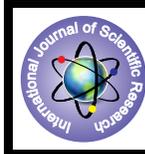


## Technological Upgradation For Mineral Development: in Context with Iron Ore Mineral



### Geology

**KEYWORDS :** Mineral development, Iron ore mineral, Technological upgradation

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### ABSTRACT

*The depleting nature of natural resource, particularly the mineral resources, demands a continuous addition of it to the domain for the future availability and use. Exploring the new horizon of mineral occurrences, lowering the cut off grade, upgrading the marginal grade and technological updating can enhance the resource base; there by enunciating the mineral development. The purpose of mineral development is to realize the full potential of mineral resources and use it to ensure lasting prosperity for futuristic uses. It helps in unlocking the provincial mineral potential and promotes attractive investment opportunity. Mineral exploration and mining activities form one part of the mineral development. Upgradation and beneficiation constitutes the best part of the mineral development. Updated technology for mineral industry to utilise the low grade ores as raw materials cost effectively is the third part of the mineral development. Geological mapping activities supporting the prospecting and mineral exploration industry are to be accelerated.*

### INTRODUCTION

The worldwide industrial scenario at present is dominated by the promising mineral based industries. It is because of the fact that the demand for the mineral and metal products is paramount in the world market. Iron and steel sector in the industrial domain is undoubtedly the leading one; indicative of this fact is the high per capita consumption of iron and steel throughout the world. Looking at the per capita, it is perceived that the steel sector is on the path of rapid growth (Beura, 2012 and 2008). The operation of such big numbers of steel industries is possible due to availability of iron ore deposits as the prime raw materials. Huge requirement of iron ore minerals as raw material has put immense pressure on the exploration and mining activities in the mineral occurring provinces of the world. The proven reserve of iron ore is depleting as has been operated by its suitability in accordance with the cut off grade. The resources, though limiting in nature, can enhance the reserve by downsizing the cut off grade. However, harnessing the low grade ore for raw materials must be supported by the modern industrial technology and efficient mineral processing activities. The demand for 65-70% Fe iron ore has been come down to as low as 45% Fe. This may so happen that 35-40% Fe ore shall be in use to cater the futuristic demand. Of course the upgraded technology in industry as well in mineral processing sector has made it possible to some extent and would have further cut the grade to redefine the ore. The iron mineral development through modern technology will not only strengthen the resource base but also support the prolonged use of it in sustainable manner.

### IRON ORE MINERAL DEVELOPMENT

The world wide per capita consumption of iron ore in its optimum momentum reveals that there is great pressure on the existing reserve. Gradual depletion of ore of specific grade may decelerate the pace at which the utility is made now. The invisible scarcity can be met with the transformation of resource to reserve. Research and development in tune with technological modifications will certainly increase the utilisation potential of marginal grade iron ore (Singh et al., 2007). The low grade ores must be upgraded along with new explorations in order to reinforce the domain of mineral development. It requires the supporting measures like mineralogical and chemical characterisation, beneficiation and utilisation of tailings. Even the Banded Iron Formation, the host rock of iron ore, having huge spread over can be converted to economic grade by removing the silica band from the iron band.

Iron and steel industries consume iron ore as the basic raw material. In general iron ores contain high silica and alumina as gangue, which badly affect the operation of blast furnace and production as well. Such association decreased the grade of iron ore. The increasing demand for iron ore and the depleting ore reserves together have emphasized cut off grade strategically to

be lowered. This needs elaborate processing and beneficiation of low grade iron ore to meet the quality raw material requirement of the blast furnace. Most often iron ore washing and agglomeration plants are commonly adopted for ore upgradation. In cases the interlocking pattern of ore and gangue association, gangue is finely disseminated to achieve adequate liberation in order to produce the acceptable grade of the product. Depending upon the ore characteristics such operations include comminution, washing, classification, gravity concentration and magnetic separation. In many instances froth flotation also had to be resorted to in order to recover valuables from the ultrafines. Wherever possible valuables were recovered in the lump and sinter feed form. In spite of the removal of the gangues like Al, P and Silica, properties like decrepitation, reducibility, softening, melting and tumbler index are to be taken care of to make the iron ore suitable for iron and steel industries. Alumina content can be lowered in iron ore fines by jigging, washing and used in blended form with the low Al content blue dust. Through jigging process it is found that the optimum iron ore recovery of 78.6% has been achieved with 63.7% Fe in concentrate (Das et al., 2007). Agglomeration process adds value to the fines in the sense that they can be used in the blast finance. Here sinters are more economic than pellets.

In the current scenario of steel production, mostly iron ore as raw material is obtained from high-grade hematite deposits. Magnetite ore as raw materials were discarded because of its interlocking with silica. Hence it requires significant beneficiation for upgradation. Technological development like high pressure grinding rolls (HPGR) for fine crushing and stirred milling for fine grinding have been in use for magnetite beneficiation (McNab et al., 2009).

### CONCLUSION

In the liberalised economy, the growth of steel sector moves very fast. So far India is concerned; the steel making capacity is likely to be 120-150 MTPA by the year 2020. Target is also kept for around 400 MTPA by the year 2040. Since good iron ore deposits are depleting fast, beneficiation technologies will have to be adopted to meet iron ore demand. Growing trend in iron consumption leads to growth of steel industries, which in turn evolve with depleting resources of high grade ores. Choice and demand for lower grade iron ore is increasing, especially friable, fines and blue dust. Pelletisation process and sintering often make use of these fines. The high grade ore consuming plants like the sponge iron industries where iron ore with +65% Fe is required should take techno savvy measures in converting the low grade ore to feed grade to reduce the future scarcity. In recent days industrial houses in iron and steel sector have taken innovative measures keeping the indispensability of mineral development in mind. For instances, low grade ore and dump fines of number of iron ore mines in Odisha have been undergone

value added processing. Steel Authority of India Ltd. is on the way to commission a 10 MT ore beneficiation and 4 MT pelletization plant. Based on the technology developed by CSIR-NML, SAIL also intends to set up slime beneficiation and agglomeration plants for Bolani iron ore. For Jindal Steel Works it has developed a column flotation based technology for iron ore slimes. The present day status of requirement of iron ore mineral and continuous growing trend certainly opt for efficient mineral development programme to fight the future mineral crisis.

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