




IIM
Metallurgy
Materials Engineering

Summary and Recommendations

of

International Conference

on

MINERALS AND METALS AND THEIR CONTRIBUTION TO MAKE IN INDIA

10th to 12th August 2016

Organised by

The Indian Institute of Metals-Delhi Chapter

and

Summary of the

11th International Exhibition

10th to 12th August 2016

By

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FOREWORD

The MMMM 2016 event comprising International Exhibition and concurrent Conference was held at New Delhi from 10th to 12th August 2016.

I am very happy to state that the Technical Committee of Delhi Chapter of The Indian Institute of Metals has organised the International Conference "Minerals and Metals Sector and their contribution to Make-in-India" at Pragati Maidan, New Delhi, from 10th to 12th August 2016.

I had the occasion to interact with a number of delegates of the Conference to get their feedback about the technical papers presented at the Conference. The feedback in this regard was quite heartening. IIM Delhi Chapter has received a lot of appreciation from various quarters about the successful holding of the Conference. Needless to say that this could happen because of the tireless efforts put in by each and every member of the Technical Committee. The Committee members have done commendable job culminating in successful organisation of the Conference. My special thanks to Shri SC Suri and Shri KK Mehrotra who took a lot of pains to make the Conference a big success.

The Technical Committee has prepared a Summary of the Conference and its Recommendations.

A Summary of the Exhibition, Conference and Recommendations has been prepared.

I have no doubt that this Summary and Recommendations will be used as a useful reference document for all stakeholders of the Metals and Minerals Sector.

KL Mehrotra
Chairman, IIM Delhi Chapter

PREFACE

The 11th Edition of the Minerals, Metals, Metallurgy & Materials (MMMM 2016) was organised at Pragati Maidan, New Delhi, from 10th to 12th August 2016. The Event consisted of the Industrial Exhibition and concurrent Conference.

Thirty two technical papers were presented in the Conference. About 200 delegates from India and overseas attended the Conference. The Conference was slotted into eight technical sessions and the inaugural and valedictory sessions.

We have prepared a Summary of the Exhibition and Conference along with the Recommendations emanating from the papers presented in the Conference. The Summary of the Exhibition and Conference has been drawn up. The Summary of the Conference indicates the broad spectrum of the topics covered in the Conference. I have received immense assistance and support from all my colleagues in preparation of this document. My special thanks to Shri KK Mehrotra who took a lot of pains in formulation of the structure of the Conference and also in preparation of the Recommendations. I have no hesitation to confess that but for his total support, our Chapter would not have been able to organise this event so successfully.

It may be stated that the recommendations that have emerged from the deliberations of the Conference will require follow up action. The Recommendations are being sent to the concerned Ministries of Government of India and to the concerned public/ private sector enterprises.

It is hoped that these recommendations will act as a useful reference document for policy makers and others associated with Minerals and Metals Sector.

S C Suri

Chairman, Technical Committee

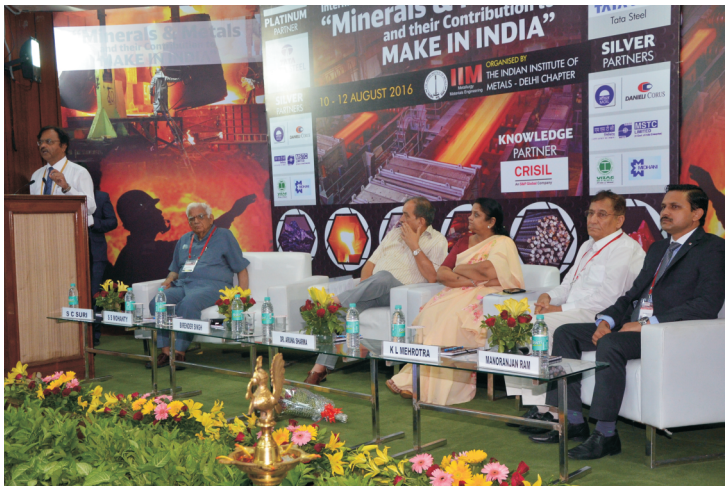
IIM Delhi Chapter

SUMMARY OF THE INTERNATIONAL CONFERENCE AND EXHIBITION

MINERALS, METALS, METALLURGY AND MATERIALS 2016

The Delhi Chapter of the Indian Institute of Metals (IIM) along with International Trade and Exhibitions India Pvt. Ltd (ITEI) has been organizing once every two years Minerals, Metals, Metallurgy and Materials (MMMM) event consisting of Exhibition and concurrent Conference in the area of MMMM. The 11th edition of this event was held at Pragati Maidan, New Delhi from 10-12 August 2016. **The Theme of the Conference was Minerals and Metals & their Contribution to Make in India.This event was co-sponsored by Ministry of Steel, Ministry of Mines, Ministry of Earth Sciences, Ministry of External Affairs, Ministry of Commerce and Industry, Ministry of Heavy Industry and Public Enterprises and Ministry of Micro, Small and Medium Enterprises besides Council of Scientific & Industrial Research (CSIR).**

The event was inaugurated by Hon'ble Minister of Steel Chaudhary Shri Birender Singh on 10th August 2016. Secretary Ministry of Steel, Dr. Aruna Sharma, also participated in the Inaugural Function as Guest of Honour.



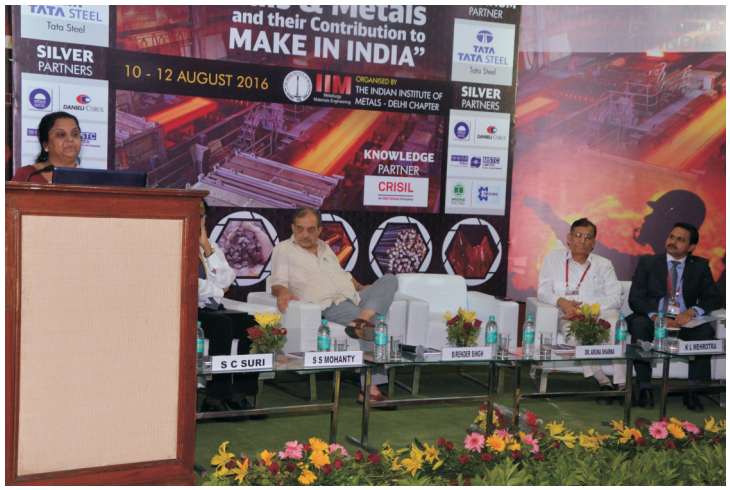
Speaking on the occasion, Hon'ble Minister of Steel Chaudhary Shri Birender Singh said that use of steel in unconventional sectors needs to be explored to increase the domestic consumption. He also spoke about focus on research and development in the Steel Sector. In this connection he stated that Govt. of India has set-up Steel Research and Technology Mission of India (SRTMI) so that India like developed countries can produce futuristic products as well. Commenting on Minimum Import Price (MIP) of steel, the Minister stated that it has been extended for two months for 66 products and Govt. of India shall review the situation thereafter.

The Minister urged for augmentation of consumption of steel. He stated that the industry must explore use of steel in sectors such as road, bridges and other industrial applications etc. so that the consumption can be increased.

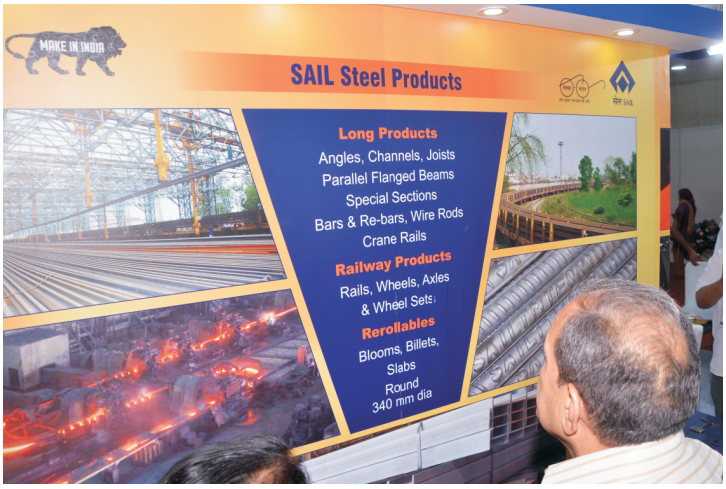
Dr. Aruna Sharma, Secretary, Ministry of Steel, delivered a Keynote Address in the Conference. In her address, Dr. Aruna Sharma stated that if we recycle 90 MT of steel from auto shredding we can save to the tune of Rs. 1.00 lakh crores worth of raw materials and this shall reduce the imports also. She also spoke about dumping of steel in the steel sector. She mentioned that MIP is a short term measure but if any country resorts to dumping of steel India will do whatever is possible to protect its interest. The only way, she stated is to mitigate the impact of low international prices by achieving operational efficiency and optimal usage of our resources. She also emphasized on the need for improving the quality of steel being produced by us. It was stated by her that Govt. of India will expect recommendations from the deliberations of this Conference.

