



Remarks on Special Issue on Ironmaking

Kyoichi ARAKI

Executive Officer

General Manager, Head of Div., Ironmaking Technology Div.

The shape of blast furnaces has not changed much since they were first introduced more than 100 years ago. The blast furnace is used for a process in which iron oxides in iron ores are reduced by carbon, the ores are melted, and molten iron at more than 1 500°C is extracted. Technologies for blast furnaces have been significantly advancing thanks to the efforts of predecessors and engineers for manufacturing pig iron, achieving higher productivity by upsizing blast furnaces and enhancing the efficiency (e.g., operations with high productivity and low coke ratio). For further improvement, limits of iron ore reduction, temperature rise (heat exchange), furnace draft, and others should be grasped and technical improvements should be made one by one to eliminate each limit. However, in a blast furnace, iron ores, coke, gas required to reduce iron ores and increase the temperature, and formed molten iron and slag coexist, that is to say, a furnace is a reactor vessel in which solids, gas, and liquid coexist. Therefore, improving reduction, temperature rise, and low pressure loss and enhancing the efficiency of operations are not easy. Therefore, technologies for enhancing the reducibility of sintered ores and improvement of the quality (e.g., improved strength of coke) are also important, in addition to improving the operation engineering of blast furnaces. The overall ability of ironmaking sectors has possibly achieved the high productivity at blast furnaces and low coke ratio.

However, since 2017, a decrease in production due to operational changes of blast furnaces has been expanding. Adjustment of the distribution of charging materials in blast furnaces has not caught up with changes in the quality of sinter and coke and changes in the raw fuel conditions such as the increased usage ratio of yard-stored sinters and coke. Insufficient withdrawal at the time of operational changes and other problems have also becoming clarified. Nippon Steel Corporation needs to review past operation improvements of blast furnaces to reestablish the operation system by going back to the starting point and needs to further improve technologies for improving the distribution of charging materials and draft.

Meanwhile, good-quality resources (iron ores and coal) have been drying up, so we will steadily develop technologies to increase the usage ratio of very fine iron ores and semi soft non and slightly caking coal in the future as well. Another development task is to reduce CO₂ from blast furnaces. Currently, we have been developing technologies to reduce CO₂ emissions by 10% using hydrogen under the COURSE50 project. We will work to establish technologies for applying knowledge obtained using a test blast furnace (IV=13 m³) installed at the Kimitsu Works to operations in actual blast furnaces.

We will continue development to enhance our technological strength steadily in order to continue supplying low-priced iron sources stably in cooperation with related sections.