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+ Tata Steel

"Simulation software from ANSYS helped us to optimize the transition tonnage produced during the grade change to maintain our very high product quality standards."

*Mrityunjay Kumar Singh
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Prediction of Transition Tonnage During the Grade Change in a Continuous Casting Process

During the continuous casting of steel, casting of different grades in the same casting sequence produces transition billets. This product mix of transition billets does not conform to any of the grades, and needs to be downgraded or diverted. The casting operators need to identify the extent and location of this intermixed zone in order to minimize the production and quality issues. So a CFD simulation was carried out to predict the transition tonnage during the grade change. This model has been well-validated with experimental trials, and has now been successfully used in the plant.

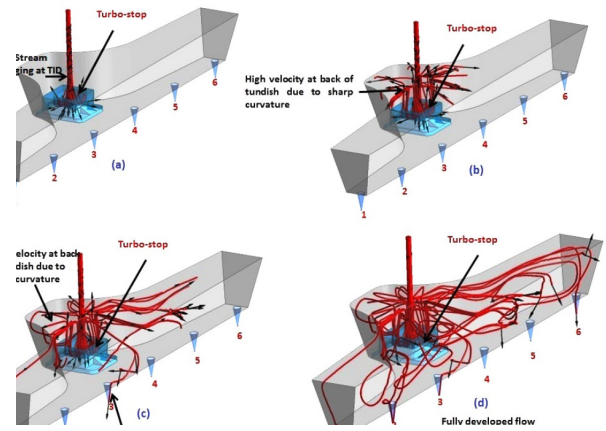
Challenges

Billet casting to convert liquid steel to solid billets is an uncertain process with many variables; for example, the casting speed may change or certain strands may become non-functional. These factors alter the flow in the tundish and change the transition tonnage. Predicting and optimizing the transition tonnage during the grade change under different plant scenarios is a big challenge, so a CFD model was developed to better understand this process.



Technology Used

ANSYS® Fluent®



Streamlines at different time intervals

Engineering Solution

- ANSYS Fluent software with the realizable k-ε turbulence model was used to model fluid flow in the tundish
- The unsteady-state species transport model was used to generate the residence time distribution of the vessel
- Further data analysis was carried out to predict the start and end of transition in the tundish

Benefits

- The robust solver and the interactive user interface in ANSYS Fluent helped to speed up the analysis setup and subsequent post-processing
- The accuracy of the simulation helped Tata Steel to optimize the transition tonnage produced during the grade change. This quality control measure led to reduction in customer complaints and saving of transition tonnage.
- Use of ANSYS Fluent reduced the cost of plant-scale experiments and testing.

Company Description

One of the world's pioneering steel companies, Tata Steel manufactures a wide range of steel products. Tata Steel primarily serves customers in the automotive, construction, consumer goods, engineering, packaging, lifting and excavating, energy and power, aerospace, shipbuilding, rail and defense, and security sectors. Tata Steel has manufacturing operations in 26 countries, including Australia, China, India, the Netherlands, Singapore, Thailand and the United Kingdom.

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