



A new refractory maintenance process that uses available waste bricks and slag, can help reduce production downtime by 80% and save Rs 3.2 crore per converter every year

THE CONTEXT

The converter used in steel making, had been identified as a key bottleneck at the Tata Steel Jamshedpur plant. The wear of refractories in the converter requires frequent maintenance to ensure optimal performance and life for the converter. This takes up considerable time, affecting shop productivity. The traditional solution of brick patching takes up eight hours as setting time. Since a converter can produce 225 tons of steel per hour, this method is not efficient. In addition, the material used for converter refractory maintenance at the Jamshedpur plant is imported at high cost, with 70% coming from a single supplier.

THE INNOVATION

The team at the plant developed a new method using waste refractory bricks (Magnesia Carbon or Mg-C) as patching material and steel making slag (waste) as the binder. The graphite present in the Mg-C bricks has a non-wetting effect with steel making slag, thereby preventing slag penetration into the brick and subsequent dissolution of the magnesia grains.

However, the presence of graphite significantly improves the refractory process. In the current innovation, carbon from the surface is removed through partial and controlled calcination, leaving the core carbon intact. The slag easily forms a bond with the brick pieces, reducing the setting time. Adding 4-5% mill scale to the partially calcined Mg-C bricks helps further reduce the setting time. As a result, the brick pieces settle in 10 minutes due to the quick formation of MgO Wustite (FeO).

KEY CHALLENGES

REDUCING THE SETTLING TIME OF WASTE BRICK

The non-wetting characteristics of graphite with slag delays the bonding process, which takes eight hours to settle in the converter refractory and there is no binder option available in the market. This has been resolved through the partial calcination of the waste bricks which reduces the setting time. The setting time is further reduced by adding mill scale (FeO) to expedite bonding through quick formation of MgO Wustite.

CONDUCTING TRIALS IN A RUNNING PLANT

Several trials have been conducted by varying the waste brick sizes, calcination, mill scale quantity and slag to establish the optimal process. All trials were designed and planned in a way that did not impact the production in the bottleneck area.

THE IMPACT

This innovation has mitigated the enterprise risk of single source procurement.

In addition, it has the potential to save

₹3.2 CR

per converter annually

Potential savings at the Jamshedpur plant operating with seven converters is around

₹22 CR