After the Inaugural Address, the Hon'ble Minister and Secretary Ministry of Steel went around the various exhibition stalls.

About 35 countries participated in the Exhibition. Around 300 Exhibitors have put their stalls in the Exhibition and more than 15000 trade visitors visited in the three days Exhibition.



In the three days event, foreign Exhibitors and consumers from around the world were impressed with the growth of steel industry in India and were eager to explore the market.



Apart from the Inaugural Session, the Conference consisted of following Eight Technical Sessions and a Valedictory Session.

- ❖ Metal Industry Business Forum
- ❖ Existing Mineral Resources in India & its future prospecting
- ❖ Effective Utilisation of Low Grade Mineral Resources
- ❖ Competitiveness of Indian Steel Sector with respect to global scenario
- ❖ Present & Future of non-ferrous in India
- ❖ Energy, Environment of Metal Sector/Super Alloys Industry in India
- ❖ Role of Infrastructure Sector to meet the Challenges of Metal Sector
- ❖ Role of Financial Institutions in shaping future of Metal Sector
- ❖ Valedictory Session

The salient points of the sessions are as under:

1 Metal Industry Business Forum (Session – I)

This Session was conceived to elicit the views of Chief Executives with regard to long term scenario of different public and private sector steel plants on the production, expansion and marketing fronts. Shri Rajeev Singhal, Vice President, (Raw Materials) Tata Steel, Dr Vinod Kumar Nowal, Dy. MD, JSW Steel, Shri P Madhusudhan, CMD, RINL, Shri A K Tyagi, CMD, MECON, Dr. D K Likhi, CMD, Midhani, Shri Anil Anand, MD Paul Wurth and Shri Rajiv Bhatnagar, Director, Essar Steel participated in the Session.

This particular session was chaired by Shri S S Mohanty, President IIM and Former Director Technical SAIL., Dr. Sanak Mishra, Secretary General, Indian Steel Association was Moderator of this Session.

Individual CEOs expressed their view points on the expansion plans, quality issues, product details, long term scenario of the steel industry and their perspective on the growth plans of the Indian Steel Sector. The long term scenario on the Non Ferrous Sector was also discussed in this Session.

2. Role of Financial Institutions in shaping future of Metal Sector (Session II)

2.1 Presentation by Resurgent India

The presentation highlighted briefly the present scenario of Indian Steel Sector which is going to be 2nd largest producer in the world in near future. Currently Indian Steel Sector is passing through rough phase with respect to down sliding of commodity prices globally, weak demand in domestic and global market and surge in import of cheap steel from China. This has impacted economics of most of domestic steel producers and resulted in about 3 lakhs crores of NPAS of banks by steel sector alone.

The salient features of various schemes introduced for revitalizing stressed assets by Financial Institutions like 5/25 , SDR, s4A were also dealt along with some positive move like introduction of MIP by Government of India to protect domestic steel sector.

2.2 Presentation by Shailendra Ajmera, Partner, Restructuring &Turnaround Services , Earnst & Young

The presentation was made under the following four major heads.

- Indian Economy snap shots : broadly begins with the positive notes on Indian Economy vis –a vis global economy stating strong macro economic fundamentals, manufacturing led investment plans, major reforms initiated by Government for sustainable growth, strong thrust on Power, and Infrastructure Projects. Move towards digital economy and deregulation and opening up of sectors as well as impact of Make in India initiatives.

- Steel Sector Overview : covered current scenario and outlook for Indian Steel Sector, steel demand and capacity from 2007 till 2019 and variation in steel prices in the past and projected for next 3-4 years. Factors responsible for stressing domestic steel industry are excess global steel capacity, sluggish domestic demand, input issues, delay in project execution, debt sustainability, non uniform level playing field, capital intensive and cyclic in nature.

- Measures to resolve the stress: Indian banks have higher exposure to metal sector compared to global peers. Many positive measures implemented by Government to safe guard domestic steel sectors are Minimum Import Price (MIP), Safe Guard Duty, Quality Control and insolvency and Bankruptcy code 2016. Setting up of Steel Research and Technology Mission in India, SPV for capacity expansion, auction of key minerals and making of 100 smart cities are few plans at various stages of implementation to drive growth of steel sector, opening investment opportunity in mining and metal sector. Recent guidelines by Reserve Bank of India for stressed assets.

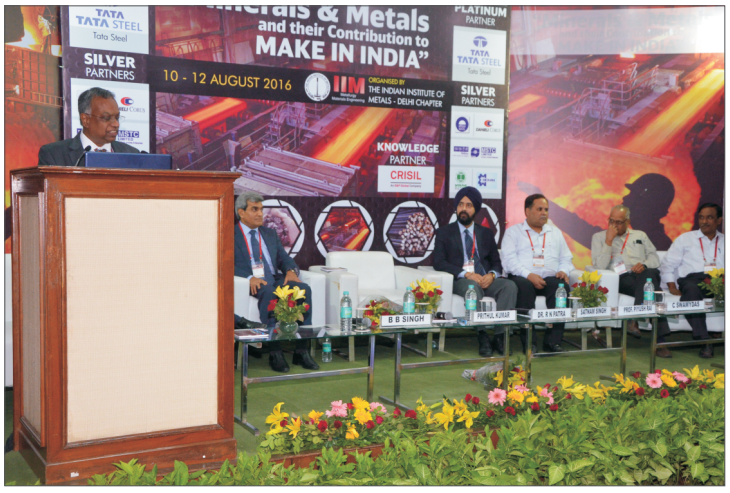
- The Way Forward from Financial Institution perspectives suggested many ideas that could help resolve the financial stress in the sector like flexible structuring scheme, approach from recover ability to operational turnaround, faster resolution of debt recovery, exploring interest rate subsidy, making procurement of domestic steel mandatory for infrastructure projects etc. .

2.3 Presentation by Shri D.R . Dogra, MD & CEO, CARE Ratings

The paper highlighted characteristics of metal industry, domestic outlook with steel demand by various sectors emphasizing demand by industrial construction and infrastructure segment. Trend in bank funding to metal sector over the last one decade, significant stress in quality of advances to iron and steel sector, credit quality, future funding requirement and policy measures taken to tackle stress advances in metal sector were discussed in details. The paper has also suggested range of proposal that how Financial Institutions can help the sector.

3 Existing Mineral Resources in India and its Future Prospecting (Session-III)

3.1 A case study on improvised blasting design in surface coal mine by Dr Piyus Rai, Department of Mining Engineering, IIT (BHU) Varanasi



The paper described various blasting schemes employed in surface mine, like standard, specialized and blasting for casting with its merits and demerits. A case study was discussed for one of the largest coal mine of India where 22-24 m high sandstone overburden was being blasted for excavation by 10m3 rope shovels with maximum digging height of 14-15 m keeping in view the importance of controlled spreading which in turn affects the excavation and digging. Modification in some existing blast design parameters were made for controlled lateral spreading / casting of muck pile in order to lower down the blasted muck by 8-10 m and also loosen it for safe and easy operation of excavators. This modification resulted in higher excavator performance by reduction in total cycle time.

3.2 Make in India opportunities with Beach Sand Minerals by C. Swamy Das, Chief Adviser & Technical Expert, Beach Mineral Producers'Association

The paper described the properties of various beach sand minerals and their global and domestic reserves. Beach sand mineral scenario, its possible value addition , benefit to the nation by bringing PRR to 0.01 with 100% value addition and socio economic benefits to the nation and use of rare earth in everyday life were other aspects covered in the paper. The paper emphasized that production and processing of Monazite mineral will augment the nuclear fuel requirement of the country in future. Implication of Atomic Mineral Concession Rules 2016 were also highlighted by stressing that there is a need for development of Beach Sand Mineral Sector as part of "MAKE IN INDIA"programm .

3.3 e-Auction: A tool for capitalising National Mineral resources by MSTC Limited

The presentation detailed out the customized and tailor made range of services offered by M/s MSTC on e auction platform . The facilities available on e Action platform are Forward Auction, Reverse Auction, E Tendering ,E Tendering cum E Auction, E book building Method, Multi Round Ascending Clock Auction. All these E commerce facilities are CVC guidelines and IT Act 2000 and its Amendment 2008 compliance. They are also in conformity with GFR norms. Minerals which have been sold through e Auction are coal, Lignite, iron ore, manganese ore, chrome ore , barytes. Mineral producers as MSTC business associates include Coal India , Rajasthan State Mines & Mineral Ltd. Singareni Collieries Co Ltd, Neyveli Lignite Corporation Ltd ,JSMDC, APMDCL,WBMDTCL, NMDC, MOIL, OMDC and monitoring committee of Karnataka and Goa. Some statistical figures of mineral e auction for 2015-16 were also presented. MSTC has also developed the electronic auction portal for allocation of major mineral block and . Chhattisgarh, Jharkhand , Gujarat, Rajasthan , M.P,AP, Maharashtra, Odisha have sought their help for mineral block auction. The status of various on - going e-commerce projects like selection of Mine Developer and Operator, Coal Mine Allocation, Power Purchase Agreement and DeenDayalUpadhayay Gram JyotiYojna were also highlighted. MSTC Information Technology capability and its state of the art infrastructure available were also presented.

