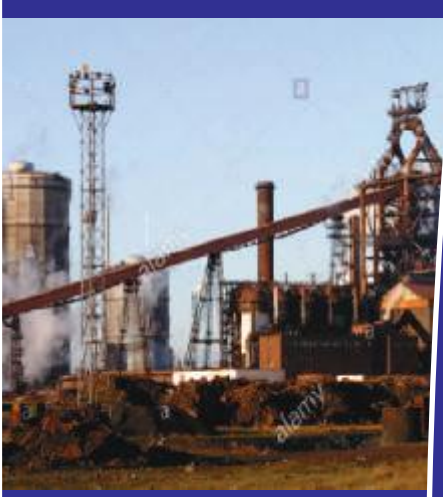




**IIM**  
Metallurgy  
Materials Engineering



*Summary and Recommendations  
of  
International Conference  
on*  
**MINERALS AND METALS SECTOR  
GROWTH PROSPECTS  
IN NEW BUSINESS ENVIRONMENT**

**29th to 31st August 2018  
At Pragati Maidan, New Delhi**

*Organised by*  
**The Indian Institute of Metals  
Delhi Chapter  
and  
Summary of the  
12th International Exhibition  
29th to 31st August 2018**

*By*  
**International Trade & Exhibitions India Pvt. Ltd**

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## FOREWORD

The MMMM 2018 event comprising International Exhibition and concurrent Conference was held at Pragati Maidan, New Delhi from 29<sup>th</sup> to 31<sup>st</sup> August 2018.

I am very happy to state that the Technical Committee of Delhi Chapter of The Indian Institute of Metals has organised successfully the International Conference “**Minerals and Metals Sector – Growth Prospects in New Business Environment**” at Pragati Maidan, New Delhi, from 29<sup>th</sup> to 31<sup>st</sup> August 2018.

I had the opportunity to discuss 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 encouraging. 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 relentless efforts put in by each and every member of the Technical Committee. The Committee members have done commendable job resulting in successful holding 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.

I would also like to express my profound thanks to Shri K L Mehrotra, immediate past Chairman of Delhi Chapter who was instrumental in giving overall support to conduct the Conference effectively.

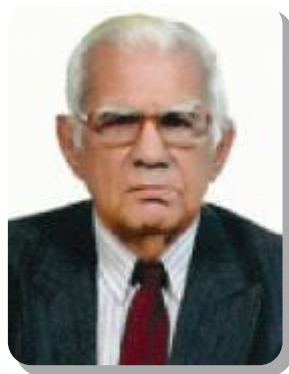
The Technical Committee has prepared a Summary of the Conference and its Recommendations.

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

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

**B D Jethra**  
Chairman, IIM Delhi Chapter





## **PREFACE**

The 12<sup>th</sup> Edition of the Minerals, Metals, Metallurgy & Materials (MMMM) 2018 was organised at Pragati Maidan, New Delhi, from 29<sup>th</sup> to 31<sup>st</sup> August 2018. The Event consisted of the International Exhibition and concurrent Conference.

Thirty five technical papers were presented in the Conference. About 200 delegates from India and overseas attended the Conference. The Conference contained seven technical sessions, inaugural session, CEO Conclave and a valedictory session.

We have prepared a Summary of the Exhibition and Conference along with the Recommendations arising out of the papers presented in the Conference. The Summary of the Exhibition and Conference has been drawn up based on the presentations made by the experts followed by interaction with participants at the end of each presentation.

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 formatting the structure of the Conference and also in preparation of the Summary and Recommendations of the Conference. I have no hesitation to confess that without his whole hearted support, our Chapter would not have been able to organise this event so successfully.

I would also like to put on record the contribution of Shri P K Bajaj, Vice Chairman IIM DC, Shri Manoranjan Ram, Shri R K Vijayavergia, Dr. Ramen Datta, Shri G I S Chauhan and N Vijayan whose support facilitated in conducting the Conference quite 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 also to the concerned public/private sector enterprises.

I would also like to thank Shri K L Mehrotra, immediate past Chairman of our Chapter, whose support gave us immense momentum to hold the Conference successfully.

It is hoped that these recommendations will be used as a useful reference document for policy makers in the Government of India and all other stakeholders 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-2018 (MMMM -2018)**

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 International Exhibition and concurrent Conference in the area of MMMM. The 12<sup>th</sup> edition of this event was held at Pragati Maidan, New Delhi from 29-31 August 2018. The Theme of the Conference was **Minerals and Metals Sector – Growth Prospects in New Business Environment**. This event was co-sponsored by Ministry of Steel, Ministry of Mines, Ministry of External Affairs and Council of Scientific & Industrial Research (CSIR).

