Blast Furnace Slag

Iron ore, iron scrap and fluxes (limestone and/or dolomite) along with coke as fuel are charged into a blast furnace to produce iron. The coke is combusted to produce carbon monoxide, which reduces the iron ore to molten iron products. These molten iron products can be cast into iron products, but is most often used as a feedstock for steel production.

Blast Furnace Slag is a non-metallic by-product produced in the process of iron making. It consists primarily of silicates, aluminosilicates and calcium-alumina-silicates. The molten slag, which absorbs much of the sulphur from the charge, comprises about 20% by mass of iron production.

Different forms of slag are produced depending on the method used to cool the molten slag. These products mainly include Air-Cooled Blast Furnace Slag and Granulated Blast Furnace Slag:

- **Granulated Blast Furnace Slag** - The molten slag is cooled and solidified by rapid water quenching to a glassy state; little or no crystallization occurs. This process results in the formation of sand size (or frit-like) fragments, usually with some friable clinker like material. The physical structure and gradation of granulated slag depends on the chemical composition of the slag, its temperature at the time of water quenching and the method of production. Granulated Blast Furnace Slag, when crushed or milled to very fine cement-sized particles, produces Ground Granulated Blast Furnace Slag (GGBS). GGBS has cementitious properties and can be used as a partial replacement for or additive to Portland Cement.

- **Air-Cooled Blast Furnace Slag** - If the liquid slag is poured into beds and slowly cooled under ambient conditions, a crystalline structure is formed and a hard, lump slag is produced, which is subsequently crushed and screened.

Manufacturing Process

Directly dispatched to Cement Manufacturing Plant
Good granulation leads to better grindability
Better Glass content and Technical Delivery Conditions (TDC) guarantee reliability, leading to quality cement production
Controlled moisture leads to savings in material cost and hence lesser idle freight
Amicable relationship with railways ensures efficient logistics

Our well equipped Slag Granulation Technology

Specifications

### Physical Properties

<table>
<thead>
<tr>
<th>State</th>
<th>Solid Grains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>0 - 10 mm</td>
</tr>
<tr>
<td>Colour</td>
<td>Whitish Grey</td>
</tr>
</tbody>
</table>

### Chemical Properties

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Min</th>
<th>Max</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiO₂</td>
<td>%</td>
<td>32</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>FeO</td>
<td>%</td>
<td>0.20</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>CaO</td>
<td>%</td>
<td>32</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>MnO</td>
<td>%</td>
<td>0.02</td>
<td>0.5</td>
<td>IS12089 : Max - 5%</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>%</td>
<td>0.10</td>
<td>1.20</td>
<td></td>
</tr>
<tr>
<td>MgO</td>
<td>%</td>
<td>0.50</td>
<td>1.20</td>
<td>IS12089 : Max - 17%</td>
</tr>
<tr>
<td>MgO₆S₄ +MgO₆SiO₄ +SO₄²⁻</td>
<td>1.60</td>
<td>2.00</td>
<td>IS12089 : Min - 1%</td>
<td></td>
</tr>
<tr>
<td>Moisture (Dry Slag)</td>
<td>%</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Moisture (Wet Slag)</td>
<td>%</td>
<td></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Insoluble Residue</td>
<td>%</td>
<td>0.70</td>
<td>4.00</td>
<td>IS12089 : Max - 5%</td>
</tr>
<tr>
<td>Loss of Ignition</td>
<td>%</td>
<td>0.00</td>
<td>0.00</td>
<td>IS12089 : Max - 5%</td>
</tr>
<tr>
<td>Size under 10%</td>
<td>%</td>
<td>100.00</td>
<td>100.00</td>
<td>IS12089 : Lump &gt;50%</td>
</tr>
<tr>
<td>Glass Content</td>
<td>%</td>
<td>90.00</td>
<td>IS12089 : Min - 85%</td>
<td></td>
</tr>
</tbody>
</table>

Sampling Procedure: As per IS12089
Testing Frequency: Weekly

### Delivery Conditions

<table>
<thead>
<tr>
<th>Mode of Dispatch</th>
<th>Rakes or Trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing/Bundling</td>
<td>Open</td>
</tr>
</tbody>
</table>

Blast Furnace Slag is utilized by cement manufacturers for producing Portland Slag Cement (PSC). It is a blended cement, which is most suitable for infrastructure projects because of its high flammability. It is manufactured by either inter-grinding in the Portland Cement Clinker, Gypsum & Granulated Slag or blending the Ground Granulated Blast Furnace Slag (GGBS) with Ordinary Portland Cement by means of mechanical blenders. At Tata Steel, we believe in offering services along with the products. Our Blast Furnace Slag is highly consistent in quality and also adheres to the specifications required for producing the necessary grade of PSC.

PSC’s inherent chemistry gives it several advantages over ordinary cement. Apart from being environment-friendly, it offers:

- High compressive strength
- Excellent resistance to chloride & sulphate attacks
- Low risk of cracking
- Improved workability
- Better compatibility with all types of admixtures
- Superior finish
- Ease of pumping
- Better resistance against alkali-silica reaction
- Minimized shrinkage cracks