3.4 Opportunity in Mining Sector by Prithul Kumar, Director, Ministry of Mines, Government of India

The presentation broadly covered the statistical information with respect to mineral resources of India, country's mineral production, resource status of minerals , mining sector performance in recent years. The global vis –a –vis domestic scenario and growth drivers were touched upon. The paper detailed out legislative framework, mineral policy & implementation & steps initiated for mineral sector reform. The reforms cover MMDR Act amended in January,2015 incorporating mineral concession grant through auction to bring transparency, District Mineral Foundation(DMF) to address the long time grievances of affected people and creation of National Mineral EXPOLARION Trust (NMET), e auction facilitation by Ministry of Mines, laying down the Mining Lease Grant Process. Status of mineral block auction – commitment made by states for auction & Pradhan Mantri Khanij Kshetra Kalyan Yogna was also discussed.

3.5 Exploration scenario on Mineral & Mining Front by M. Raju, Koteswara Rao & D.S. Jeere of Geological Survey of India

The paper discussed the domestic mineral resources vis-a-vis global scenario and contribution and rank of India in principle mineral production in 2013.The status of baseline data for mineral exploration by Geological mapping, Geochemical mapping , Geophysical mapping & Aero geophysical survey were highlighted. Resources of major mineral estimated by GSI till 2007 and resources established and augmented by GSI from 2010-11 to 2013-14 were shown. Other activities of GSI like identified Geological potential based on geological information acquired till date, State wise detail of mineral belt / terrains within the OGP Areas, prioritization & planning of mineral exploration as well as commodity wise percentage of number of exploration projects under taken by GSI were discussed in detail. The importance of Green field discovery and deep seated and concealed deposit and efforts in this direction and National Mineral Exploration Policy initiative undertaken by GSI and were also covered.

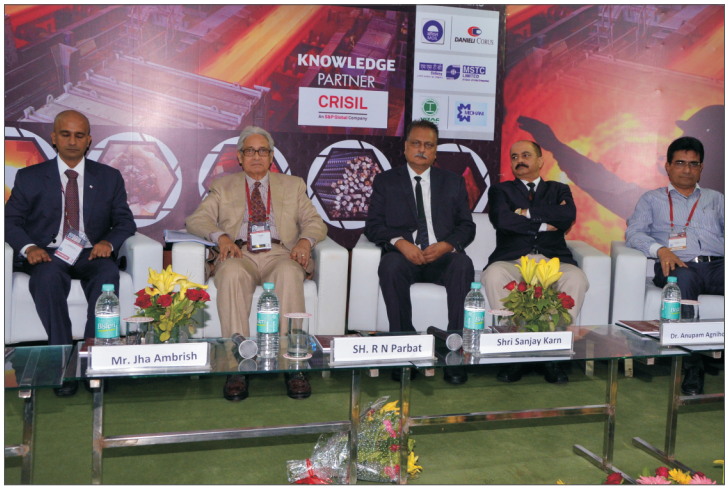
3.6 Challenges and Opportunity in Mineral, Mining and Coal Sector by Satnam Singh, Director, CRISIL Limited

The presentation described the country's mineral scenario in global context , recent developments with respect to key policy initiatives and sectoral development. The challenges and opportunity for prospecting and exploration and mine development and operation were discussed in details.

4 Present and Future of Non-Ferrous in India (Session-IV)

4.1 Additives manufacturing: Challenges & Opportunities by Shri S.K. Jha, Director (Production & Marketing), MIDHANI

The paper briefly explained the Additive Manufacturing (AM) which is used to produce complex parts in titanium alloys and super alloys in aeronautical and medical applications. The principle and classification of AM, Status and merits / demerits of different AM processes like Power Bed Fusion, Direct Energy Deposition, binder jetting, sheet Lamination were explained. Parameters involved in AM processing are Beam powder interaction, porosity, scan strategy, deposition strategy, cracking, delamination & swelling and residual stress. 3 D Printing achievement covers face replacing, artificial leg made by scanning the good leg for precise measurement, making artificial ear, 3d printed gun parts, RAF fighter plane flies with parts manufactured by 3d printing, printing miniature model, printing fancy I phone cases and jewelry printing. Future of AM and role of MIDHANI was also highlighted.



4.2 Importance of R&D in Aluminium: world and Indian scenario by Dr. Anupam Agnihotri, Director, JNARDDC, Nagpur

The paper broadly discussed R&D expenditure with respect to their GDP by various developed countries and funding pattern and compared with Indian figures. Statistical figures for different kinds of research activities by various countries and their set priority were shown with the help of charts. The paper also stated Indian position with respect to patent filing globally and explained discussed H index, Global Technology Index, R&D investment and country position, Paper also highlighted the usage of aluminium in commercial aircraft, metal of future, strategic metal and green metals . The paper made reference with respect to future of aluminium industry in India.

4.3 End use applications of Copper along with its challenges & opportunities by Sanjay Karn, Vedanta

The presentation covered the overview of refined copper status in India vis- a vis global scenario. It was stated that global mines production was 19.2 Mt in 2015 which was 3.5 % higher over previous year and expected to reach to a level of 21.4 Mt by 2019. The world copper production is growing @ 2-3% and achieved a production level of 21.9 in 2015. The corresponding India copper production was 0.79 Mt. Global copper consumption commensurate with world copper production and was 21.8 Mt in 2015. The consumption is growing @ 2-4%. Asia consumes about 63 % of total copper consumption in world. Global refined copper market likely to be in surplus in 2016-18 as China copper demand fails to live to its expectation. Emerging markets of India, Africa, Latin America and middle East are expected to compensate demand growth to some extent. Per capita copper consumption in India is only 0.6 kg against China 6 Kg and global average 2.7 kg. It is estimated that the refined copper consumption in country will increase from 0.67 Mt in 2015-16 to a level of 1.02 Mt in 2021-22. End use segment for copper consumption are Electrical like transformer, rotating equipment, Wires and cables, Automobiles, Refrigeration, and other miscellaneous uses like Railways, Ordinance, Industrial machinery and equipment, Alloys products, coinage etc. The challenges being faced by Indian copper industry are mismatch between the refining capacity and mining capacity, surge in import of refined copper, inverted duty structure i.e less duty on refined copper than copper concentrate, high working capital requirement, low capacity utilization of units and no export incentive etc. On the other hand the opportunities for domestic copper industry are huge market potential, demand by automobile sector growing with CAGR @ 12%, increase in power generation capacity by 43% in next 5-6 years, expansion of railway network and Make in India initiative by Defence sector.

4.4 Latest Advancement in Coke Oven Battery Design for reduced Environmental Impact by Giovanni Siri, Suresh Sinha & Ambrish Jha

The presentation highlighted various advancements that have been incorporated in coke oven battery to minimize the pollution. Coke oven plant is the major contributor to NOx, SOx, CO, CO2 & particulate matter. The main sources of emission in coke oven are dust emission during handling of coal, charging emission, leakage from door /

charging lid / AP, emission during coke pushing, emission from stack, emission from quenching operation and emission from coke handling. Some of the advancements are as follows:

i. Installation of jumbo coke oven battery of 79 m3 volume reduces drastically number of charging/ pushing per day and number of ovens. This results in less emission from for same capacity of coke production.

ii Single side collecting main provide better air flow and lesser leakage points on oven top thus lesser emission.

iii Staggered Heating System minimizes NOx and CO in waste gases, provide longer flame and lower flame temperature, uniform temperature distribution along the wall as well as optimizes fuel consumption.

iv SOPORECO single oven pressure control system : It minimizes stack emission by reduction of leakage between oven and heating walls.

v Smoke less charging for stamped charged battery : Paul Wurth smoke less charging system is combination of SOPORECO and Charging Gas Transfer (CGT) car pushing sequence. This restricts emission to atmosphere.

vi SUPRACOK: Level 2 automation system: Advantages of this is to get consistent improved quality coke , reduction in gas consumption, increase in battery life, more precise and complete information to operators to achieve better performance.

4.5 TMK General Presentation

TMK, Russia is a leading global manufacturer and supplier of steel pipes for oil and gas sector. TMK operates more than 30 production site across the world. TMK is among the top 3 producers of steel pipes in world. They ranked first in Russia for both seamless and welded steel pipe manufacturer. TMK production units consist of 5 EAF, 7 continuous caster, 11 hot rolled seamless mills, 76 cold rolled seamless mill,29 welded rolling mills, 37 heat treatment lines, 48 threading lines , 10 coating lines and 2 R& D Centres. Total shipment of the pipes in 2015 was 3.87 Mt out of which 62 % was seamless and 38 % welded pipes. TMK is a leader in production of premium tubular products on the Russian market with around 75 % market share in 2015. TMK new products are TMK UP TORQ & TMK UP CENTUM. TMK main customers are Russian and international oil & gas companies, major CIS machine building and energy companies. TMK produces seamless pipes with max 426 mm dia and welded pipe with 610 mm dia. In 2014 Green well coated premium connection TMK UP PF has been certified under ISO 13679 CAL IV. TMK has successful experience in OCTG supply for off shore projects as well as line pipe supply for off shore pipelines.