At the outset, Shri B D Jethra, Chairman, IIM Delhi Chapter welcomed the Hon'ble Minister of Steel and distinguished guests on the dais and the participants of the Conference.

Shri Anand Sen, President, The Indian Institute of Metals and President (TQM & Steel Business), Tata Steel, welcomed the Hon'ble Minister of Steel and also gave a brief description of The Indian Institute of Metals and the MMMM Event. He also presented a brief overview of the Steel Sector.

Shri S C Suri, Chairman, (Technical Committee), presented brief contents of the Conference.





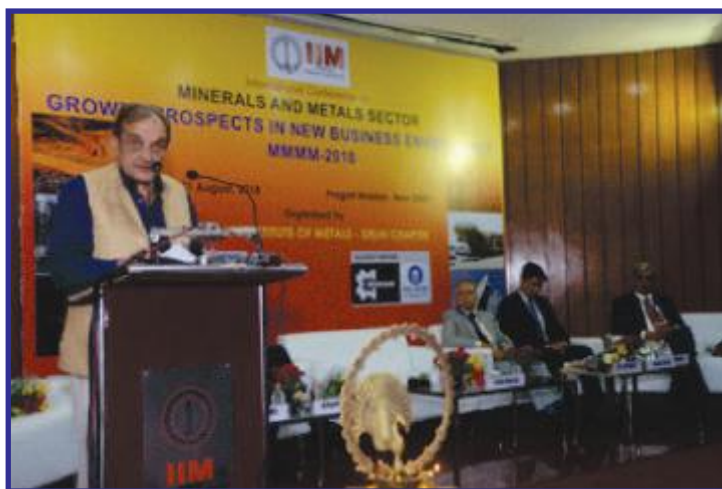
Shri Sanjeev Batra, Director (Finance), International Trade and Exhibitions Pvt. Ltd (ITEI) presented a brief overview of the Exhibition.

The event was inaugurated by Hon'ble Minister of Steel Chaudhary Shri Birender Singh on 29<sup>th</sup> August 2018. In his inaugural address, Hon'ble Minister of Steel Chaudhary Shri Birender Singh said that within a short span of time, by following the practice of using domestic produce steel in government projects, country has been able to save at least Rs 5000 Crore. Among other things, he also mentioned that by end of this financial year, India will become the second largest steel producer in the world. He expressed his confidence that steel sector is on the right track and as envisaged in National Steel Policy 2017, India will be able to achieve 300 million ton steel production capacity by 2030-31. The Hon'ble Minister also stated that Ministry of Steel has created Steel Research & Technology Mission of India (SRTMI) to promote the R&D initiatives in the Steel Sector covering primary and secondary steel producers. The SRTMI has started functioning under the aegis of Ministry of Steel.

After inauguration, the Hon'ble Minister and the dignitaries on the dais released the Conference Souvenir.

Thereafter, Shri N K Kakkar, Secretary, IIM Delhi Chapter presented vote of thanks.

After inaugurating the Conference, the Hon'ble Minister also inaugurated International Exhibition and went around the various stalls put up by domestic steel / Non ferrous metal producers, State Government Department, Technology / Equipment suppliers from India & Abroad.



16 countries participated in the Exhibition and around 500 Exhibitors have put their stalls in the Exhibition . More than 12000 trade visitors visited exhibition area during in the three days events. During the Exhibition & International Conference, foreign exhibitors, and delegates from around the world were impressed with the growth of metal sector in India.

Apart from the Inaugural Session, the Conference consisted of CEO Conclave, seven Technical Sessions and Valedictory Session, as under:

- ❖ CEO Conclave
- ❖ Prospects of Mineral Industries and Raw Material Security for future growth of mineral and metal sectors.
- ❖ Planning of Infrastructure & Logistics Support
- ❖ Enhancing Competitiveness of Indian Steel Sector
- ❖ Prospects of Non-Ferrous Industry
- ❖ Metals Requirement of Strategic Sectors
- ❖ Secondary Steel Sector – its Contribution and Challenges
- ❖ Energy / Environment Issues in Minerals and Metal Sectors
- ❖ Valedictory Session

The CEO Conclave comprised of

- Mr. Anand Sen, President Indian Institute of Metals and President TQM and Steel Business TATA Steel
- Dr. Vinod Nowal, Deputy Managing Director, JSW Steel





- Mr. Gopal Singh, CMD, Central Coal Fields Limited
- Mr. H. N. Rai, Director (Technical), Steel Authority of India Limited (SAIL).
- Mr RN Parbat, a veteran in Metal industry & Past President, Indian Institute of Metals, moderated the proceedings of the CEO Conclave
- The Conclave had an interesting deliberation on the present and future of Indian Steel Sector and National Steel Policy – 2017 announced by Ministry of Steel, Government of India. JSW Steel, TATA Steel and SAIL - the three major domestic steel producers expressed their confidence of capacity enhancement to 50 Million ton each by 2030. Mr. Gopal Singh, CMD, Central Coal Fields Ltd, assured the steel producers that the supply of both coking and non-coking coal from Coal India mines will improve in coming years and thrust should be given to install number of coal washeries to meet the requirement of low ash coal to consumers.



