

A Report on Workshop on Threshold Value of Minerals for Eastern States Organized by Indian Bureau of Mines, Ministry of Mines, Government of India at Noamundi, Jharkhand

1.0 Introduction:

Indian Bureau of Mines is a subordinate department under the Ministry of Mines, Govt. Of India and is responsible to ensure scientific and systematic mining, conservation of minerals, protection of Environment in ‘major’ minerals in the country. To ensure the conservation of minerals, Indian Bureau of Mines has initiated various measures, issued guidelines and also carried out Research and Development studies for utilization of low grade minerals. Recognizing the importance of “today’s waste is tomorrow’s wealth”, Indian Bureau of Mines is notifying ***Threshold value of Minerals (THV)*** from time to time for important minerals.

Threshold value is a cut off value below which mineral obtained after mining can be discarded as waste. The first notification of Threshold value of minerals was issued by Indian Bureau of Mines in 1990. Subsequently Indian Bureau of Mines has revised the Threshold values in October 2009. Since last notified THV in 2009, many representations have been received from various mining companies and stake holders requesting Indian Bureau of Mines to review and revise the threshold value of minerals. Therefore Indian Bureau of Mines decided to hold five workshops across the country to take stock of the situation and assess the stake holder’s view through deliberations. Second such workshop for eastern states comprising Orissa and Jharkhand was organized at Noamundi Iron ore Mine of Tata Steel Limited, Jharkhand on 21.08.2017 in respect of Iron Ore and Manganese ore.

2.0 Inaugural session

2.1 Shri. Pankaj Kumar Satija, General Manager (OMQ), Tata Steel Limited in his welcome address emphasized the importance of Iron & Manganese ore in Odisha and Jharkhand region which shares bulk volume of iron and manganese ore being mined in India. He highlighted the current scenario of iron ore business, cost and grade constraints, storage issue with sub grade, wastes and tailings in leasehold areas, the difficulties being faced in beneficiation and utilization of low grade iron ores by the companies.

2.2 Shri Chanakya Chaudhary, Group Director, CCRA, Tata Steel Ltd., highlighted the need for redefining the threshold values for Iron and Manganese ores considering practical aspects for arriving at an optimum solution in proper utilization of natural resources. Shri Chaudhary suggested that threshold value may be fixed region-wise based on ore characteristics in various part of the country, their economic viability, end-use and available technology for economic mining.

2.3 Shri Ranjan Sahai, Controller General, IBM elaborated the need of debating on redefining the threshold value on the basis of demand-supply chain,

economics, research and development and related environmental issues. He highlighted the various actions being taken by IBM in-recent past including online review mechanism of Mining Plan and various returns submitted by lessee. He emphasized on the greater requirement and being vigilant over the correctness of all data being furnished in all types of returns and in filling application of Star Rating for mines. He informed that IBM is already working on the process of setting road map for re-allocating expiring leases after 2020 for which mechanism of backward calculation has been brought in for assessment of remaining resources. A need of exploration for upgrading resource was also highlighted. Shri Sahai emphasized on application of technology in evaluation methodology for enforcing regulations as per law so that uniformity is maintained in all inspections and reviews.

2.4 The Inaugural session concluded with the vote of thanks proposed by Shri A Nandi RCOM Ranchi.

3.0 Technical Session

3.1 Shri S K Adhikari, Chief Mining Geologist, IBM in his presentation highlighted the background and journey of defining the threshold limits for minerals started first in 1990 and that got redefined in 2009. He also shared the resource base of hematitic ore as on 2015 with respect to 2005 for India on cumulative and also for eastern states of India. Shri Adhikari informed the gathering about the suggestions received from the recent (July 2017) workshop on threshold value at Goa for southern states. Shri Adhikari also touched upon the threshold value for manganese ore and resource base compared between 2015 and 2005.