5 Technology and Competitiveness of Indian Steel Sector with respect to Global Scenario (Session-V)

5.1 Competitiveness of Indian Steel Industry by Sushim Banerjee, DG, INSDAG

Growth and competitiveness of Indian Steel linked with macroeconomic indicator like investment, consumption, expenditure, capital cost,labour productivity, good

governance, trade policy etc. Logistic, incidence of taxes &duties, raw material sourcing (price & quality), are other primary determinants for competitiveness of steel. Major aspects of competitiveness of steel are cost, quality, value added products, customer base, export orientation. Element wise production cost break up when comparing with Japanese cost reveals that raw material cost is marginally higher in spite of India has good reserves of iron ore. Though labour cost is lower but is being offset with higher energy and other cost components. Indian plants having their captive ore mines have 30-35 % raw material cost wherein others buying ore from open market will have 50 -55% . Introduction of energy efficient technologies / equipment will result in reduction in production cost. Plant having old technology / processes employed more manpower thus having higher labour cost, 15-20 % against 3-5% for modern plant outsourcing majority of work. Techno-economic parameters of various production processes of Indian plants are also inferior as compared to most efficient plants in the world. As per WSD March16 report JSW ranked 6th, SAIL 14th and Tata Steel 16th in world class steel market ranking (Proof of competitiveness). Some of the strong indicators listed under the strength of competitiveness in world class steelmakers, SAIL & Tata Steel placed most favourable for iron ore mines whereas JSW was most favourable for labour cost over plants in developed countries. Indian steel are competitive after China & CIS countries. To further improve the competitiveness of Indian steel the following steps needed.

- Improving the techno economic parameters and reducing energy consumption
- Reduction in consumption of raw material
- Reducing the financing cost
- Production of more value added products
- Focus on enhancing export of more finished products / enhanced export competitiveness

5.2 Raw Material Security and Rising Imports by P.K.Ghorui, JSW, Bellary

The crude steel production in India has increased from 31.8 Mt in 2004 to 89.6 in 2015 at CAGR of 9.55%. It is estimated that by 2020-21, the installed capacity will reach to a level of 202 Mt. Against this backdrop, the raw material requirement i.eiron ore, coking coal and coal for injection for 2020-21 will be 241 Mt, 75.3 Mt and 12.0 Mt respectively. Iron ore production during 2014-15 in the country was only 129 Mt. With total reserves of 28.5 billion tonnes , only 28% of total reserves are proven / usable.

Around 70 % iron ore mined are of high grade (> 62% Fe) and urgent attention is required to utilize low grade ore / fines for sustainable development of steel industry. With 301 billion tones of coal reserves, only 40 % resources are usable . out of which 12% reserves account for coking coal. Non coking and coking coal production in 2014-15 was 422.6 Mt and 51.6 Mt respectively. High alumina silica ratio in Indian iron ore and high ash content in coking coal have an adverse affect on economics of steel making like higher specific consumption of raw material, higher slag volume, higher energy consumption, reduced productivity etc. With ban on mining of iron ore in Karnataka and Goa, the export of ore has drastically reduced to 4.7 Mt whereas import has gone up to 15 My in 2014-15. With increase in steel production vis –a –vis reduced iron ore production, the iron ore import will rise. The import of both coking coal and non coking coal is also on rise over last 10 years with import of coking coal of 43.7 Mt in 2014-15. The reasons for steel maker going for import are

- Allocated mining capacity not matching with domestic requirement
- Inconsistency in quality
- Value for money
- Mining industry and steel industry are delinked that led to imbalances in demand / supply

Following strategies are suggested for raw material security and to reduce import.

- Optimisation of input resources
- Maximization of waste utilization
- Entering into MOU with major local and global raw material suppliers
- Focus on Research and Technology
- Allocation of resources & efficient infrastructure and logistic support
- Integration of Mining & Steel Industry
- Adoption of scientific mining

5.3 Challenges in installation of Basic Oxygen Furnace by S.K. Dey, MECON Ltd.

The presentation emphasized the need for installation of BOF to achieve the target steel production of 300 Mt. The share of BOF in world steel production is 74.4 % against 42.7 % in India. Most of BOF vessels installed in early sixties to nineties are first generation technology and equipment without combined blowing facilities. The BOF were operating without dog house and de dusting unit and with less application of automation. The presentation highlighted configuration of BOF units for installation of 1.0 to 9.0 Mt capacity steel units. Prerequisite for installation of BOF requires well defined packages, right selection of technology supplier, scope matrix, and sequential erection and commissioning of various packages. Various activities involved in installation of green field BOF units are

- Contract finalization
- Development of layout
- Design & Engineering
- Civil & Structural work
- Supply & erection of equipment
- Testing & cold trial
- Hot trial & commissioning

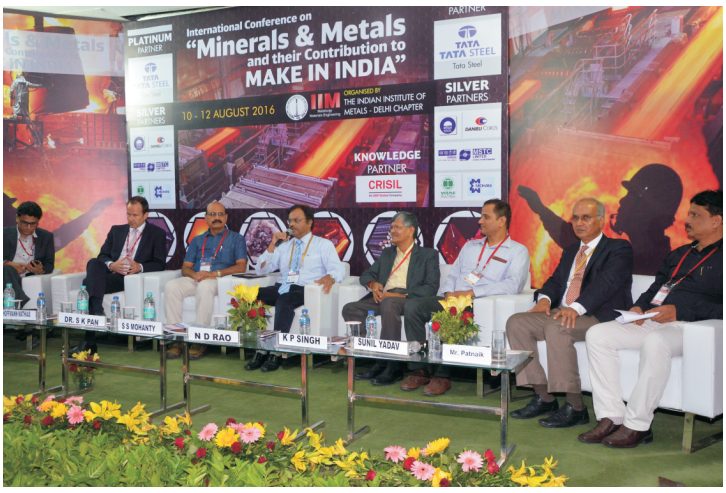
The activities involved in revamping of brown field BOF shop are

- Thorough walk through
- Health study
- Disconnection of utilities
- Civil & structural modification
- Retrofitting of new equipment
- Testing & trial run
- Hot testing & commissioning

The volume of work and time schedule of recently executed projects were mentioned. The presenter also discussed in details critical issues to be taken care during engineering, execution and challenges faced due to design, execution and manufacturing deficiencies. Challenges during testing and trial run, during ramp up and stabilization were also covered along with safety and quality assurance.

6 Effective Utilization of Low Grade Mineral Resources (Session VI)

6.1 Beneficiation & Pelletisation by Sunil Yadav, Vice President , Projects & System (Mining) METSO



India is endowed with 12 billion tones of proven reserves of iron ore which is 13% of world iron ore. Around 250 Mt of iron ore was mined in the country. Indian steel industry is consuming 6.9 Gcal / tcs as against global average of 4.5 Gcal / tcs which is 50 % higher than global average. The Indian steel emit 2.7tonnes of CO_2 / tcs against global average of 1.75 t / tcs which is also 50 % higher than global average. The factors affecting higher energy consumption and higher CO_2 emission are outdated technology, inferior raw

material quality and higher alumina silica ratio in ore. Major challenges in beneficiation of low grade iron ore are

- Increasing recovery of iron value through magnetic
- Increasing recovery of iron value through flotation
- close water circuit
- Lowering grinding cost
- Tailing re treatment

METSO has come out with the solution for the above five challenges by providing

- METSO High Grade Magnetic Separator : increase grade & recovery
- Microcelcolumn: increase grade & recovery. The benefits of METSO column flotation are improved recovery, optimized grade, increased throughput, no plugging, on line replacement, reduced wear & maintenance.
- Lamella thickener which saves space by 60 %. By using sliding instead of free sedimentation the settling speed is increase dramatically.
- Verti mill for grinding reduces power by 40 %. It is energy efficient, low capital required, easy to operate, long mill life with minimum maintenance. Verti mill for iron ore grinding have been installed in Australia, China, Mexico, Brazil and USA with capacity ranging from 5tph to 202 tph.
- Dredge Technology: Tailing reclamation by dredge

METSO is the world leading designer of Grate kiln ore pelletising system with 54 installation world widewith installed capacity of 140 Mt .Capacity ranges from 3 Mt/yr to 7 Mt/yr in a single system

METSO also offer straight grate iron ore pelletization system and installed plant at JSPL, Barbil line1 of 4.0 Mt/yr capacity & line 2, Essar Paradeep Line 1 of 6.0 Mt/yrcapacity& line 2,JSW Amba River Coke line 1, Essar Minnesota, USA, Monnet Line1.

