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Development of the Super COURSE50 blast furnace process

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“Hydrogen Utilization in Iron and steelmaking Processes” project (called GREINS project) started in 2021 with the aim of further reducing CO₂ emissions based on the knowledge gained from the COURSE50 project. The project is a multi-track technical development project such as hydrogen reduction technology using blast furnace, hydrogen direct reduction technology to reduce low-grade iron ore, electric arc furnace technology for high-grade steel production, electric smelting furnace technology for hot metal production, and CO₂ capture technology with energy-saving. The project is being carried out by the Hydrogen Steelmaking Consortium consisting of four partners (Nippon Steel, JFE Steel, KOBELCO, JRCM) and thirteen research institutes. Both COURSE50 and GREINS project are funded by the New Energy and Industrial Technology Development Organization (NEDO). In this presentation, the Super COURSE50 blast furnace process will be presented and discussed. In the Super COURSE50 blast furnace process, hydrogen is sourced from outside the integrated steelworks and preheated before being injected into the blast furnace. In this way, we maximize the hydrogen reduction reaction in the blast furnace and minimize the CO₂ emissions. The Super COURSE50 blast furnace aims to reduce CO₂ emissions by more than 40% compared with the current blast furnace process. In May 2022, the COURSE50 experimental blast furnace was modified to conduct high-temperature hydrogen injection tests. Tests conducted in the blast furnace from November to December 2024 achieved a 43% reduction in CO₂ emissions from the blast furnace (the world’s highest level).

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