3.2 Dr. Dilip Ranjan Kanungo, Superintending Officer (Ore Dressing), IBM made presentation on Results of beneficiation studies on iron ore of Eastern India sector. Results of case studies were shared for iron ore samples (mostly low grade ore) collected from different mines in Odisha and Jharkhand with average iron value varying from 49.7% to 58.3%. The beneficiation testwork indicated that different types of ore responds differently and desired grade (61.1% Fe to 64.5% Fe) enhancement is achieved at different yield (22.6wt% to 63.5wt%) at various adopted beneficiation processes. Dr. Kanungo also detailed about the mineralogical studies carried out on the iron ore samples in understanding modal abundances and liberation characteristics. The presentation also shared the beneficiation studies carried out for the recently auctioned blocks from Keonjhar and Sundergarh district of Odisha. Dr. Kanungo emphasized on the need for detail understanding of petro-mineralogical studies, mineral phase associations to understand the beneficability of any ore. He also highlighted on the issue of poor response of iron ore having greater association of kaolinite and gibbsite. During the presentation, Shri Arun Kumar from SAIL expressed the concern of low yield % in most of the cases which may not be economically viable and create problem in handling of huge generation of waste.

3.3 Shri Asim Chatterjee from Tata Steel Limited elaborated the iron ore resource base and their geographic distribution in India, nature of iron ore (magnetite, ferruginous and siliceous hematite) and their relative abundance in India in his presentation. The presentation also threw light on the iron ore production scenario in current years and growth projections along with present consumption pattern (lump:fines ratio) and grades of iron ores by various steel plant of India. He highlighted the characteristics of different hematitic iron ore types found and being mined in India and emphasized the reason of poor response of beneficiation of iron ore of eastern regions for the states of Jharkhand and Odisha. Two case studies were also shared to understand beneficiation aspects of low grade iron ore from the mines of Tata Steel Limited. The test work indicated that grade can be improved to around 62%Fe at very finer grain size at around 32% yield. The presentation concluded that at lower yield, low grade iron ore in the range of 50-58% shows response to beneficiation but processing of iron ore with 50 % Fe content is extremely difficult. It was emphasized that gangue mineral plays an important role in iron ore beneficiation and beneficiation of low grade iron ore will have greater difficulties for waste and tailing disposals. Hence a consideration of alumina content in iron ore was suggested to define the threshold value for the iron ores of eastern states of India. Tata Steel proposed that at the current threshold value of 45% Fe and cut-off value of 10% alumina may be considered for better management of natural resource. During the panel discussion, Shri Abhijit Sen from Rungta Mines highlighted the concern of poor response of beneficiation of such low grade iron ores with respect to low yield% and considering environmental issue with respect to mining and stacking where there is space constraint in mines. Shri Sen proposed that it would be appropriate that along with introducing alumina% in re-consideration of threshold value for iron ores of eastern states, the iron value may be revised from present 45% to 50%.

3.4 Shri Arun Kumar from Steel Authority of India (SAIL) in his presentation highlighted the environmental issues that get exaggerated while mining and beneficiating low grade iron ores of Eastern India. He emphasized on the need for fine grinding the ore for liberation and transporting the same for pelletisation which will have adverse impact on environment. He emphasized that at present there is no such plant scale beneficiation being practiced in eastern part of India with low grade ores due to its inherent characteristics and poor response to beneficiation processes. Shir Kumar also indicated that India at present amongst other major steel making countries uses higher alumina (~2.5%) burden which impact on overall productivity and cost with higher consumption of coal and coke where Indian steel industry is highly dependent on high cost imported coking coal. Considering the constraints over difficult beneficiation characteristics of iron ores from Eastern India, SAIL proposed to upgrade the threshold value of iron ore to about 50-55% Fe with considerations of alumina and silica.