6.2 Reduced Sinter Production Cost – Mechanical & Process Solutions by Mathias Hoffmann, Paul Wurth

The presentation begins with Paul Wurth internal development in sinter plant area since end of 1990's. Paul Wurth now is part of SMS Group. Paul Wurth is supporting Make In India initiative to represent India as capable manufacturing Country.

Following steps have been suggested for reducing sinter production cost.

i Effective raw mix preparation for use of low grade iron ore.

Recommended raw mix preparation is one high intensive mixer + one drum. Horizontal or vertical high intensive mixer is possible. Alternative configuration is 2 drums + 2 high intensive mixer. Use of high intensive mixer results in increase

in material permeability, increase in productivity, decrease in sinter return fines, maintained sinter quality. Economical advantages are

- Possibility to use less expensive ores since the requirement for grain size distribution are reduced.
- Possibility to maintain chemical composition of sinter by introducing pellet feed in the raw mix with a low impurity level to compensate for cheap low grade ore.
- Inherent fuel reduction

ii Vertical Ignition hood for reducing internal return fines and solid fuel consumption

With modular assembly and advanced control system, the vertical burner enhances the cake temperature profile, reduces return fines production by 5%, increases strand productivity, increases strand length by 2-5 min brown filed replacement, reduces hood start up time by 20 minutes. With increase in thermal efficiency the fuel consumption reduces by 20-40%. The flexible burner configuration allows blast furnace/ coke oven gas as well as pre heated combustion air.

iii Sinter coolers for increasing production capacity and heat recovery Annular cooler

The advantages of annular coolers are

- ❖ Reduced footprint for same capacity
- ❖ Low leakage sealing system
- ❖ Reliable drive system
- ❖ No derailing possible
- ❖ Low wear on supporting wheel & rails due to upside down construction
- ❖ Low electrical consumption
- ❖ Maintenance friendly design

Shaft cooler

These are designed with advanced mechanical concept coupled with countercurrent configuration for maximum heat recovery. The benefits are minimum civil works, small footprint, long residence time, high cooling efficiency,

Counter current shaft cooler

The advantages are reduction in cooling air flow, 100% cooling air is recovered for circulation to sinter strand , reduced dust emission to environment, maximum steam production, reduced maintenance due to simple & robust mechanical design

Heat recovery from sinter cooler

Heat is extracted from sinter cooler for vapour production / feed water heating / power generation.

Sinter Automation Solution

Sinter Automation solution is composed of instrumentation and level2 automation system like on line evaluation content of FeO content in sinter, on line mass balance etc.

Servicing activities for fine tuning of process & maintenance

It encompasses inspection, audit, training and advisory services, site services, spare parts supply, equipment installation etc.

6.3 Beneficiation Plant at Balaghat for upgrading low grade Manganese ore by jigging by Shri P V V Patnaik, CGM, MOIL, Nagpur

Manganese is the 4thmost used metal in terms of tonnage after iron . aluminum and copper. Over 95 % of manganese production is used in steel making and other metallurgical processes. The most important non metallurgical application of manganese in the form of manganese dioxide used in dry cell battery. The other use of manganese are production of potassium permanganate and manganese sulphate.

South Africa, China & Australia combined produces about 60 % of global Manganese production whereas China and India consumes 63 % of global manganese production. About 48% of manganese global production is traded as many countries do not have reserves. India is 2nd largest importer of Manganese ore. India is having close to 430 Mt reserves of manganese ore with 80 % of low and mix grade.

The demand of Mn ore in India has grown up from 1.3 Mt in 2000-01 to 4.7 Mt in 2013-14 at a CAGR of 10.2 % where the production has grown up at CAGR of 3.7 % during the same period achieving production of 2.59 Mt in 2013-14. It is estimated that there will be a gap of 5.8 Mt and 8.0 Mt between demand & supply by 2025-26 & 2029-30 respectively.

To meet the demand in long term, Manganese ore production will have to be raised by enhancing output from existing mines, and by opening additional virgin deposits/ acquiring mines overseas. India is deficient in high grade low phosphorus ore reserves. This necessitates import of high grade ore to blend with low grade domestic ore Deep sea nodules can be potential resource for manganese in future.

As a largest producer of Mn ore in India, MOIL has taken steps in this direction to ensure higher recovery and by improving the quality of ore by installing 0.5 Mt /yr capacity integrated beneficiation plant including air pulsated jig at Balaghat. Another 0.4 Mt /yr capacity beneficiation plant was installed at Dongri. Mines.With installation of beneficiation plant at Balaghat, the overall Mn recovery has improved from 72% to 84%. Additional recovery from dump of 3.0 Mt per batch of 100 Mt ROM due to mechanization. This has resulted in lower cost of production. .

6.4 Iron ore Pelletisation : Vizag Complex by Essar Steel

The paper gave an over view of major facilities of Essar Group installed at various location in India. Essar Steel is operating fully integrated steel complex by installing world class facilities. The plant has captive port and power generation units. The plant produces flat products confirming to international quality standard. Plant is fully aligned with World Steel Association sustainability indicators. The investment in steel complex in india is about US $ 7.0 billion. Apart from steel complex at Hazira of 10 Mt/yr capacity, Essar is having 8 Mt /yr capacity beneficiation plant at Kirandul, Bailadila, 267 km slurry pipeline supplying concentrate to 8.0 My/yr pellet plant at Vizag.

Essar Steel has also installed 12 Mt/yr capacity beneficiation plant at Dabuna, Orissa, 253 km slurry pipeline supplying concentrate from Dabuna to 12 Mt capacity pellet plant at Paradeep.One stream of 6.0 Mt capacity pellet plant wsa commissioned in 2012. In the recent auction Essar won iron ore mine with a reserve of 99.5 Mt. Essar Group has captive birth at Hazira port with handling capacity of 30 Mt, at Vizag 32 Mt and at Paradeep with 16 Mt respectively. Essar is generating 270 MW power at Hazira, 120 MW at Paradeep and 45 MW at Vizag.

The major production facilities of Essar Steel at Hazira are as follows.

Iron Making complex:

- 6.8 Mt /yr gas based DR plant (6 Modules)
- 1.7 Mt Blast Furnace shop
- 1.7 Mt Corex shop (2 modules)

Steel making Complex:

- 4.6 Mt/yr capacity EAF shop (4 furnaces)
- 2.5 Mt /yr CONARC I Furnace
- 2.5 Mt/yr CONARC II Furnace

Rolling Mill Complex

- 3.6 Mt/yr capacity Hot Strip Mill
- 3.5 Mt /yr capacity compact strip Mill
- 1.5 Mt/yr capacity Cold Rolling Mill
- 0.6 Mt /yr capacity Cold Rolling Mill at Pune
- 0.5 Mt capacity galvanizing line each at Hazira& Pune
- 0.4 Mt capacity colour coating line at Pune
- Plat Mill of 1.5 Mt capacity
- Pipe plant of 0.6 Mt capacity

Salient features of beneficiation plant, slurry pipeline and pellet plant at Vizag were also covered.

6.5 Trend towards increased adoption of pelletisation & its usage in large blast furnace by Shri P K Singh, MECON Ltd.

Presently installed capacity of steel unit in the country is 110Mt & is expected to reach to 300 Mt by 2025. Steel production through BOF will increase from current level of 44% to 70 % by 2025. Currently per capita consumption of steel is 61 kg . The per capita consumption in rural area is meagre 11 kg. There was a gradual decrease in production of iron ore from 2009 onward and was lowest 130 Mt in 2014. Indian iron ore is friable in nature therefore while mining & crushing and screening of graded lump ore, fines generation is as high as 70 %. In addition while washing the ore to reduce alumina silica ratio, considerable slimes are generated and dumped at mine sites. It is estimated that around 97 Mt of slimes has been dumped at various mines having Fe content between 45-50 %. Pelletisation is only solution to overcome the following problems:

- Conserving high grade depleting ore reserves
- Effective utilization of dumped fines / slimes to solve the environmental issues
- Reduction in cutoff grade from 55% to 45% by IBM for dumping
- More than 58% Fe required in feed for iron making processes

Pellets are used both in blast furnace and DR plants as feed material.

The advantages of use of pellet in blast furnace are :

- Uniform shape & size provide better bed permeability
- more surface / unit weight along with higher bulk density
- Higher Fe content as compared to sinter
- narrow softening – melting temperature range
- High average compression strength
- More resistant to degradation compared to sinter
- Can be transported to longer distance

The only negative aspect of pellet is swelling of pellet results in loss of strength in blast furnace

It was mentioned that upto 85-90 % pellets constitute blast furnace burden in some of the European plants. In India Tata Steel, Essar Steel & JSW are using 25-40 % pellet in blast furnace burden.

