

# FLUX INJECTION THROUGH TUYERES IN BLAST FURNACE

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## ABSTRACT

An appropriate slag formation is a precondition for getting a smooth operation of the blast furnace and a good quality of hot metal. It includes dissolution of the gangue of iron bearing materials and ash of fuel & fluxes into a liquid slag properly with desired slag properties. Cohesive zone has the highest resistance to the gas in the blast furnace, its shape and thickness normally determine the gas distribution. If the slag volume at the cohesive zone can be decreased and the slag properties can be improved significantly, the productivity of blast furnace could be increased accordingly. Physically, the burden, except for coke, transforms gradually from solid state-soft-semi-melt and finally into complete molten state. During the process, voidage of the burden decreases making its permeability worsens. Chemically, the composition of the slag formed depends on not only on the compositions of the burden charged, but also on the reduction degree of the iron bearing materials at the cohesive zone and dissolution of the burden materials charged. Reduction of iron oxides remained in iron bearing materials proceeds at much faster speed at cohesive zone than in lumpy zone. Dissolution of fluxes changes their basicity. Both above reactions lead to different viscosity and different melting point of slag. To decrease the variations in slag basicity and the slag amount in the cohesive zone Ma (1) has proposed injection of fluxes through the tuyeres, instead of charging them from top, to improve slag formation in the blast furnace. The basicity of slag formed at different locations in the blast furnace is compared for normal blast furnace operation and operation with injection of fluxes through the tuyeres. Indian iron ore have higher amount of gangue content mainly in the form of alumina and silica. Because of higher gangue content, BF requires a high amount of flux for their removal as slag. In order to achieve desired slag basicity in final BF slag, it becomes necessary to charge higher amount of flux directly or through sinter/pellet (iron bearing materials) in BF. This results in high basic bosh slag. Several attempts have been made in India to overcome the problem of highly viscous and high melting bosh slag in the bosh zone. Direct fluxes charging in BF have been discontinued over the years and occasionally it is being practiced in Indian BF. Flux requirements in BF are met through sinter/pellet by adjusting its chemistry. Normally high MgO & higher sinter basicity is being maintained to get final BF slag chemistry. A new system has been installed at BSP for introduction of this technology. This technology also has a great potential in terms of enhancing CDI rate, better slag formation inside BF, good quality of hot metal (Decrease in % Silicon & Sulphur content of hot metal and their variation), reduction in Pressure drop inside BF thereby better wind acceptance etc.

**Keywords:** Blast Furnace, Bosh Slag, Permeability, Flux injection, Tuyeres

