

BLAST FURNACE TROUGH MATERIALS AND TAP HOLE CLAY MATERIALS

Blast Furnace Trough Materials (Trough Mix)

The flow rate of molten metal and slag through the trough system increase many times in case of larger blast furnaces. To get good campaign life special attention must be given to both refractory lining and design i.e. trough geometry and cooling system. The trough design is based on fluid flow characteristics along with thermo-chemical reactions. The important parameters of the geometry would be - length, width, depth at drainage point, distance between iron and slag over-flow, skimmer opening dimensions, and side-wall angle. Each of the above parameters affects the campaign life of the furnace trough if not designed properly. Cooling helps to bring down the hot face temperature, and thus the wear by way of chemical attack, infiltration and thermal stresses.

Development of sophisticated materials and innovative installation and repair techniques now make it possible to hold hot metal in today's deep pooling type iron troughs for a week or more without draining for maintenance. In this area the traditional graphitic high alumina ramming masses used in the past have been replaced by high quality, low moisture, metal or organic fiber containing castables with Al_2O_3 - SiC - C as the standard refractory base material (dry ramming masses / gunning compound / ULCC) for troughs. The important physical properties for this material are - thermal expansion, hot strength and thermal conductivity. The following shows the role of different constituents of trough mix (material).

Table: Role of different components in the Blast Furnace Trough Mix (Refractory)

Material	Role
Alumina components	Volume stability Wear resistance
Silicon Carbide (SiC)	Wear resistance Oxidation resistance Slag penetration resistance
Carbon	Spalling resistance Slag penetration resistance
Anti-oxidants	Oxidation resistance

	Hot MOR
Resin	Hot MOR Binding strength

Blast Furnace Taphole Clay Materials (Refractories)

With the prevailing trend of increasing capacities of Blast Furnaces the conditions for applications of Taphole Clay (refractory materials) have become more stringent as there has been a significant increase both in the pig iron temperatures and taping durations. These requirements are met by increasing Al_2O_3 percent and adding some SiC (around 15 to 20 percent) along with metals and nitrides as special additives in blast furnace taphole materials (refractories). Hence, depending on the capacity of the Blast Furnace the specifications of Taphole Clay to be used would vary. The binders used vary from purely coal tar based mixes to resin bonded ones or a dual bond.

The function of the *taphole clay* (*taphole material*) in a blast furnace is to enable smooth operation of the taphole, maintain constant taphole length and ensure separation of hot metal and slag. The following table depicts the various functions and property matrix for taphole clay.

Table: Function vs. Property Matrix of Blast Furnace Taphole Clay

Closing Hole	Easy plugging and drilling.	=> Plasticity of fireclay. => Good gas permeability. => Proper sintering.
Hearth Protection	Constant length.	=> Resistance to hot metal and slag. => High stickiness to the furnace wall.
Constant Delivery	Erosion resistance.	=> Expansive nature. => Resistance to hot metal and slag.

Source : <http://viewforyou.blogspot.in/search/label/Blast%20Furnace>