High percentage of pellet in large capacity blast furnaces encountered the ' following problem:

- Control of gas flow distribution poses several difficulties
- Increase ore carbon ration in centre
- Tendency to impregnate coke layer
- Heat load in bosh belly region increases considerably
- Increase in tuyere velocity
- To counter rolling effect, central coke percentage to be increased

In 2015, total installed capacity of pellet plant in India is about 83Mt with production of 27 Mt. It is estimated that the requirement of pellet for 300 Mt steel production will be about 140 Mt.

6.6 Quality requirement of iron bearing burden for large blast furnaces in context of SAIL by S.K.Pan, RDCIS, SAIL

SAIL plants have total 18 sinter machines with production of 20.6 Mt and 20 nos blast furnace with production of 15.7 Mt hot metal in 2015-16. Total requirement of iron ore is 24.8 Mt out of which 9.1 Mt is lump ore. Burden quality for large blast furnaces are

Lump ore : Fe : 63.7%, Al2O3 : 2.5 % max, SiO2: 2.2%, Size : 10-40 mm

Ore Fines : Fe : 58.6 %, Al2O3: 2.4, SiO2 : 3.2 %, Fe0: 10%, Size : 5-40 mm

An important prerequisite for sinter is that it should have adequate strength, reducibility to withstand impact, abrasion & size degradation. SAIL on an average using 65-80 % sinter in blast furnace.

To improve sinter plant productivity and quality, RDCIS undertaken four innovative projects.

a) Improvement in productivity of sinter by pre heating of sinter mix using steam at Sinter Plant 2 at DSP

- Sinter mix temperature increase from 30 Deg C to 55 Deg C
- Sinter machine speed increased by 6.8%
- Coke breeze consumption decreased from 74 kg to 69 kg/t
- Sinter strength TI (6.3 mm) improved from 69.1 % to 73.1%
- Sinter plant hourly production rate has increased by 5%.

b) Improvement in performance of Sinter Plant 3-RSP through optimization of process parameters.

Installed three self rotating rollers over the sinter charge just before ignition hood

- Yield of sinter increased from 77.8% to 81.3%
- Plant return fines (-5mm) reduced from 302 kg/t to 242 kg/t
- Sp. Productivity increased from 1.019 to 1.244 t/m2/hr

c) Introduction of air humidification system at Sinter Plant at DSP & BSL

The advantage are improvement in heat transfer through sinter bed & acceleration of fuel combustion in presence of water vapour.

d) Installation of slime beneficiation plant at Dalli, Bolani&Meghahatuburu mines to recover fine concentrate from process rejects.

6.7 Role of Pellets in Effective Utilization of Low/Medium Grade Iron Ore by Mr. N D Rao, President, Pellet Manufacturers' Association of India.

Use of prepared burden has become a regular feature for increasing Blast Furnace Productivity and utilization of low grade iron ore.

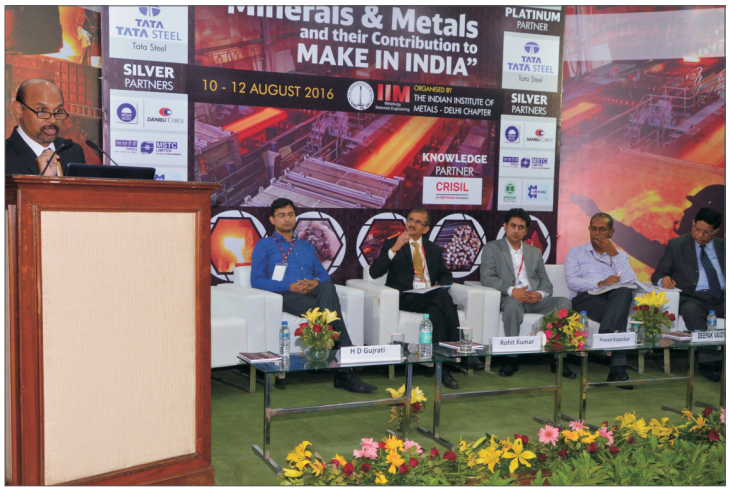
Iron ore pellets are being used in the Blast Furnace along with lump iron ore and sinter. This burden creates better interaction between the descending burden and upward movement of reducing gases. Use of pellets also helps in utilization of low grade iron ore fines. There exists a capacity of over 90 MT for manufacture of pellets for use in the Blast Furnace Burden. Pellets have also a good export potential.

The presenter made series of recommendations concerning the policy frame work for utilization of low grade iron ore fines dumps. These policy recommendations were associated with change of royalty structure for low grade ores and establishment of coal linkages for end user plants engaged in pellet production. The recommendations also pertained to providing financial incentives for beneficiation and pellet industry for use of slurry pipeline transportation system.

It was also suggested that sale of low grade fines of iron ore content below 60% should be made mandatory for all the user industries.

7 Role of Infrastructure Sector to meet the Challenges of Metals Sector (Session VII)

7.1 Dedicated Freight Corridors & Steel Sector by H.D. Gujrati, Director (Operation & Business Development) DFC



Indian Railways and steel industry has an eternal relationship and plays a dual role as transporter and also as major consumer of steel. More than 70 % of traffic of steel sector moves by rail. Government has projected 300 Mt steel production by 2025by expansion of existing plants and setting up few green field plants. The epi centre of future growth centre of steel will be Odisha, Jharkhand, Karnataka, Chattisgarh. Logistic requirement for additional steel production will be

- Predictability in wagon supply & transit
- High end product movement
- Supply chain visibility
- Total seamless solution with single agency, single document & last leg logistic

The initiative taken by Railways are

- Capacity augmentation on identified route: Capex planned 8.56 lakh crores during 2014-19
- Upgrading iron ore route to 25 t higher axle load train
- Improved design of wagons
- Private investment in special purpose wagons
- Private freight terminals
- Private container train operator
- Setting up dedicated freight Corridors

With completion of Dedicated Freight Corridor (DFC) project, DFC will be able to move 7.1 m high wagon as compared to present wagon height 4.26m, width of the wagon will be 3.66m instead of 3.2 m, can stack 4 container instead of 2, axle load will be 32.5/25 t against 22.9 / 25 t , max. speed 100 kmph against 75 kmph.

DFCC responsibility will be

- To manage train operation & infrastructure maintenance on DFC
- Will have own station & control Centre
- Rolling stock ownership
- Marketing & development of terminal by IR & DFCC

DFC is a game changer in transport logistic in the sense that faster, longer & higher transport system, connectivity to major port in Gujarat & Maharashtra, schedule time tabled train & induction of modern technology in train operation and maintenance.

7.2 Stainless Steel End use Evolution in India by Shri Rohit Kumar, Director, ISSDA

The paper described evolution of stainless steel & its initial growth in the world. Stainless steel was the fastest growing material since 1980 with compound annual growth rate of 5.32 % till 2014. Indian Stainless steel production history dates back to 1978 with commissioning of Alloy Steel Plant at Durgapur & VISL at Bhadravati, Karnataka and in 2014 the production reached to a level of 3.0 Mt. The apparent consumption in 2015 was around 2.6 Mt. Grade wise production of stainless steel in 2015 was 58 % 200 series, 29% 300 series and balance 13 % 400 series. Sector –wise usage of stainless steel : Metal goods -52%, process & engineering 27%, art 9%, ABC-7% & others 5%. Global Stainless steel production in 2015 was 41.5 Mt. Per capita consumption of stainless steel in India is only 1.9 kg against the world average of 6 kg and developed economy over 10 kg.

With its inherent properties, Stainless steel find new application in Automotive Railways & Transport (ART) Sector –Coach interior, bio digester tank,, metro rail coaches, Architecture, Building and Construction (ABC) : Building interior, cladding, roofing, wall panel, Escalator, lift, gates, hand rails . hallow section, signage etc.

The other areas catching up fast for stainless steel usage are overhead water tanks, mobile water vending machines, water tankers, stainless steel reinforcement bar, edible oil tanker, solar panel in Indian Railways.

It is estimated that stainless steel demand will grow with CAGR of 8-10 % in next 3-4 years with its usage in new applications.

7.3 Developing infrastructure for 100+ years for maintenance free life by Deepak Vaidya, Outokumpu

The paper highlighted 100 years history of stainless steel development combining its properties and classifications. Stainless steel with its unique properties like standing in extreme climate condition, aesthetic consideration and uniqueness, safety, demand for particular mechanical properties, low maintenance or price stability over long term, safety and sustainability considerations, corrosion resistance, good fatigue resistance, noble look and excellent appearance, 100 % recycled finds its vast application right from cutlery, food storage container, silos to bridges, Use of stainless steel reinforcement in concrete structure is catching up very fast due to its attractive life cycle cost in coastal areas, marine exposure areas and many structure all around the world are using stainless steel reinforced bar in building and other structures.

8 Energy, Efficiency of Metal Sector / Super Alloys Industry in India (Session VIII)

8.1 Carbothermic reduction of black sand ilmenite to form Fe- TiC complex by Mohamed El – Sadek, Metallurgical R& D Institute , Egypt

Egypt is having a reserves of 40 Mt ilmenite rock and about 31 mt of black sand deposits containing about 2.2 Mt of rutile and 28.5 Mt of ilmenite. Titanium minerals are generally processed for TiO_2 or Titanium sponge production. About 94% of titanium minerals are processed for TiO_2 production to be used in paint, welding rod, paper industries etc.

