Remarks on Special Issue on Refractory Technology in the Steel Industry

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The Reiwa era began and Nippon Steel Corporation has sailed into this new term as a second start. I have experienced both tension and determination since this Special Issue on Refractory Technology in the Steel Industry was organized at this important time.

Refractories have been essential for iron production for many years, and refractory technologies have advanced and expanded along with the progress of iron production. At the outset, fireclay was used without being treated. Currently after several thousand years, various types of refractories (e.g., bricks, castables, and heat insulation fiber) are used for all sections in the processes from ironmaking, steelmaking, and rolling for the purpose of retaining hot metal, molten steel, molten slag, and various types of high-temperature gases, refining, heat insulation, and transportation. Refractory technologies have always had a significant influence on the feasibility of new processes, operation stabilization, improvement of steel quality, energy saving, and cost reduction.

We propose the following concepts for the improvement and development of refractories:

(1) Reduce the costs of general-purpose products as much as possible within the specifications.

(2) For sections that determine the service life of equipment, enhance the durability of refractories as much as possible within the range where such refractories pay premium prices even if the unit prices are only slightly expensive.

(3) For sections where considerable advantages (e.g., higher steel quality, shorter construction periods, and reduced unit costs of fuels) other than the costs of refractories are expected, develop materials and construction methods that justify the total costs.

In addition, refractory technologies are not mere material technologies. They are comprehensive technologies including various related technologies that match various phases in the service lives of refractories and facilities for which refractories are used. Such phases include raw materials for refractories, refractory material production and evaluation, furnace building and construction, drying and heating, inspection and testing, repair, demolition, and recycle.

The refractory departments at our company have been making constant efforts to prevent serious problems, such as run-out and leakage of hot metal, molten steel, flame, and hot gas, in order to produce steel with a higher quality at a lower cost in a stable way. At the same time, we have also been working on a variety of tasks: standardization, systematization of the trend management, mechanization, automation, development of test and repair technologies, new construction methods, and high-durability and high-functionality refractories, introduction and utilization of AI, and establishment of evaluation technologies that can simulate actual equipment

more accurately. Through these approaches, we aim to address a wide range of issues: aging furnaces that have been operated for many years, operations becoming more severe due to deteriorating quality of raw materials for steelmaking and higher functionality of steel products, growing demand for reducing energy consumption and CO_2 emissions and for higher productivity, decreasing the number of skilled workers for furnace building, laws and regulations becoming stricter, and situations of raw materials for refractories and refractory products most of which are imported.

This special issue introduces our work mainly carried out since 2000 as far as the space allows. With the Tokyo Olympic and Paralympic Games coming up soon, we will further promote refractory technology development so that we will be able to lead the world in refractory technologies and continue to stand on the winners' podium. We cordially solicit the continued support, guidance, and cooperation from all parties concerned.