CHAPTER 5

Proposed Measures to Augment Iron Ore Availability

National Steel Policy (revised 2008), envisages domestic steel production of the country to be 180 million tonnes per annum by 2019-20 and the new steel capacity that would come up through BF-BOF route would be around 60% and that through DRI-EAF/IF route would be around 33% and the remaining 7% would be accounted for by other routes. To meet such demand of the domestic steel industry, run-of-mine (r.o.m.) iron ore requirement would have to be over 500 million tonnes per annum as against the present level of production of around 220 million tonnes (2009-10).

The present installed capacity of steel making in the country is about 78 million tonnes while the actual production reported is 65.51 million tonnes (in 2009-10). The estimated steel production in India by the year 2019-20 is expected to rise threefold from existing level. To meet such target, there would need to be a proportionate jump in the iron ore production.

Almost all of the present-day production comes from hematite reserves, magnetite reserves are not being exploited for domestic consumption because of its poor grade. India is almost completely self-sufficient with regard to iron ore (hematite) but with future steel production envisaged it will have an impact on the reserves. Existing hematite reserves of 8.09 billion tonnes (NMI) as on 1.4.2010, may last for 15–20 years maximum. Hence, creations of additional domestic resources are crucial.

In India, major economic deposits of iron ore are found associated with volcano-sedimentary Banded Iron Formation (BIF) of Pre-Cambrian Age. The major "hematite" type iron deposits are located in well defined belts in the States of Orissa, Jharkhand, Chhattisgarh, Maharashtra, Goa and Karnataka. Almost all the five major iron ore belts were explored for high-grade ores at a cut-off of around 60% Fe and many exploited for high- and medium-grade ores (+62% Fe) over last six decades. The country has huge

resource potential of low-grade iron ore in this belt too, although, exploration efforts were highly inadequate.

With the depleting high-grade Iron ore reserves and revision of threshold value of iron ores to 45% Fe & 35% Fe (from hematite ore & siliceous hematite ore respectively), it is obligatory on the part of mining industry to exploit low/lean grade iron ores which were hitherto considered as waste. The fresh exploration strategy is to be drawn with the cut-off/threshold grade ores as a target.

Given the current stage of economic development, the need of the hour is not only to explore new deposits but also to make use of low-grade ores. In the context of a future availability of iron ore for the domestic industry and also for global business, due impetus in exploration and utilisation of low-grade iron ores, especially fines has to be imparted. The low-grade fines from operating mines which have not been utilised adequately and wasted, also have to be made use of.

Apart from this, significant quantities of slimes are generated (approx. 20–25% of ROM) during the wet processing of iron ores. These slimes that are normally dumped in the tailing ponds have led to their accumulation over the years. NMDC has about 20 million tonnes of such accumulated iron ore slimes in the tailing ponds of different mines. These slimes are considered as an environmental hazard as the risk of these slimes causing water pollution in the vicinity areas is very high.

Hence, it has become necessary to look for utilisation of these slimes. This has opened a new vista in iron ore utilisation and thrown a greater challenge to the mining industry to make these reserves economical for iron and steel making. As these reserves are national wealth & non-renewable, optimum utilisation of iron ore resources of the country has thus become top priority for sustainability.

The mainstream integrated steel plants (ISPs) came with captive ownership of iron ore mines. The merchant iron ore business (non-captive sector) in India flourished and catered mainly to export needs. Demand for iron ore in international business was biased towards high-grade ores. There was no demand for domestic fines even in the high- or medium-grade. The low-grade fines were not exploited adequately, as the economic prospects for it were not favourable. The iron ore prices were so low that there was hardly any profit to make even from prime quality ores in global market. The national business too was not encouraging till the last decade. Till 1980s, though iron ore fines (-10 mm) had the same iron percent as lumpy ores, they had no value. Only after 1980, when the boom in iron ore segment caused an upheaval in the markets, iron ore fines began to get exported through MMTC and that to only +63% Fe ore was mined and marketed. Today +58% ore is also mined and exported.

Low-grade fines were either lying in heaps or were put to various non-metallurgical uses, that is, for filling in pits and building roads. Therefore, the economic sense to beneficiate and agglomerate the low-grade fines & concentrates did not prevail among the iron ore miners.

Increasing life of the reserves i.e., adequate availability of the primary raw materials is a major requirement for sustained steady operation of the integrated steel plants. This is a vital need for sustained progress of the economy in the country. To ensure adequate availability of the raw materials, the critical measures would be utilisation of low-grade hematite ore & magnetite ore, use of fines/slimes stored in mines/tailing ponds and exploration of new deposits.

The present iron ore beneficiation facilities in the country are highly inadequate and do not utilise the sophisticated beneficiation practices. The beneficiation process technology in vogue is limited to sizing, washing and classification to meet the size requirement with nominal rejection of silica and alumina impurities in washed slimes fraction. Such washing facility was basically successful on account of selective mining of medium- and high-grade ore. Even the fines generated from such iron washing plants failed to meet the stipulation in respect of alumina. However, such practice of processing may not be of any help without the deployment of appropriate beneficiation technology, once low-grade ores are mined to augment production.