The R&D efforts has been focused to develop new classes of high performance of steel with higher fracture toughness and strength of steel with minimum increase in cost. Fe- TiC is metal matrix reinforced with TiC. Fe – TiC has the following properties.

- ❖ High temperature tolerance
- ❖ Good lubrication & resistance galling due to low friction coefficient
- ❖ Unique combination of high wear resistance with heat & corrosion resistance
- ❖ Good machinability by conventional machining method like turning, milling & drilling.

Fe – Ti C finds application in heat Shield for aircraft, anti wear cutting tools, grinding Wheels, magnetic recording heads & forming tools. Traditional route for Fe-TiC production is carbo thermal reduction of TiO_2 by carbon at 1700-2100 deg C. Alternative route involve GAS Phase reaction of TiCl4, high temperature synthesis, Mg thermal reduction of TiO_2, laser chemical vapour deposition & gas phased laser induced reactions. Various methods available for synthesis of Fe- TiC are powder metallurgy, conventional melting & casting, carbo-thermic reduction, combustion systhesis & alumino-thermic reduction.

The objective of R&D works was to synthesise Fe- TiC directly from black sand ilmenite and carbon black via mechanical activation followed by carbo-thermic reduction under argon atmosphere at relatively lower temperature. It was found that carbo-thermic reduction of black sand ilmenite with carbon black is greatly enhanced by mechanical activation of starting material before reduction process.

It is feasible to poroduce Fe- TiC composite from titanium raw material mixed with carbon black through mechanical activation followed by reduction process under inert atmosphere. Fe-TiC is formed after 50 hours of milling follower by reduction at 1200 deg C for 3 hours.

8.2 Ramon ROB-Robot in Steel by Luo Yang, DGM, Ramon Science & Technology Co Ltd, China

Robotic system developed by Ramon for steel industries are for the following application

a) Robot Spray Marking Machine:

The disadvantages of manual marking machines are incorrect marking, limited production, cannot do auto tracking, tough working conditions. The merits of Robot spray marking machines are

- ❖ Clear & correct marking on the object like high temperature resistance coating material
- ❖ Suitable for complicated working environment
- ❖ Online tracking each marking object
- ❖ Reduces manpower

The major component of the system consist of robot, water descaling system, painting & electrical cabinet. The system uses industrial robot as executive platform to spray

high temperature paint on billet /slabs. The system can operate between 200-800 degC and water based anti high temperature paint is used as spray material. The system are currently in use by many Chinese plants.

The other robotic application developed by M/s Ramon are

- ❖ Robot Mould powder feeding system
- ❖ Robot temperature and measuring system

8.3 Paul Wurth contribution in efficient iron making with proven technologies by Rajesh Garg, Paul Wurth India Ltd.

The presentation was focused on the best practices prevailing in the world for fulfilling its objectives and Paul Wurth contribution in achieving excellence in the industry. Paul Wurth services ranges from plant & technology of blast furnace, coke making, agglomeration, Direct reduction technology, environmental protection & recycling technologies, system & equipment for non ferrous, ferro alloy plants, town planning, civil engineering & infrastructure projects.

Paul Wurth offers the following efficient technologies / processes for steel plant.

1. BLT Condition monitoring

Continuous automatic survey of BLT equipment with reliable instrumentation & real time visualization & alerting system. The merit of this system are accurate lifetime prediction of critical parts, fully open user interface, avoid unplanned shutdown of blast furnace & sudden damage of BLT equipment.

2. BF Process & Optimisation Expert System

Modern, modular & user friendly software tools for blast furnace. The advantages of this tool are achieving lowest coke rate through stable BF operation, early detection of process phenomena , real time operational recommendation, remote technical servicing through data tracking and diagnosis.

3. Process Automation Level 2

This takes care of charging process, raw material tacking, mass/ energy balance, interface with level 1, laboratory, probes, level3, flame & raceway condition, hearth wear monitoring, liquid level tapping and temperature and Silicon forecast.

4. Stoves waste gas heat recovery

Use stoves waste heat to preheat stove combustion air & combustion gas. Uses proven heat pipe technology to design a gas tight maintenance free heat exchanger. It saves BFgas.

5. Recycling of BF Sludge

Hydro metallurgical extraction of Lead & zinc from Blast Furnace sludge and reuse of rich iron / carbon sludge in iron making process. The merit of this technology is to maximize the yield of clean Fe & Cc matrix back to iron making process. The concentrated zinc and lead cake can be sold to respective industries. It also reduces sludge basin, stockpiles and hazardous soil infiltration.

6 BF Burden Distribution by BLT charging system

The Chute Transmission Gear box (CTG 3) of BLT system was redesigned to address the problem of large blast furnaces. The high rotating speed of 12 rpm allow finer charging pattern. It has closed pressurized cooling system / high efficiency cooling panels along with sturdier mechanical design and improved lubrication system. The merit of the system is highest charging accuracy thus high permeability in the blast furnace despite the use of lower quality raw material. It improve coke rate & process stability.

7 INBA Slag Granulation System

The system transform molten blast furnace slag into valuable product with the help of high pressure water quenching process.

8 Pulverised Coal Injection with dynamic distribution.

The process involve selective injection of fine coal through each tuyeres. It minimizes costly BF coke consumption in blast furnace .

9. BF Cooling system

Metal inserts installed in copper stave grooves which results in enhanced gas turbulence near the wall. The curved stave matches with BF profile It substantially increases lifetime of staves. It reduces thickness of stave therefore increases the inner volume of blast furnace.

10 BF with COKE Oven Gas shaft injection

Hot & reformed coke oven gas is injected into blast furnace. It can be retrofitted in existing system also. The injection results in increase in productivity, decrease in fuel rate and decrease in CO_2 emission to atmosphere.

11 Top Recovery Turbine (TRT)

The system recovers energy from blast furnace gas pressure up to 30 % of total BF energy consumption, increases BF gas cleanliness and enhances blast furnace top pressure control.

12 TMT Probes

Tapping Measuring Technology supply various kinds of probes like stock line probes, Fix above burden probes, Furnoscope camera, in burden probes, Torpedo ladle radar probes etc for various functions.

8.4 High Strength Steel for Naval Applications : An example of Make in India by Dr. R. Balamuralikrishnan, DMRL, Hyderabad

The stringent required for naval application should have the following properties.

- With stand critical operating conditions in the range of -35 to +40 Deg. C
- Full submergence in saline atmosphere, wave loading, sea slap, vibration & thermal exertion
- Resistance to stress corrosion
- High brittle fracture resistance

High strength low alloy steel meets the above criteria. DMRL & NMRL have jointly taken up the project to develop AB class of steel for marine applications. The plates & bulb bar of ABA will be used for hull & other structures whereas AB2 plates will be used for flight deck. DMR 249 A has much superior impact properties than other steels. Fined grain ferrite microstructure is desirable with good combination of strength and toughness. Good steelmaking with ladle metallurgy (Calcium treatment) with optimum rolling parameters will produce the desired results. AB2 is low alloy steel therefore more tolerant than DMR 294A.

Concerted efforts by multiple agencies led to successful development & industrial production of steel that was essential for naval hull application.

A close association between academia and industry is needed to meet the quality requirement of steel to navy in future in given time at competitive cost.

8.5 Pulverised Coal Injection: Myth is broken by Danieli

Primary component which contribute majority of hot metal cost is coke. Over the years steel maker have tried oil, natural gas , plastic, coal tar , coke oven gas and pulverized coal. Pulverised coal injection (PCI) becomes most popular and sustainable due lesser adverse effect on blast furnace process. Some of the furnaces in Europe are injecting coal over 200 kg/ t hot metal . The adverse effect of PCI on BF operation are

- Higher PCI increases ore to coke ratio i.e. lesser permeable furnace
- Gas distribution towards wall, higher and fluctuating heat load

The higher coal injection requires stable protective skull at hot surface, efficient / reliable cooling to extract fluctuation if the skull detaches, easy to replace cooling members if damages, ensuring 100% availability of cooling at all time.

