

Castability and inclusions in a low sulphur Ca-treated peritectic steel for two deoxidation techniques

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ABSTRACT

Liquid inclusions are important to avoid nozzle clogging during continuous casting of steel. In order to minimize clogging tendency at a Brazilian steelworks for a low sulphur Ca-treated peritectic steel, deoxidation technique was changed from only Al addition as deoxidant to Fe-Si ferroalloy followed by Al addition, reducing the amount of Al by 20 wt%. Calcium treatment procedure was not changed. According to steelworks data, clogging occurrences were drastically reduced with this process change. In this context, quenched steel samples were collected from the tundish before and after the aforementioned process change. Non-metallic inclusions characterization was manually performed using SEM-EDS. For both conditions – before and after the industrial process changes – the inclusions were typically globular ones. However, before the changes the inclusion modification was not complete, since the core of the inclusions was composed by polygonal spinel. After the changes the inclusions became homogeneous (completely modified); some of them presented CaS ring around the globular inclusion. Computational thermodynamics was applied to calculate the castability windows; they show that the amount of calcium dissolved in liquid steel was too low before the process changes, and this fact explain the blockage of the tundish nozzles which was observed at steelworks, due to deposition of high melting point spinel inclusions.

Keywords: inclusion, peritectic steel, clogging, deoxidation, computational thermodynamics