Mr. Anand Sen mentioned the research activity being undertaken by Tata Steel to convert non coking coal to coking coal. Major steel producers currently spending huge foreign exchange in importing coking coal to meet their demand will witness a major revolution with a breakthrough in this important & relevant R& D effort.

Dr Nowal of JSW Steel emphasised that in order to achieve the targeted capacity of steel production as per National Steel Policy, the capital requirement will be huge. As such it is necessary that interest rate on borrowing should be attractive to raise capital for expansion / installation of green field plants.

Another pertinent issue raised by Director ( Technical ) SAIL was that India need to improve a lot on logistics front as the transportation cost of incoming raw material from mines to Plant site and outbound finished steel from Plant site to stockyards is significantly higher in comparison to China.



## Technical session – I

### **Prospects of Mineral Industries & Raw Materials security for future growth of Mineral & Metal sectors.**

This session was chaired by Shri R.N. Parbat Former President, Indian Institute of Metals.

The Session had four presentations . The eminent speakers were from Centre for Engineering and Technology (CET),SAIL, TATA Steel, NMDC & MECON.

The speaker from TATA Steel, presented an interesting analysis that for new steel plant facilities, the ROIC with captive iron ore supplies comes to 13.5% and without captive iron ore supplies, ROIC works out to 11.3%, which are both below the weighted average cost of capital, which is coming around 14%. Also, another fact highlighted i.e. within the entire steel value chain profitability is challenged and margins move to mining.

Presentation from CET,SAIL emphasised that raw materials are the most significant contributor towards the production cost in steel industry. Its contribution varies from 60-70% of the production cost. The steel making raw materials such as iron ore, coal, coke etc are known for their price volatility. The amplitude of the price volatility multiplied with the high percentage contribution of this factor of production induces a significant risk in the operating expenses of steel companies. The risk diversification can be achieved through financial tools like derivatives and hedging. However, financial tools bring an additional cost which goes against the concept of cost leadership which is often the preferred strategy of steel companies as bulk producers. Another effective way which align very well with the strategy of steel companies is to have captive source for supply of the major raw materials. Since non-availability of captive source for supply of raw materials exposes a firm to higher risk and a position of competitive disadvantage, many steel companies hesitate in expansion of their existing production capacity or addition of new capacity. The hurdles coming into the way of having secured supply of raw materials may prove to be a major stumbling block in achieving the ambitious target contemplated in the New Steel Policy. The policy makers may look into the obstacles such as delay in getting various clearances, land availability, capacity restrictions, socio-economic factors etc which are hindering steel



companies from having a secured, sustainable and cost effective source for supply of steel making raw materials.

NMDC presentation detailed out the salient features of proposed 3.0 Mt /yr capacity integrated steel plant under commissioning at Nagarnar, Jagadapur, Chattisgarh along with 2.0 Mt/yr pellet plant. The feed for the pellet plant will be beneficiated lean iron ore which will be transported from Bailadila ore mines to pellet plant through slurry pipeline.

MECON presentation covered the raw material scenario to achieve 300 Mt/yr steel production by 2030. Requirement of iron ore & coking coal will be to the tune of 500 Mt & 170 Mt /yr respectively. For upgrading the scale of iron ore production concentrated thrust towards capacity enhancement of operating iron ore mines and speedy auctioning and development of free hold iron ore areas would be required. Development of Special Mining Zones (SMZ) in iron rich free hold areas shall be required to achieve the required iron ore production. In addition to this enhancement of the iron ore resource base of the country is the urgent need for sustainable supply of iron ores to cater the need of steel plants. Methods of exploration and exploitation of magnetite resource of the country is yet to be developed through the way of scientific and eco-friendly techniques. Integrated infrastructure facilities for mineral evacuation should be given due importance while developing the mine infrastructures. Although the country is having sizeable coking coal



reserves, substantial quantity of the reserves are rendered unworkable on account of coal seam fire and subsidence. Planning for raising coal production from the Jharia coalfield requires addressing these inherent impediments adequately.

