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Simulation-based optimization of coupled material–energy flow at ironmaking-steelmaking interface using One-Ladle Technique

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ABSTRACT

The ironmaking-steelmaking interface of the steel manufacturing process involves the hot metal ladle circulation and the energy dissipation which are coupled processes with an interrelated but independent relation. Therefore, the synergistic operation of the material flow and the energy flow at the interface is momentous to the effective production of the ironmaking-steelmaking section. However, there is a lack of solutions to realize the synergy. Here, we presented a coupling simulation model for the material flow and energy flow of the ironmaking-steelmaking interface, based on the mathematical description of their operation behaviors, the operation and technical model of the production equipment and the temperature-decreasing model of the ladle. Further, the coupling simulation model was applied to a concrete ironmaking-steelmaking interface using the One-Ladle Technique. The coupling simulation model proved its performance in providing comprehensive decision-making supports and optimized production management strategies by achieving a solution that results in a decline of 10 °C in the average temperature drop of the hot metal and a reduction in the cost per tonne of steel by CNY 1.02.

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Keywords:
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