3.5 Shri Indrajeet Mukherjee from Rungta Mines Limited in his presentation highlighted of production percentage of different grades of iron ore that are being produced and dispatched from Joda and Koirala sector of Odisha. The analysis of data indicate that bulk of the iron ore produced and despatched from this sectors in recent

years (2015-16, 2016-17) are having iron value of >62%. This very fact highlighted that there is no such market for iron ore having Fe content below 55%. Shri Mukherjee also highlighted that for proper stacking of non-marketable subgrade ore, it requires sufficient area within the lease which is the biggest concern. Result of test work done with ores from mines of Rungta Mines Ltd. indicated that with feed grade of 55.7% Fe and at 47.6% yield the iron ore product could be upgraded to 61.04% Fe. The associated issues with beneficiation of low grade ore was also highlighted where handling and disposal of tailings in the mine premises is a greater challenge with impact on environment. Considering present market scenario with lower price of iron ores, Rungta mines submitted their views for revision of the threshold value for iron ore of Jharkhand and Odisha at 55% Fe.

3.6 Shri Rajeeb Kumar Mohanty of Tata Steel Limited discussed on the genetic varieties of different types of manganese ore that are found in India. He also highlighted the general methods for beneficiation of manganese ore being practiced in India. Details of mineralogy and chemistry of manganese ore with regards to Joda sector of Odhisa was highlighted. Shri Mohanty emphasized on the generic strategies for beneficiation of low grade manganese ore issues with use of low grade manganese ore in manganese alloy production. It was brought to the notice that, the complexity in mineralogy of manganese ore, its gangue iron associations for manganese ore of Joda region imposes a greater challenge on the beneficiation of low grade manganese ores due to similar density and magnetic property as of associated hematitic iron contents. Result of test work on understanding beneficability for low grade manganese ore was detailed during the presentation. The test work was performed with a head grade of 18.79% Mn collected from subgrade stockpile at -10mm size. The test work could upgrade the ore to 29.53% Mn at a yield of 31%. Such low grade product cannot be used directly for production of manganese alloys. Another beneficiation study was carried out with relatively higher head grade at around 26.7% Mn and at 1.2 Mn/Fe ratio. The test work revealed that coarse magnetic separation was not possible, through crushing and followed by magnetic separation and wet processing for removal of slime could able to upgrade around 11.4% Mn with an improved 1.4 Mn/Fe ratio. Even at this up gradation concentrate could be achieved to 38% Mn which still do not meet the required min 45% Mn for ferromanganese plants for end use. Above these, Sintering & briquetting is required to utilize these fines for use as feed in the furnace by mixing with high grade manganese ore, which further increases the cost of the production. Shri Mohanty also indicated relative breakups of subgrades and overburden in Joda area for Mn below 25%. This shows about 90% ore material (wt%) is overburden with Mn below 10% with rest only 7% lies in the range of 10-20% Mn and only 2% contributes to 20-25% Mn. This was further emphasized that among the major producers of manganese ore, India at present produces lowest grades of manganese ore having 10-54% Mn content. Only China has kept lower limit of Manganese ore at 20% Mn. All other countries have kept lower limit of Manganese ore for their use greater than 20%. No other country is maintaining threshold value of 10% Mn except India. Considering the difficulty in beneficiation aspects of manganese ore of

Joda region, Tata Steel proposed to reclassify threshold value for ferruginous Mn ore of eastern region at 20% Mn with a consideration of Mn/Fe ratio.

4.0 Points of open discussions at the end of the presentations

4.1 By Shri Alok Tripathi (CSIR IIIMT-Bhubaneswar)

Shri Tripathi informed the gathering about the recent study being carried out for slime beneficiation and success achieved with samples from a Nigerian company by reduction roasting and magnetic separation which could able to upgrade low grade ore to +64% Fe at around 52-56% yield which can be made usable by pelletizing routes. Responding to this, Shri A K Mukherjee from Tata Steel Limited and Shri A Sen from Rungta Mines Ltd. and Dr T C Ananda from Gua Mines, SAIL indicated that Indian steel plants are designed to take mostly hematitic ore with very limited scope for use of magnetite (natural or converted). It was also emphasized that only a certain percentage of pellets can only be accommodated in the blast furnace burdens for steel making.

