

Technological Challenges on Low Grade Iron Ore Beneficiation and Pelletisation

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Abstract

The iron ores constitute the vital raw materials for iron and steel industries and are a major resource for our industrial and economic developments. These are valuable natural resources being finite and non-renewable. As per the recent National Steel Policy of Govt. of India, steel production will be enhanced to 300 million tons per annum (MTPA) in 2025 from current production of 86 MTPA. For production of 300 MTPA, the country needs the high quality iron ore around 450MTPA. Unfortunately the country is not endowed with requisite quantity of high grade iron ores. It is, therefore, imperative to make the best use of available low grade iron ore resources through scientific methods of mining, beneficiation and agglomeration. Challenges and solutions for upgrading Indian low grade hematite iron ore in association with goethite, kaolinite, gibbsite minerals as well as recovery of micro fines of iron phase minerals from slimes/tailings from iron ore washing/beneficiation plants should be taken of seriously to maximize the utilization of these resources for long term sustainability. These can be achieved by using suitable eco-friendly beneficiation processes through necessary R&D backup. Similarly, the economic and eco-friendly processes are essential to maximize the recovery of iron value from lean grade ores like BMQ/BHQ/BHJ/BGQ through physical beneficiation with or without a pyro-metallurgical treatment. The nature of iron phase minerals and associated gangue minerals decide the process flow sheet of beneficiation to be adopted.

In order to utilize the micro-fines concentrate, the Indian iron makers are sifting their focus from sinter intensive blast furnace operation to pellet oriented operation in combination of other smelting technologies. Adoption of suitable pelletisation technology of varying capacity is necessary to encourage meeting specific needs with respect to availability and type of iron ore fines/concentrate available in the country. The Indian hematite iron ore concentrate has high LOI because of the presence of kaolinite, goethite and gibbsite even after beneficiation process. As this ore is fragile in nature, the Blaine number of pellet feed material is high. To maximize the iron values from the slimes and tailings, flotation process may be adopted in future. It provides the hydrophobic characteristic on the surface of the particles, which has negative impact on pelletisation. It is the challenging task to handle the iron ore concentrate having high LOI, high Blaine and hydrophobic surface particles. It needs to improve the heating cycle of induration segment of the present pelletisation technology either grate kiln or straight grate processes through fundamental studies.