Another presentation from NMDC detailed out prospect of mineral industry under new business environment through a number of policy changes. Mineral Industry is set to be more vibrant with various measures adopted such as Exploration for deep Seated Minerals, Digital India, Introduction of e-way Bill in Logistic Sector, Transparency in allocation of Mineral Concession, addressing the concern of Mining affected persons, promulgation of National Mineral policy 2017 in align with sustainable development Goals and reforms to facilitate Ease of Doing Business .

The important take-aways from this session were

- Limited auction of iron ore resources amongst end users and provision of renewal of captive concession.
- Facilitate auction of mineral blocks in a regular manner.
- Utilization of low grade fines must be promoted
- Transportation of iron ore fines to pelletization units should be through cost effective slurry pipelines and conveyors.
- Acquisition of mineral assets overseas.
- Facilitate exploration & optimal utilization of deep seated coking coal reserve.
- Coking coal blocks should be allocated through limited auction amongst end users in steel industry.
- Semi coking / coking coal should be given to only steel producers.
- CIL should create e-auction windows for steel players.
- Explore the efforts to raise resources of limestone, manganese and chromite ore.
- Suitable measures and procedural simplification should be done to support the rising requirement of refractories.



## Technical Session – II

### Planning of Infrastructure & Logistic support

The Session was chaired by Dr Sanak Mishra, Former MD, RSP & President, IIM.

The session had five presentations. The eminent speakers were from Vizag Port Trust, Power Finance Corporation, National Highway Authority of India Limited, MECON and SAIL. The speaker from Vizag Port Trust presented the roadmap for Port modernization and new port development in the country which include enhancing the port capacity to more than 3,500 MTPA by 2025 with 112 major capacity expansion projects at an investment of Rs.70,000 Crores, development of new ports, augmentation of rail and road connectivity, pipeline projects, development of IWT and other logistics like development of Multi Model Logistic Parks etc. Shri P.L.Haranadh, Dy. Chairman, Vizag Port Trust, also briefly described the development plan developed by Vizag Port Trust for modernization of Port Infrastructure in the major thrust areas of Deepening of channels and berths, development of new berths, modernization/mechanization of existing berths and improvements in connectivity and other logistics such as Multi Model Logistic Hub. Vizag Port has

taken up modernization plans with an investment of Rs. 4,450 crores through Private Sector participation as well as with the internal resources and with the funding from





Sagarmala programme. The capacity of the Vizag Port has been augmented from 63 MTPA to 120 MTPA during the last 4 years.

The presentation from Power Finance Corporation emphasised that stressed asset in Power Sector is becoming a major challenge. It was mentioned that approximately 60,000 MW may be under financial stress. Lenders have exposure of approximately INR 3 Lakh Crore to such assets and it is imperilled due to slow resolution process and tepid power procurement demand from Discoms in last 3 to 4 years.

Presentation from NHAI highlighted the various projects which are under execution and being taken up for next 3-4 years to ease out road transportation from one part of the country to another part of country.

Paper from MECON on iron ore slurry transportation through pipeline highlighted the importance of slurry transportation in view of projected growth of steel industry which is putting tremendous pressure on the Railways infrastructure with respect to inward & outward traffic, loading and evacuation of raw materials/ finished products. Lack of sufficient Railways infrastructure could pose a major challenge to the growth targets of steel. The paper gave a brief idea about the design of such iron ore slurry pipelines. The presentation also gave an overview of the various tests such as geological tests and complex hydraulics problems which are unique to the design of slurry pipelines and are used for finalization of design parameters of slurry pipeline. Presentation also mentioned the advantages of transportation of iron ore by slurry pipeline with respect to costs involved, impact on environment and reliability.

Presentation on smart city by Dr Rakesh Kulshreshtha stressed that making Indian cities smart and productive has introduced new thinking and skills in managing the urban infrastructure. These trends have definite imperatives for steel industry as the infrastructure and construction sectors are the biggest consumers of steel in India and the industry contributes to about 2 per cent of the country's GDP. The trend towards enhancing liveability quotient of India's urban dwellers and at the same time increasing awareness on climate change and desire to improve quality of life has raised expectations from industry to invest in environment friendly iron and steel making technologies with optimum use of resources and energy. On the other hand there are ample opportunities for the industry to develop steel for eco-friendly solutions; wind energy, electric cars, green buildings etc.



### Technical Session – III

#### Enhancing competitiveness of Indian Steel Sector

The session was chaired by Shri P.K. Bajaj, Former CEO, Durgapur Steel Plant & Vice Chairman, IIM Delhi Chapter.

