

Optimization of the Slab Cooling Process After Continuous Casting Using Numerical Simulation



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Monitoring the thermal condition of slab piles after continuous casting is essential for the logistics operation of a steel plant, ensuring compliance with shipment deadlines and enabling further processing steps that require a minimum slab temperature. To achieve the necessary accuracy, cooling procedures must account for the dimensions of the slab pile, as cooling time is influenced by both the size and the number of stacked slabs. In this work, correlations for slab pile cooling times were developed through numerical simulations and subsequently integrated into the plant's logistics system.

Introduction

After exiting the continuous caster, slabs are stacked in the slab yard for cooling before further inspection, processing or shipment. The process of cooling slabs in the slab yard must be controlled based on the metallurgical and mechanical properties of the steel grade. Typical cooling methods, such as forced water cooling, conventional stacking and the utilization of a hood, are illustrated in Fig. 1.

Forced cooling with water is the most intense cooling method for a slab stack, as shown in Fig. 1a. This cooling method allows for cooling to 50°C in less than 24 hours but can only be applied to less demanding and soft

steel grades not prone to cracking. Air cooling in a stack (see Fig. 1b) reduces the cooling intensity; however, the bottom and top slabs of the stack may be exposed to higher cooling intensities compared to the slabs inside the stack. For more sensitive steel grades, heat loss to the ground and the top surface of the stack can be reduced using a “sandwich configuration,” in which the bottom and top slabs are replaced with slightly larger hot slabs of less demanding steel grades. The slowest cooling method for the most demanding steel grades involves the application of a hood, which is thermally isolated with glass wool or refractory material, as shown in Fig. 1c. The cooling time stays well

Figure 1

Cooling of continuously cast slab stack in the slab yard by forced cooling (a), in a conventional stack (b) and inside a hood (c).

