

Optimisation of Inclusion Chemistry by Improved Steel Cleanliness and Optimum Calcium Treatment

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Bokaro Steel Plant produces ~ 2.0 million tons of low carbon aluminium killed (LCAK) steels per annum. Calcium treatment is done regularly at the end of ladle treatment to avoid clogging of submerged entry nozzles (SEN). With calcium consumption of 0.23 kg/t, inconsistent calcium in steel, SEN clogging and slide gate erosions were reported. Nozzle clogging during casting of LCAK steels was primarily caused by deposition of complex oxide and sulfide inclusions and slide gate erosion by excess calcium in steel. Optimum calcium in steel was essential to achieve desired inclusion composition conducive to smooth casting and eliminate slide gate or SEN erosion effectively. With calcium consumption of 0.12kg/ton optimum calcium content in steel could be achieved through i) improved steel cleanliness, ii) restricted CaS formation and iii) optimum aluminium content in steel. Process optimisation resulted in reduction in aluminium consumption by 1.0 kg/t and improvement in steel cleanliness with consistent total oxygen level of < 42 ppm. Desired inclusion characteristics conducive to longer sequence length was achieved and evidenced through EPMA. Erosion of slide gate plates could be eliminated completely.

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