



Remarks on Special Issue on Steelmaking

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This special issue is the first one on steelmaking renamed as Nippon Steel Technical Report. The changes and advancement of steelmaking technologies so far are outlined below. The current steelmaking operation consists of (1) hot metal pretreatment, (2) converter, (3) secondary refining, (4) continuous casting, and (5) slab conditioning. In the refining operation ((1) to (3)), refining for high purification and component adjustment are performed based on the required material quality. In the following continuous casting ((4) and (5)), the material is solidified and conditioned to manufacture high-quality cast metal without internal and surface defects.

According to Nippon Steel Technical Report No. 61 issued in 1994, refining technologies were reformed and advanced as follows: In the first period (in the 1960s), the converter process was introduced and developed; in the second period (1970s), the vacuum degassing process (secondary refining) was spread and the converter process was reformed; and in the third period (1980 to 1994), the refining functions were divided by hot metal pretreatment and the refining technologies were matured. Meanwhile, continuous casting technologies were reformed and advanced as follows: In the first period (1960s), the industrial continuous casting process—mainly billet bloom continuous casting machines—was established; in the second period (1970s), the use of larger equipment commenced with the introduction of slab continuous casting machines and it was advanced; and in the third period (1980 to 1994), the application of such technologies to high-grade steel began, which matured the technologies. In the 30 years from 1960 to 1990, the basic constitution of the current steelmaking processes and elemental technologies in each process were established.

Nippon Steel Technical Report No. 104 issued in 2013 summarized the development trends generated in approximately 20 years since the previous special issue on steelmaking was issued. In the refining operation, the desiliconization, desulfurization, dephosphorization, and decarbonization processes were divided by reviewing hot metal pretreatment. Also, converter-type hot metal dephosphorization with excellent thermal tolerance that did not involve fluorine was applied, and impurities and nonmetallic inclusions were reduced by enhancing the degassing performance depending on the requirements for each steel grade. In the continuous casting, the productivity was improved by increasing the speed and cross sections, the operation was stabilized (e.g., measures against breakout), and quality technologies were improved through enhancing the processability and strength and reducing defects to zero. Thus, the technologies in the steelmaking processes established by the 1990s were further improved.

This special issue introduces the new steelmaking technologies developed after Nippon Steel

& Sumitomo Metal Corporation started in 2012. This issue shows the trends and prospects of the latest steelmaking technology development, basic studies that support further deepening of the steelmaking processes, and the advancement of steelmaking technologies where the characteristics of each works and integration synergy were fully utilized. We hope that our customers, researchers at universities and research institutions, and students will read this issue and understand our research and development of steelmaking technologies that we have developed and deepened as a leader in the world.

We will work to fully understand steelmaking through research and development to supply high-performance steel that matches customer needs stably and to contribute to the sustainable development of society through environmentally friendly steelmaking processes. We cordially solicit your further understanding and encouragement.