The beneficiated concentrate so produced needs to be agglomerated before its use in iron making. Most of the ISPs are having their own sintering plants for sinter making but none of them has any pelletisation facility. Characteristically, sinter has limitations, as it is to be made adjacent to its use. Hence, only captive mines of ISPs have and to limited extent merchandise mines adjacent to MSPs make it for their own consumption. On the other hand, pellets which can be made and marketed anywhere, do not find favour in Indian scenario as pelletisation is a capital intensive besides beneficiation precedes pelletisation. Thus, only big player can venture for it.

The entire ISPs in the country use predominantly high-grade calibrated iron ore lumps followed by sinters in their blast furnace burden for pig iron making. Seldom pellets are used in their BF burden. On the other hand, with the advent of DRI technology particularly coal-based sponge iron unit, the high-grade calibrated lumps were used very lavishly. This resulted in usage of higher percentages of lumpy iron ore i.e., around 45% in iron making in India as against 15–20% lumps used globally. Only gas-based DRI units in the country are using pellets for sponge iron making.

To cope with the increasing demand of quality iron ore for future projected growth of steel industry and in order to conserve limited reserves of high-grade iron ore lumps in the country, iron ore beneficiation followed by pelletisation is inevitable in the present scenario. The present pelletisation facility in the country is highly inadequate and needs a minimum of threefold rise to cater to the need of the iron making industry particularly of the coal-based DRI units which are lamenting over non-availability of quality economic iron ore lumps in the country.

With the existing as well as future projected steel capacity coming through ISPs and DRI units (coal-based), requirement of pellets will be very high and demanding. Assuming that entire ISPs make use of a minimum of 15% pellets (optimum) in their blast furnace burden then, at the projected steel production level it will require around 25 MTPA pellets. Further, even if all coal-based DRI units use 50% of pellets replacing high-grade lumps, then it will require around 25 MTPA pellets. Thus, around 50 MTPA (min.) pellets additionally will be required. This will conserve a substantial high-grade hematite lumps. The surplus production, if any, from ISPs as well as in non-captive sector could be supplied to the indigenous sponge iron plant (coal-based) and the remaining could be exported. Recent waving of the export duty by GOI may encourage venturing for pellet making by the industry.

Steel is a long-term business and the raw material resources are to be planned at least for a period of fifty years with similar growth rates. As we look into our strength regarding availability of iron ore, the present level of proved reserves are not encouraging for the projected demand of the ore by 2019-20. As managers of raw materials, it is our responsibility to see that the requirement of input is comprehensively met in quality as well as quantity. This brings us face to face with the issue of conservation and beneficiation followed by agglomeration of beneficiated fines.

To push growth and for sustainable development of the Iron Ore Industry, the availability of quality raw material is unavoidable. It is therefore imperative to address timely execution of the following aspects by the Industry:

5.1 SHORT TERM MEASURES

(i) Preparation of feasibility of mining of the several small/low-grade deposits already identified and proved earlier, needs to be ascertained in view of enhanced requirement and deployment of appropriate beneficiation technology.

(ii) Immediate processing of sinter fines (classifier underflow) being used for sinter making by ISPs, for making of quality sinter grade material production (reduction of alumina), after deployment of appropriate beneficiation technology.

(iii) Immediate utilisation of available stacked fines (-10/6 mm) in non-captive sectors and slimes (-100 mesh) impounded in the tailing ponds of iron ore washing plants and stacked sub-grade/marginal grade ore through deployment of appropriate beneficiation technology.

(iv) Improving the processing capacity of existing beneficiation facilities to produce quality product.

(v) Consideration for concept of total beneficiation of r.o.m. ore at the cut-off of 45% Fe

(for quality lumps, sinter & pellet fines) to be introduced for optimum utilisation of available reserves.

(vi) Developing new mines with total beneficiation facility.

(vii) Exploration of low-grade iron ores associated with high-grade types within the existing mine/lease area.

(viii) Augmenting sintering plant capacity by Integrated Steel Plants.

(ix) Contemplating pelletisation facility by ISPs and non-captive sectors to accommodate additional concentrate generated from beneficiation of low-grade ores, fines & slimes.

(x) Augmenting existing pelletisation plant capacity in non-captive sector.

(xi) Encouragement for use of pellets in DRI units (coal-based) and thereby discontinuance of liberal use of high-grade lumps.

5.2 LONG TERM MEASURES

(i) Convert the existing hematite resources into reserve by detailed exploration followed by feasibility.

(ii) Exploring the possibility of persistence of iron ore (hematite) at depth. (Beyond 50 meters or from existing pit bottoms of large working mines of hematite).

(iii) Exploration in freehold area within known iron ore belts. Most of the freehold areas within iron ore belts not been explored so far owing to lack/absence of iron ore exposure/outcrop need to be explored. Besides, ideal lease/relinquished areas may be thoroughly assessed by drilling as well as within lease area.