4.2 By Shri Kumarswamy (Thriveni Earthmovers Pvt. Ltd)

Shri Kumarswamy opined that the moment threshold value of Iron Ore is increased from 45% to 50% or 55%, the equal quantity will become waste. In the eastern sector almost all the mines are in operation and no pit is ready for back filling. Hence the waste also has to be stacked as it is. Therefore, he proposed to continue with the existing system for another decade which will not give any adverse effect on the industry.

4.3 By Shri V Srinath, Joint President (Essel Mining & Industries Limited)

Shri Srinath emphasized on bringing up the threshold value close to present usable grade which will help in better utilization of subgrades by blending.

4.4 By Shri Pradipta Mahapatra (Thriveni Earthmovers Pvt. Ltd)

Shri Mahapatra debated on the scope for developing mechanism for setting up mine-wise threshold value considering grade and tonnage available for mining from individual leaseholds.

4.5 By Shri Sourabh Kumar Sahu (Sirajuddin Mines) & Shri Satish Mohanty (Aryan Ispat& Power (P) Ltd.)

Considering the beneficiation difficulty and cost factor in use of low grade ore, Shri Sahu and Shri Mohanty proposed to modify the threshold value for iron ore of eastern region to 55% Fe.

Finally, **Shri Parag M Tadlimbekar, Suptdg. Mining Geologist IBM Nagpur** summed up all the presentations and deliberations and thanked all the participants for their valuable contribution in the workshop.

The list of participants is enclosed as annexure.

ANNEXURE**LIST OF PARTICIPANTS FOR THRESHOLD VALUE WORKSHOP FOR IRON AND MANGANESE****HELD AT NOAMUNDI, JHARKHAND ON 21ST AUGUST 2017**

S.NO.	NAME	NAME OF MINES / ADDRESSES
	S/SHRI	
1.	RANJAN SAHAI	CONTROLLER GENERAL, IBM
2.	S.K.ADHIKARI	CHIEF MINING GEOLOGIST,IBM
3.	A.NANDI	RCOM,IBM,RANCHI
4.	CHANAKYA CHAUDHARY	GROUP DIRECTOR, TATA STEEL
5.	PANKAJ KUMAR SATIJA	GENERAL MANAGER, TATA STEEL
6.	K.K.SAHOO	M/S PENGUIN TRADING & AGENCY LTD.
7.	R.P.MONDAL	BARSUA IRON MINES M/S SAIL
8.	S.N.BISWAS	GHATKURI IRON ORE MINE M/S OMML
9.	MANAS PATRA	PATMUDA MANGANESE MINES KOIRA
10.	PRABHAT KUMAR JHA	PATMUDA MANGANESE MINES KOIRA
11.	P.M.TADLIMBEKAR	IBM, NAGPUR
12.	DR.V.G.K.BHAGVAN	IBM, NAGPUR
13.	T.K.SONARKAR	IBM, NAGPUR
14.	A.D.GUPTA	IBM, NAGPUR
15.	H.N.SINGH	SARDA MINES PVT. LTD.
16.	SUNIL K SINGH	SARDA MINES PVT. LTD.
17.	DR.B.NAYAK	CSIR-IMMT, BHUBANESWAR
18.	P.MOHAPATRA	THRIVENI EARTH MOVERS PVT. LTD.
19.	S.S.NAYAK	O.M.C.LTD. (KHANDADHAN)
20.	SUSANTA MAHARANE	KISA, GUALI
21.	DR.INDRANIL SAHA	NRD, JAMSHEDPUR
22.	S.S.SHAH	MIOM
23.	ASHRAM KUMAR	MIOM, SAIL
24.	ARUN KUMAR	GUA, SAIL
25.	L.N.GHANA	O.M.C.BARBIL
26.	NISHIKANTA SAMAL	BPJ MINES, OMC LTD.
27.	D.N.PARIDI	RUNGTA MINES, BARBIL
28.	K.S.CHAUHAN	BOLANI ORES MINES RMD SAIL
29.	D.K.MANANTA	RUNGTA MINES LTD., JAJANG
30.	P.C.NAIK	BOLANI, SAIL
31.	A.K.MUKHERJEE	R&D TATA STEEL, JSR
32.	H.MAZUMDER	RUNGTA MINES LTD.
33.	B.K.JHA	RUNGTA MINES LTD.
34.	RAMASHISH KUMAR	USHA MARTIN LTD.
35.	B.P.KARKETTA	IBM, RANCHI
36.	R.K.SOHNİ	IBM, RANCHI
37.	DEBASHIS JENA	OMQ, TSL, JODA
38.	A.DUTTA GUPTA	P.G.MANGANESE MINES JODA
39.	DR.KHAGERWAR MAHANTE	ESSEL MINING & IND. LTD.
40.	V.SRIKANTH	ESSEL MINING
41.	AMIT SHARMA	KIM

