Numerical Evaluation on Lower Temperature Operation of Blast Furnace by Charging Carbon Composite Agglomerates

Steel Research Int., 78 (2007) No. 1, 10-18, DOI: 10.2374/SJM5872-SRI-78-2007-10

Chu, M., Yagi, J.-I., Nogami, H.

Institute of Ferrous Metallurgy, Northeastern University, Shenyang 110004, China

This paper places emphasis on evaluating ironmaking operation lower temperature. Blast furnace operation with carbon composite agglomerates (CCB) charging and/or lower operation temperature has been numerically examined using a modified multi-fluid blast furnace model under constant thermal conditions of the raceway. The numerical calculation shows that a lower in-furnace temperature level is achieved under the operation with the CCB charging. With CCB charging, the location of the cohesive zone shifts downward and the temperature of the thermal reserve zone decreases. The decrease in heat requirements for solution loss, sinter reduction and silicon transfer reactions compensates the increase in heat demands for CCB reduction and direct reduction, and rather improves the efficiency of blast furnace. Consequently, the productivity improves, the coke rate shows a notable decrease and the total reducing agent rate also tends to decline compared with conventional operation without CCB charging. Therefore, charging carbon composite agglomerates contributes to the enhancement of blast furnace performance. Furthermore, the model predicts that higher operation efficiency is achieved if the melting and/or tapping temperature could be dropped. The innovative technology of lower temperature ironmaking is expected to be applied in industrial blast furnaces after resolving the problems in engineering and economic evaluations.

Full article