(iv) Exploration of low-grade ores (hematite & magnetite) in the country, other then mining area needs to be put on the fast track.

(v) Evolving suitable mining technology to exploit magnetite ore which are mostly occurring in the environmentally and ecologically sensitive areas of the Western Ghat region of the country.

(vi) Exploring beneficiation potential of hematite resource namely banded iron formation which is basically banded hematite quartzite (BHQ) or banded hematite jasper (BHJ) forming the base rock of the enriched iron ore deposits. This base rocks contains around 25 to 35% Fe.

(vii) Evolving of suitable technology for utilisation of goethite rich iron ore in iron making.

Beneficiation of low-grade iron ore will generate a substantial goethite rich iron reject (Fe 50–55%) which may cause huge environmental problem on account of its stacking.

Having known the reserves & resources of iron ore (hematite & magnetite), practical ratios of lumps v/s fines during mining, properties & grades of the country's ore, demand & supply of ores to domestic steel plants at present & in future etc, there is no need to have any debate over, whether Indian Industry should go for massive expansion of beneficiation & agglomeration plants or not. For protecting individual industry's as well as national interest over a long period, it will not be out of place to say that a Statutory Regulation be brought to ensure full utilisation of the mined ore which automatically will lead to adoption of latest efficient technologies of beneficiation & agglomeration.

5.3 DESIRED STRATEGIES TO ACHIEVE IRON ORE PRODUCTION TARGETS

5.3.1 Favorable Mineral Policy

Detailed review of iron ore mining leases to ensure legal, scientific and environmental-friendly mining that will ensure uninterrupted supply of iron ore/pellet to steel industry, particularly coal-based sponge iron industry, which is totally dependent on raw material from merchandise mines. Sponge iron will play a key role in the development of steel sector and the industry is very well placed to meet the fast growing demand of metallics. Sponge iron is the substitute for steel melting scrap. Scrap availability is getting difficult and the coking coal reserves are limited. Therefore, steel industry has to depend heavily on sponge iron for the supply of metallic in future.

5.3.2 Expeditious Renewal & Grant of Mining Leases

The present procedures for grant of RP/PL/ML are cumbersome. Time for grant of ML is about 7-8 years involving clearance from about ten odd agencies. Policy towards expeditious disposal of ML should be in place.

5.3.3 Grant of Forest & Environmental Clearances in Fixed Time Frame

Most of the iron ore deposits/occurrences are located in areas under forest cover, and therefore receipt of grant of clearance from forest and environmental-related concerns is unavoidable. For exploration and exploitation of such deposits located in forest areas, clearance from Environment & Forests Department should be obtained within stipulated time fram in order to hasten the processes of augmentation of resources of iron ore.

5.3.4 Development of Large Mines with State-of-the-Art Technology

Encouragement for introducing state-of-the-art technology and scientific approach towards development of large mine is an essential prerequisite. Besides, large scale mining, beneficiation and agglomeration have to be given the much-needed impetus.

5.3.5 Encouragement for Creation of Beneficiation and Agglomeration Facility

Provide incentive for beneficiation (value addition), pelletisation & sintering. The present facility in the country for processing & utilisation of beneficiated fines through agglomeration are highly inadequate in non-captive sector in particular, leading to export of large amount of fines. Creation of beneficiation facility by the small and medium size entrepreneurs is difficult as it is capital intensive. In almost all the major iron ore belts, adjacently located small mines can form some sort of syndicate for their beneficiation needs based on the concept of custom mill. Similar, efforts can also be made by them for utilisation of the produced beneficiated concentrate by creation of pelletisation facility. In order to encourage such capital intensive project, Govt. should make available necessary infrastructure viz., land, power, fuel (coal), water requirement etc, at the subsidised rate, reduce the royalty for pellet making industry and waive-off import duty for imported technology and equipment required for setting up beneficiation and pelletisation facilities. These in the long run not only mitigate problems associated with stacking of these fines but also conserve the limited high-grade lump ore reserves.

5.4. FUTURE SCOPE OF IRON ORE EXPLORATION

CGPB Committee-I in their Base Document (draft) on ferrous minerals identified following areas for exploration of low-grade iron ore in India. They are,

Orissa	:	**Bonai-Keonjhar belt, Tomka-Daitari and Umerkote belt.**
Jharkhand	:	**All major high grade ore deposits contain low grade lateritic ores.**
Karnataka	:	**Bhagalkot, Tumkur and Chitradurga districts.**
Maharashtra	:	**Sindhudurg, Gadchiroli (Surajgarh range) and Gondia districts.**
Chhattisgarh	:	**Siliceous hematitic ore (55–60% Fe) and lateritic hematite ore (45–55% Fe) in all 14 deposits of the Bailadila range, Dantewara district.**
Andhra Pradesh	:	**Cuddapah, Kurnool, Karimnagar, Adilabad and Guntur districts.**