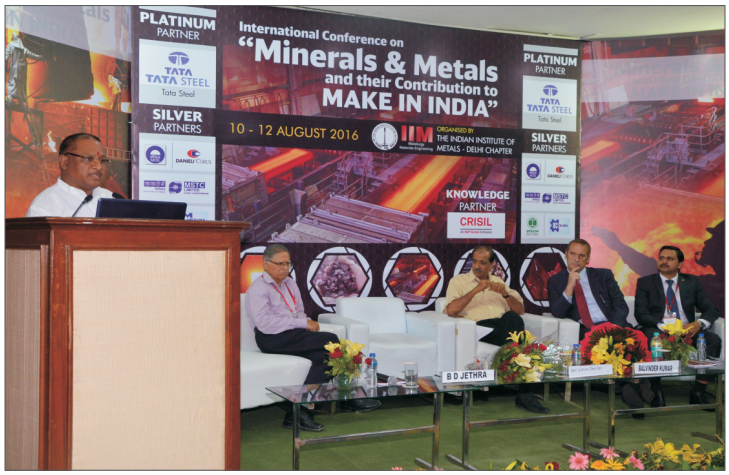
Tata Steel & JSPL are injecting over 200 kg of pulverized coal whereas RSP, ESSAR Steel and other Tata Steel furnaces are using 150 -200 kg of coal/ thm. Other blast furnaces of SAIL plants, JSW, Bhushan Steel are using 50 -150 kg coal / thm. There was a myth that Indian blast furnace cannot accept more than 150 kg/ thm. Which was broken by Tata Steel, JSPL, SAIL plants and JSW.

It is estimated that if all the blast furnaces uses minimum150 kg coal / thm there will be potential saving of Rs more than Rs 1360 crores With 200 kg injection , the saving will be to the tune of more than Rs 2300 crores. An exercise carried out for 1700 cum blast furnace with iron stave and 80 kg coal injection rate vis –a vis same capacity furnace with copper plates and 200 kg injection rate reveals a saving of Rs 120 crores with higher injection rate.

8.6 Industry 4.0 in metal: The digitalization of steel production by Primetal Technologies

Digitalisation is driven by new customer requirement and enabled by new technology. The vision of Primetals Technology for digitalization of production in metal industry is to integrate intelligent production by merging machinery with software. Primemetals Technologies (PT) is to guide the customer to next generation of production by step wise improvement of entire automation system to digital production considering all aspects. Fully automated plants fulfill all requirement regarding automated operation to be ready for integration into the digitized production. Digitisation can be operational by integrating smart factory & through process control quality, smart work & diagnosis, smart sensors, cyber physical system, smart services & smart data and connectivity. Industry 4.0 is not available off the shelf. Each plant operators must define their own particular implantation strategy. Prime metals Technologies will actively assist plant operators in the digital transformation of their production plants with their portfolio elements and services.

9 Valedictory Session



The Valedictory Session of the Conference was presided over by Shri Vishnu Deo Sai, Hon'ble Minister of State for Steel on 12th August 2016. Shri Balvinder Kumar, Secretary Ministry of Mines delivered Guest of Honour Address.

Secretary Ministry of Mines spoke about the turnaround taking place in the mining sector. He stated that metallic minerals output has grown from 14.24 crore metric tonnes to 17.05 crore metric tonnes between April 2015 and February 2016. Iron ore output has risen significantly as many of the mines that were shut in recent years have started operating again in states like Goa and Odisha. He further stated that Govt. expects mineral output to rise further in 2016-17. He also spoke about the progress in the area of auction of mines. He also touched upon the thrust being given by Government in the area of exploration.

The Hon'ble Minister in his Valedictory Address spoke about the need for augmentation of consumption of steel. It was stated by him that research and development and innovation in the steel sector needs a strong push. In this connection it was informed by him that Govt. of India has set-up Steel Research & Technology Mission of India (SRTMI) to promote the R&D initiatives in the steel sector.

The Hon'ble Minister gave away the awards to the distinguished exhibitors in the Exhibition. The awards were also given by the Minister to the Delhi Chapter functionaries who made significant contribution in organizing the Conference.

The Recommendations of the Conference are Annexed.

RECOMMENDATIONS

➢ Raw Material security & Availability

India has ambitious growth plans for creating steel production capacity of 300 Mt by 2025. To ensure such ambitious growth plan, the stakeholders should chalk out a concrete plan to ensure long term availability / security of major input raw material like coking/ non coking coal, iron ore, limestone both from domestic as well as international sources.

Immediate action is required by concerned agencies for mapping of these minerals from unexplored areas and action for mining of inferred & other category of identified reserves.

Amendment in MMDR Act by Government as well as transparent procedure in allocation of mines are a positive steps by Government .

➢ Effective utilization of lean ore / coal

India has large reserves of low grade iron ore (less than 55 % Fe) and mountain of ore slimes at various mine sites. Though few plants started using low grade ore fines by beneficiating/ pelletising, more concerted efforts are needed by other plants.

Effective use of dumped slimes posing threat to environment and occupying land need serious efforts by integrated steel plants.

Similar is the case with coal reserves of sub-optimal quality. These can be used after beneficiation and washing etc. Coke making technology like stamp charging facilitate use of inferior quality coal in the blend without compromising on quality of coke. These efforts not only conserve our precious high quality raw material but help in sustainable development of steel industry on long term basis.

➢ Thrust on Penetration of Rural Market

Presently per capita consumption of steel in the country is around 60 Kg. The same in the rural sector is around 10-12 Kg. The Indian rural sector remains fairly unexposed to their multi-faceted use of steel

Country can absorb 300 Mt steel by 2025 when there is quantum jump in per capita consumption in rural areas. A well defined timebound action plan is the need of the hour to penetrate this segment. Enhancing applications in rural areas assumes a much greater significance now to match supply demand by 2025. The usage of steel in cost effective manner is possible in the area of housing, fencing, structures and other possible applications where steel can substitute other materials which not only could bring about advantages to users but is also desirable for conservation of forest resources.

➢ Innovation / Technology up-gradation through R & D

There should be greater thrust on R&D efforts / technology upgradation in the steel sector. The expenditure on R & D by steel plants is much lower as compared to their counter parts in developed world. More focus should be given on Industry oriented R & D work. It will make the steel industry more competitive in global market

with less dependence on foreign technology / equipment supplier who demand huge price for technology / know supply. Even the technology/ know how provided by foreign suppliers are developed suiting to their raw material and working conditions and takes very long time for tuning & stabilising to Indian raw material and working conditions.

➢ Preparing for demand for future

The speed & degree of changes in the global economy plays a very vital role for steel industry to remain competitive in global market. Demand of newer quality steel with higher properties is order of the day. Development of infrastructure like high speed trains, super critical thermal power plants, sophisticated defence equipment/ warship/aircraft, transportation of oil & gas through national grid pipeline for long distance and creation of smart cities require high quality steel with specific mechanical, chemical & physical properties. To meet customer ever increasing demand for quality steel in time & cost, steel makers must determine how to optimize and create a new product mix and decide to invest in their modernisation / expansion/ creation of new facilities accordingly.

Steel producers should focus more on production of value added products rather than commercial quality. This not only enhances the bottom line of the company with more sales realisation but also enhances foreign exchange earning with higher export volume. Efforts on production of import substitution steel will have strong bearing on reducing foreign exchange outflow from the country.

➢ Make in India Initiative

India has in house reputed design & Engineering organisations as well as plant & Equipment manufacturing facilities. These organisations are capable of providing services at par with their counter parts of developed nations. Government / industries should avail of their services in order to reduce their capital expenditure & faster execution of projects. This action by industries will be a step forward in MAKE IN INDIA initiative.

In specific cases where the technology is not available in the country, technology absorption mechanism can be devised for further implementation of projects.

One of the main reason for many steel units become non viable / declared NPA is that they have borrowed technology / equipment from foreign suppliers with high CAPEX. The plants have to run under very narrow operating parameters regime which lead to non starter of the plant or become unviable due to poor techno economic parameters. Effective steps need to be taken to rectify the situation.

➢ Focus on Increased Use of Pellets in Blast Furnaces

Use of iron ore pellets in the Blast Furnace Burden is being increasingly adopted in iron ore making. The government may consider providing incentives to beneficiation

and pellet industry for use of slurry pipeline transportation system. There exists a need for change in the royalty structure for low grade iron ore. There is also a requirement for prioritization for the end user plants to participate in the auction of iron ore mines. Pellets Manufacturers be allowed suitable coal linkages for production of pellets.

➢ Government Initiatives

In order to achieve the set target of 300 Mt steel production by 2025 and also to encourage domestic steel producers to expand / install new capacity, Government of India has taken many steps which are given below.

- The PSU / private steel companies have announced to enhance their crude steel production further beyond their ongoing expansion plan.
- Ministry of Steel has set up an industry driven Steel Research & Technology Mission of India (SRTMI) in association with public & private sector steel companies to spearhead R& D activities in Iron & Steel Industry with initial corpus fund of Rs 200 crores.
- Formation of SPV to set up plant with capacity 3 to 6 Mt/yr
- Constitution of Project Monitoring Group to fast track various clearances / resolutions of issues related to investment of Rs 1000 crores or more.
- Imposing 30 % export duty on iron ore lump to discourage high grade lump ore for export & make available to domestic steel producers, also making export duty nil on low grade iron ore & fines
- Amendment in MMRD Act and auction of coal / ore mines
- Identified 30 steel products under mandatory quality standards
- Imposing MIP to protect domestic steel industry for cheap import from China/ other countries.
- Taking adequate steps to meet infrastructure requirement for production of 300 Mt steel by 2025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