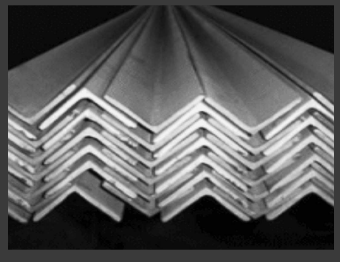
Government of India
Ministry of Mines
INDIAN BUREAU OF MINES

IRON & STEEL

IRON & STEEL
VISION-2020



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PREFACE

The growth in the Indian Iron & Steel Industry is nothing but staggering. Iron & Steel industry's exponential growth particularly in the past decade is attributable to factors, such as, strong global demand and buoyant domestic scenario. These favourable prospects have led the Ministry of Steel to project steel production of the country to be around 180 million tonnes by the year 2019-20, a threefold rise from the present level of 65 million tonnes (2009-10). To meet such ambitious target in steel making several of the Industry's key concerns, viz. increasing raw material insecurity, constraints in creation of new projects, expansion of existing projects and infrastructure bottlenecks need to be prioritised and addressed.

Taking cognisance of issues at hand in relation to the Iron and Steel Industry and owing to the magnitude of attention that iron and steel could attract, the Ministry of Mines, Govt. of India, entrusted Indian Bureau of Mines to conduct a relook on policy orientation on the basis of techno-economical parameters and all other parameters with respect to availability of reserves, environment, expansion of technical know-hows etc. Born out of such imperatives is this comprehensive book entitled "Iron & Steel—Vision 2020" that aims at revisiting a whole gamut of interconnected issues that exists and confronts the Indian Steel Industry in all its strata from Mines to Metals. This publication endeavours to cover the status of each specific type of industrial units of iron in the country in detail, covering all aspects, viz. iron ore resources & exploitation, beneficiation & agglomeration and Iron & Steel making processes and in furtherance identify the gap areas in all the concerned units in the Sector so as to devise modus operandi to achieve optimum utilisation of available iron ore reserves and augment standards in order to meet the set national goal in steel production.

The dependence on the iron ore, namely, haematite for steel making in the country presently is far too high. Haematite being high-grade and lumpy in nature easily meets the specifications for steel manufacturers. However, increased dependence on haemetite – 45% of iron ore lumps (haemetite) are utilised in India for steel making as opposed to 15–20% used globally – has engendered its short supply and the country is staring at diminishing prospects of availability of high-grade lumpy haematite ore. Increasing the life of the reserves have become an essential imperative and is vital for sustenance and progress of the country's economy. To ensure adequate and prolonged availability of raw material, critical measures for utilisation of low-grade ore, use of stored slimes in tailing ponds and exploration of new deposits must be exhorted. The fragile nature of sizeable Indian iron ore with the present proportion of lumps to fines used in the country being around 2:3, axiomatically leads us to believe that large chunks of fines either are unutilised or are exported. This trend needs reversal, utilisation of fines must be encouraged and for this beneficiation followed by agglomeration is the need of the hour.

Every effort to collect, assimilate and incorporate actual data from the industry was pursued to authenticate the facts reflected in the book. Questionnaires were circulated to all concerned parties and one Workshop on Agglomeration was also conducted to acquire data. Besides, views of eminent personalities in the respective field of specialisation were also carefully studied and integrated to widen the scope and comprehensiveness of this title. In-house R & D works on beneficiation of various types of iron ore across the country carried out at IBM's Ore Dressing Laboratories and flow sheets thus developed have been interspersed at relevant portions. These flow sheets could provide the much-needed roadmap for likely process routes of beneficiation of iron ore (area and character specific) in the country.

Centric on a gamut of technical insights especially on the need of enhancement in iron ore reserves; value addition/beneficiation of low-grade ores, fines & slimes; development of agglomeration activities especially pelletisation of beneficiated fines; use of pellets in iron making specially coal-based DRI units and integrated steel plants; conservation of limited high-grade iron ore lumps; etc., this book attempts to steer a pathway to the future and that which could lead the country's Iron & Steel prospects into a realistic dimension of growth.

The prelude to the origination of this publication is the persuasion and guidance of Shri S. Vijay Kumar, Secretary to the Govt of India, Ministry of Mines, who was ever insistent that the data on iron & steel amassed during the course of the Study be transformed into a publication for public consumption. Indian Bureau of Mines owes profound gratitude to the Secretary (Mines) for his invaluable counsel and direction.