42.	RAJAN K	NIM
43.	RAHUL KISHORE	KTM
44.	DIPAK BEHERA	TATA STEEL
45.	DEEPAK SHRIVASTAVA	TATA STEEL LTD.
46.	AMARESH SAMANTA RAY	AMTC PVT. LTD.
47.	N.K.S RAO	TATA STEEL LTD.
48.	RAHUL BHADRE	THRIVENI
49.	D.P.CHAKRABARTY	TATA STEEL
50.	NABONITA DAS	TATA STEEL
51.	S.K.JHA	GPCL
52.	RAJEEV KUMAR	TATA STEEL LTD.
53.	K.RAMAKRISHNA	TATA STEEL LTD.
54.	A.K.THAKUR	TATA STEEL LTD.
55.	PRAKASH KUMAR	SMT.DEVIKABAI VELSI
56.	SANTANU PANIGRAHI	NOAMUNDI, TATA STEEL
57.	ABHAY	TATA STEEL
58.	SHEKHAR PRASAD	TATA STEEL
59.	R.L JOSHI	TATA STEEL
60.	BIJAM BISWAS	TATA STEEL
61.	V.J.OUSPAALUM	TATA STEEL
62.	VIVEK .AGRAWAL	TATA STEEL
63.	RAJNISH KUMAR	TATA STEEL
64.	S.GHOSH	SUPER SMELTERS LTD.
65.	YASWANT KUMAR	PATMUNDA MANGANESE MINES OMM LTD., KOIRA
66.	A.C.MAJHI	M/S OMM LTD.
67.	ANIRBAN CHATTERJEE	NIM
68.	BIPLAM KUMAR MAHATO	NOAMUNDI
69.	T.C.SEI	S.N.MOHANTY GROUP OF MINES
70.	ARINDAM GHOSH	NOAMUNDI
71.	PALLAVY MARIYAM VARGHESE	NOAMUNDI
72.	S.N.RANA	SARDA MINES PVT. LTD.
73.	A.K.CHOUDHARY	K.N.RAM & CO.
74.	ALOK TRIPATHY	CSIR-IMMT,BHUBANESWAR
75.	GULSHAD KHAN	SERAJUDDIN MINES
76.	P.K.SAHA	OMC LTD, KOIRA
77.	MOHAMMAD KAIF	INDRANI PATNAIM MAHAPARVAT MINES
78.	S.D.PAHARI	SAIL, MIOM
79.	J.PRASAD	SAIL, MIOM
80.	ASIM CHATTERJEE	TATA STEEL
81.	DR.T.C.ANANDA	GUA MINES-SAIL
82.	MAJOJ KUMAR SETHY	M/S OMC LTD.
83.	RITANJALI BEHERA	M/S OMC LTD.
84.	ARUN BALBANT ROY	M/S OMC LTD.
85.	JOYDEV CHATTOPADHYAY	SAIL, BOLANI ORES MINES
86.	V.KONKA	RUNGT A MINES LTD.
87.	S.N.JHA	TATA STEEL LTD.
88.	ABHIJIT SEN	RUNGT A MINES LTD.

