Dynamic Secondary Cooling Control System

A Product Of Automation Division, Tata Steel Limited

Dynamic Secondary Cooling Control (DSCC) system is a mathematical model for controlling the secondary cooling water flow rate in a continuous casting machine to ensure that a consistent strand surface temperature profile is maintained, regardless of the variation in casting speed.
Beneath the mould in a continuous caster, solidification of steel continues through the different zones of cooling through water sprays while the strand is continuously withdrawn at the casting speed. The spray flow rates are adjusted to control the strand surface temperature until the molten core is solid enough to reach the metallurgical length.

Cooling in the secondary zone is of vital importance in determining the quality of slabs because uneven cooling may cause the formation of cracks, bulging & scale formation. It is therefore important to design a uniform cooling system to control the temperature of the partially solidified cast.

The Dynamic Secondary Cooling Control (DSCC) system predicts and controls the temperature in real-time accurately during continuous casting of steel. The system adjusts the spray-water flow rates in the secondary cooling zone of the caster, in order to maintain the desired temperature profile throughout the steel even in significant variation in casting speeds.

Defect Free Slabs Through Dynamic Secondary Cooling
Methodology

The convention control strategies for secondary cooling based on instantaneous casting speed only cause steep changes in the water flux with the changes in the casting speed resulting in uneven cooling & strand reheating.

The mathematical model based DSCC system takes into account the super heat, mould heat removal, steel chemistry and actual water flow in the secondary cooling zone to predict the thermal state of the strand in the real time simulation mode.

In the control mode, the system predicts the water flow set points to level-1 system either based on simulated thermal state and steel grade wise target surface temperature profile or a strand residence time control strategy.

- Simulation Mode
- Control Mode
- User Friendly GUIs

DSCC Application Screen
Benefits

- Reduction in cracks
- Reduction in strand bulging
- Reduction in cap-off time of casters
- Slab quality improvement & reduction in downgrading
- Reduction in variation of strand temperature with casting speed changes

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