

Mold Powder Behavior in a Medium-Thickness High-Speed Slab Caster at Nucor Steel Gallatin



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The development of practices on the medium-thickness high-speed caster at Nucor Steel Gallatin has continued with a focus on casting powder interactions in the mold with respect to powder mixing, heat removal and thermocouple behavior. The impact of mold plate thickness changes and mold water are also illustrated to highlight the impact on heat removal.

Introduction

The author's paper from AISTech 2024¹ introduced the wide range of operating conditions required for the medium-thickness high-speed caster at Nucor Steel Gallatin (NSGAL) and the necessary casting flux properties. NSGAL has two in-situ relined

furnaces and a single off-line reline and exchange furnace. This unique arrangement leads to variable delivery times to the caster of 26 to 52 minutes dependent upon furnace scenario leading to casting speed ranges of 3–6 m/minute. Table 1 provides the

Table 1

Basic Description of Caster¹ and Mold

Main radius	5,500 mm	Alloy	Cu-Cr-Zr
Vertical length	3,540 mm	Coating	Ni plated from 400 mm
Containment length	26,576 mm	Water flow	Cut slot design
Width	900–1,870 mm	Flow direction	Water flows from top to bottom
Mold exit thickness	132.5 funnel, 142.5 straight	Flowrate	Water flow variable (6,200 to 9,297 l/minute)
Strand exit thickness	110–123	Width	2,000 mm wide
Containment	Continuous bending and unbending	Length	1,200 mm long
Tundish	69 T	Softening temp	500°C/932°F
Oscillation - Hydraulic	0–12.5 mm stroke; 25–490 cpm	Conductivity	315 W/mk, 182 BTU/hft°F
Braking and damping system	Rotolec mm-emb ²	Tensile strength (@200°C)	380 N/mm ² , 7.93*106 lb/ft ²
Speed range	2.5 to 6 m/minute	Hardness at 20°C	120 HBW
Reduction	Liquid core and dynamic soft reduction	Elongation at 200°C/392°F	24%