce CO2 emissions in the steel industry to levels consistent with the Paris Agreement's long-term goals. Therefore, it is necessary to develop new steel production technologies that are more innovative than these technologies. That is, it is necessary to ultimately develop super-innovative technologies, such as an iron-making technology that can reduce iron ore with hydrogen alone, which helps achieve zero emission in iron-making processes, and a carbon recycling technology that can separate and recover CO2 generated in iron-making processes and use it as a raw material to produce valuable substances (carbon capture and utilization). This project also covers these efforts.

Necessity for developing and implementing technologies for the transitional period in order to switch to super-innovative processes in the steel industry

On the other hand, even if the steel industry is to switch to new iron-making processes that enable to achieve zero emission in the future, it is essential to preserve the current steel production technologies, which are based on traditional blast-furnace methods, as technologies for the transitional period in order to fulfill steel demand from society. Therefore, it is necessary to also develop technologies that help reduce CO2 emissions in the existing production processes. Specifically, it is necessary to consider developing a technology to increase the use of hydrogen for reduction of iron ore in a blast furnace on the basis of knowledge acquired through the COURSE 50 initiative or a technology to use biomass as an alternative to carbon derived from fossil fuels. This project also covers these efforts.