Coalescence of dedicated minds and integration of efforts from teams of Bureau's officers especially from Ore Dressing Division and Publication Section have made this publication a reality that it is today. It would be unfailing on the part of the Bureau if the stupendous contribution of Shri A.T. Sutaone, Retd Suptdg Officer (Ore Dressing), IBM, whose astuteness and expertise in shaping the contents of this publication is not recognised and due indebtedness to him is not conveyed.

It has been our persistent effort, over the years, to evolve, moderate and implement strategies for development of Mineral & Mines Sector, this publication is one small step in that direction. It is believed that this publication will find interest and acceptance among all those Policymakers, Regulatory Agencies & Consultants who are associated and connected to this discipline of study and are concerned with the development of the country's Mines & Mineral Sector.

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Vast bodies of prevalent and existent information that have connection with the object of study in this publication were resourced and consulted during the course of the preparation of the publication. Plenitude of published and unpublished reports of Geological Survey of India (GSI), Central Geological Programming Board (CGPB) Committee-I and Central Pollution Control Board (CPCP) have had their share in formulation and manifestation of the technical details reflected in the publication. The Bureau is grateful to each one of these Source Agencies and would place on record its profound indebtedness and appreciation.

Contribution of in-house Divisions of Indian Bureau of Mines viz. Mines Control & Conservation of Minerals (MCCM) Division, Mining & Mineral Statistics Division, Mineral Economics Division, Mineral Map Cell, Ore Dressing Division and Publication Section besides efforts of several in-house experts have been instrumental in the evolvement of the publication from its nascent stage to what it is today. Every modicum of contribution received is worthy of praise and is thankfully acknowledged.

ABBREVIATIONS

A

ABC	After Burner Chamber
ACCAR	Allis Chalamers Controlled Atmosphere Reactor

B

BF	Blast furnace
BHJ	Banded Hematite Jasperite
BHQ	Banded Hematite Quartzite
BIF	Banded Iron Formation
BMQ	Banded Magnetite Quartzite
BOF	Basic oxygen furnace

C

CGPB	Central Geological Programming Board

D

daN/pellet	Deca newton per pellet
DHIMS	Dry high intensity magnetic separators
DR	Direct reduction
dR	Degree of reduction
DRC	DAVY Reduction Corporation
DRI	Direct reduced iron
DSC	Dust Settling Chamber
DTA	Differential Thermal Analysis

E

EAF	Electric arc furnace
EPMA	Electron Probe Micro Analyzer RINL
ESP	Electrostatic Precipitator

G

GCT	Gas Conditioning Tower
GOI	Government of India
GSI	Geological Survey of India

H

HBI	Hot briquetted iron
HGMS	High Gradient Magnetic Separators
HMC	Heavy- Media Cyclone
HMS	Heavy- Media Separation

I

IBM	Indian Bureau of Mines
IF	Induction furnace
ISO	International Organisation for Standardization
ISP	Integrated Steel Plants

K

kWh	Kilowatt hour
KIOCL	Kudremukh Iron Ore Co. Ltd,

L

LD	Linz and Donawitz

M

MML	Mysore Minerals Ltd.
MoS	Ministry of Steel
MOU	Memorundum of Understanding
MSP	Mini Steel Plants
mm	Milimeter

N

NMDC	National Mineral Development Corporation

O

OMC	Orissa Mining Corporation
OMS	Output per man shift
O/F	Overflow
O/S	oversize
OSIL	Orissa Sponge Iron Limited

R

RDI	Reduction Degradation Index
RHF	Rotary Hearth Furnace
Rashtri	ya Ispat Nigam Limited

S

SR	Smelting Reduction
SAIL	Steel Authority of India
SIIL	Sponge Iron India Limited

T

TPD	Tonne per day
TDR	TISCO Direct Reduction
TISCO	Tata Iron & Steel Company
TPH	Tonne Per Hour

U

U/F	Underflow
UMSP	Ultra mega steel projects
UNFC	United Nations Framework Classification
UHP	Ultra High Power

W

WHIMS	Wet high intensity magnetic separators (Electric)
WLIMS	Wet low intensity magnetic separators
WMIMS	Wet medium intensity magnetic separators

X

XRD	X-ray Diffraction

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