89.	DR.SAROJ KUMAR DASH	RUNGTA MINES LTD.
90.	MANORANJAN NATH	USHA MARTIN LTD.
91.	M.MUKHERJEE	TATA STEEL
92.	PRAFULLA PARIDA	ESSEL MINING
93.	BIKASH RANJAN NAYAK	M/S GONS (P) LTD.
94.	ABHAY KR.GUPTA	TATA STEEL
95.	BISWAJIT DUTTA	NOAMUNDI TATA STEEL
96.	MANISH KUMAR	NOAMUNDI TATA STEEL
97.	SATISH MOHANTY	IRON & MANGANESE MINES, AMTC
98.	S.SHEKHAR	TATA STEEL LTD.
99.	D.K.CHOUDHARY	O.M.C.LTD.
100.	A.P.MOHAPATRA	O.M.C.LTD.
101.	I.V.MALLICK	M/S ANIL KHIRWAL NOAMUNDI IRON ORE MINES
102.	PANDE	NOAMUNDI MINES
103.	SANJIT ADHYA	NOAMUNDI MINES
104.	BIKRAM KUMAR
105.	S.S.MISHRA	JODA WEST
106.	B SAHOO	SUPER SMELTERS LTD.
107.	PRAVEEN KUMAR	
108.	AWNISH KUMAR	TATA STEEL
109.	B.K.KUMAR	OMML
110.	DEEPAK KUMAR ACHARYA	KAYPEE ENTERPRISES, BARBIL
111.	MANAS KUMAR SAHU	DALPAHAR IRON & MANGANESE MINE
112.	DR.MANOJ KUMAR	SAIL
113.	ATUL BHATNAGAR	TATA STEEL
114.	RAJEEB K.MAHANTY	TATA STEEL
115.	D.MANOHARAN	OMC LTD., BARBIL
116.	G.K.BEHERA	OMC LTD., BARBIL
117.	KAMAL BHASKER	SAIL, BOLANI ORES MINES,
118.	DR.D.R.KANUNGO	IBM, NAGPUR
119.	INDRAJIT MUKHERJEE	RUNGTA MINES LTD.
120.	K.K.NANDA	G.P.C.L
121.	S.K.BUYAN	TATA STEEL
122.	G.KUMARA SWAMY	THRIVENI
123.	Y.R.OBALESH	TEMPL
124.	C.BEHERA	TATA STEEL
125.	SANJAY KUMAR	SMPL THAKURANI IRON ORE MINE
126.	SOURAV KUMAR SAHU	S & CO BALDA BLOCK IRON MINES
127.	BHABANJ CHALEMA	S & CO BAKA BLOCK IRON MINES
128.	DINESH PATRA	TATA STEEL LTD.
129.	BRAJ BINOD KUMAR	TATA STEEL LTD.
130.	TOAMEIR SHABID	TATA STEEL LTD.
131.	D.BANAJI	TATA STEEL LTD.



Distinguished Guests on the Dias from left Shri Anupam Nandi, Regional Controller of Mines, IBM, Shri S K Adhikari, Chief Mining Geologist, IBM, Shri Ranjan Sahai, Controller General, IBM, Shri Chanakya Chaudhary, Group Director, CCRA, Tata Steel Ltd., Shri Pankaj Kumar Satija, General Manager (OMQ), Tata Steel Ltd.



Lightening the lamp by the Guests

Speakers and Presenters of the Workshop



**Shri S K Adhikari,
Chief Mining Geologist
IBM**



**Dr. D R Kanungo,
Superintending Officer
(Ore Dressing), IBM**



**Shri Asim Chatterjee
Tata Steel Limited**



**Shri Arun Kumar
SAIL**



**Shri Indrajeet Mukherjee
Rungta Mines Limited**



**Shri Rajeeb Kumar Mohanty
Tata Steel Limited**



**Shri Parag Tadlimbekar
Superintending Mining Geologist
IBM**



Participants in the Workshop

Participants interacting in the Workshop

