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Improvement in Blast Furnace Performance Using Softening - Melting Zone Profile Prediction Model at G Blast Furnace, Tata Steel Jamshedpur

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Abstract : The productivity of a blast furnace and the quality of the hot metal produced are significantly dependent on the smoothness and stability of furnace operation. The permeability of the furnace bed, as well as the gas flow pattern, influences the steady control of process parameters. The softening – melting zone that is formed inside the furnace contributes largely in distribution of the gas flow and the bed permeability. A better shape of softening-melting zone enhances the performance of blast furnace, thereby reducing the fuel rates and improving furnace life. Therefore, predictive model of the softening- melting zone profile can be utilized to control and improve the furnace operation. The shape of softening-melting zone depends upon the physical and chemical properties of the agglomerates and iron ore charged in the furnace. The variations in the agglomerate proportion in the burden at G Blast furnace disturbed the furnace stability. During such circumstances, it was analyzed that a w-shape softening-melting zone profile was formed inside the furnace. The formation of w-shape zone resulted in poor bed permeability and non-uniform gas flow. There was a significant increase in the heat loss at the lower zone of the furnace. The fuel demand increased, and the huge production loss was incurred. Therefore, visibility of softening-melting zone profile was necessary in order to pro-actively optimize the process parameters and thereby to operate the furnace smoothly. Using stave temperatures, a model was developed that predicted the shape of the softening-melting zone inside the furnace. It was observed that furnace operated smoothly during inverse V-shape of the zone and vice-versa during w-shape. This model helped to control the heat loss, optimize the burden distribution and lower the fuel rate at G Blast Furnace, TSL Jamshedpur. As a result of furnace stabilization productivity increased by 10% and fuel rate reduced by 80 kg/thm. Details of the process have been discussed in this paper.

Keywords : agglomerate, blast furnace, permeability, softening-melting
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