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ROOT CAUSE ANALYSIS OF INTERNAL DISCONTINUITIES IN HIGH CARBON SILICON KILLED STEEL PROCESSED THROUGH INGOT AND CONTINUOUS CASTING ROUTE FOR CRITICAL APPLICATION

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ABSTRACT

Detection and identification of genesis of defects leading to any kind of failure are the preliminary but very important steps towards product quality. Present investigation includes in-depth analysis of the internal discontinuities present in high carbon silicon killed steel, which has been made in Basic Oxygen Furnace (BOF), subjected to secondary refining and further processed through bottom pouring ingot route as well as continuous casting through Bloom cum Round caster (BRC). Detailed metallographic study of the inclusions or entrapments was carried out with respect to their type, size, volume fraction and morphology. Compositional evaluation using energy dispersive spectroscopy attached with scanning electron microscope has facilitated the analysis.

Outcome of the micro-cleanliness evaluation revealed entrapments of mould powder in samples of continuously cast steel. Corrective measures in mould powder quality and mould oscillation control have led to lowering of rejection level to great extent. On the other hand, presence of alumina (mostly), silica (occasionally) and aluminium silicate was found predominant in sample of product processed through ingot casting route. Inclusion volume faction was found higher in rejected steels.

Steel cleanliness is function of de-oxidation and refining process, improper practices lead to presence of non-metallic inclusions. De-oxidisers type, sequence and method of its introduction into a melt contribute to lowering of such inclusions/entrapments leading to minimizing rejection level of end product. Proper selection of quality of bottom pouring materials also helps to avoid entrapment of exogenous material during teeming operation in ingot casting.

Keywords: Silicon killed steel, failure, entrapments, non-metallic inclusions