The Design and Start-up of the Granular Mold Flux Feeder at Stelco Hilton Works Slab and Bloom Casters

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Introduction

Technology for the application of mold flux into the continuous casting mold in North America has not kept pace with other casting advancements. Standard mold powder addition is accomplished by an operator pushing powder into the mold at regular intervals. This is a tedious, labor intensive, and inconsistent method for applying mold flux.

A unique automatic feeder has been commissioned at Stelco Hilton Works taking advantage of the excellent flowability and low dusting characteristic of granulated mold fluxes. Operational and environmental benefits have been realized.

Potential Benefits of In Mold Feeding

During the continuous casting process, mold flux is added to the top of the strand at the mold. Figure 1 shows the cross section and manual flux addition of a typical caster mold. Mold flux plays an important role during the casting of steel. Primary functions of mold flux include: lubrication of the strand for withdrawal from the mold, heat transfer modification, steel inclusion absorption, thermal insulation from heat loss, and protection against re-oxidation from the atmosphere.

<table>
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<th>Casting Practice</th>
<th>Problems</th>
<th>Possible Outcomes</th>
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<tr>
<td>Thin layer of unmelted flux</td>
<td>Low thermal insulation leading to reduced slag generation, large meniscus hook formation, freezing of steel in mold, exposure of steel to the atmosphere</td>
<td>Reduced of lubrication leading to a breakout, quality flux problems associated with deep oscillation marks, formation of steel floaters reoxidation of steel</td>
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<tr>
<td>Excessive additions of mold powder</td>
<td>Slag entrapment, meniscus deformation, carbonization of steel, uneven fusion</td>
<td>Entrapment breakout, slag rim formation, poor oscillation mark formation</td>
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<td>Starve and feed application</td>
<td>Varying thermal insulation leading to inconsistent slag generation, varying slag chemistry due to inclusion absorption, rope formation, and uneven meniscus formation</td>
<td>Rope formation causing breakouts, thin slag depths causing sticker breakout, varying slag chemistry changes flux properties affecting heat removal and consumption, quality issues due to oscillation mark formation</td>
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Table 1. Upset Conditions due to Poor Flux Feeding