Five speakers namely from Tata Steel, JSW, CET (SAIL), Paulwurth and Dr Sanak Mishra made the presentation.



The presentation from CET, SAIL highlighted IISCO modernisation and expansion programme with an investment of over Rs 18,000 crore. The plant has now been completely transformed into a state-of-the-art integrated steel plant in all facets of steel making, right from raw material handling to finishing mills. The modernised and expanded ISP has epitomised the spirit of the 'Make in India' campaign. This modernised and expanded plant is producing high quality steel rebars, including earthquake-resistant grades, wire rods and universal sections, including parallel flanged beams, for fulfilling the need of India's growing infrastructure and construction sector. ISP's new and modern plant has facilitated SAIL to a phase of reinventing its processes and becoming world class in all spheres of production performance and marketing to customers.

The paper from JSW highlighted the commercial use of Blast Furnace Slag and BOF slag. JSW initiatives for Recovery and Recycling of process wastes (dust, sludge and mill scale) is really

commendable. Journey towards achieving zero waste through Process Improvements and Technological Innovations is possible – this has been demonstrated by JSW.



Presentation from Paul Wurth highlighted the fact that through smart modernisation techniques, capacity enhancement from the existing asset is possible by collaboration of technology provider and steel plant operators. Engineering solutions are available which can enhance substantially the capacity of existing production facilities of a steel plant with



lesser CAPEX. Another point highlighted was that going forward for having 300 million tons capacity, one must keep in mind how to reduce the amount of carbon load on our society and how to make our steel plants more energy efficient & environmental friendly. It may be worthwhile to focus on Electric Arc Furnace route for tonnage steel production with considerable steel scrap availability and lower power tariff.



Dr Sanak Mishra stressed in his presentation that it is necessary to create a technologically advanced and globally competitive steel industry that promotes economic growth. Towards this goal, there are several segments of the steel industry in India which need to reach global norms in terms of energy efficiency in operation, cost efficiency in value addition, and in product characteristics in terms of chemical and physical attributes—particularly with respect to surface quality and dimensional tolerances. At the same time, it is also imperative that major technological interventions are required, especially in many instances of steel assets created before 80's in areas of coke ovens, sinter plant, iron making, steelmaking, casting and rolling, to name a few. In the secondary steel sector the extent and level of automation must go up. In brown field expansions of capacity into new product lines, quality control systems throughout the processing chain have to be strengthened which again will require technology interventions. Being globally competitive will call for consistent reduction in specific consumption of raw material and energy, improvement in yield at all stages of conversion, and enhancement of product features. Much of this will be possible in the selection of state-of-the-art environment-friendly technologies in green field projects, as well as in their adoption in revamping of pre-existing older assets. Competitiveness will also depend upon the capability to design and innovate new processes and develop new products for the market; the importance of R&D cannot be underestimated.

## Technical Session – IV

### Prospects of non-ferrous industry

The session was chaired by Shri Santosh Sharma, CMD, Hindustan Copper Limited. Eminent speakers from non-ferrous industry as well as Dastur& Co made the presentation.

Mr Pugazhenthly highlighted the current & emerging scenario of lead & zinc in India. He mentioned that about 80% of Zinc consumed in India goes into the hot dip galvanizing sector for tubes, wires, sheets, structurals, fasteners etc., Traditionally hot dip galvanized steel products are used in power transmission, railway electrification and telecom since they provide a long, maintenance free life. The new markets are highways, renewable energy, rural electrification, galvanized rebars for RCC structures, smart cities etc. About 75% lead is used for manufacture of lead acid batteries; Lead batteries find usage in automobiles, inverters, telecom, railways, defence communication, UPS for computers etc., The new, emerging application areas are renewable energy, electric vehicles, street lighting, traffic signals etc.,



Dr Agnihotri, Director, JNARDDC spoke about aluminium R&D & emerging applications in India. He mentioned that although Indian Aluminium companies have traditionally developed research capabilities in house, they have also established collaborative links with other organizations but still the Indian aluminium companies are dependent on international technology suppliers and they are acquiring technology from international enterprises through licensing or takeovers. Although in India aluminium R & D is generally undertaken by the industries, Government R & D institutes and academia but has not yielded significant benefit to the nation as a whole. Investment in R&D is still not considered

a cost effective activity by the Indian aluminium companies, hence there is a necessity for the government to step in and support aluminium R&D efforts in collaboration with industries, academia & R&D institutes.

Indian aluminium companies along with Government of India should work on new developments for a number of strategic projects in all business segments related to



aluminium like defence, automobile, building & construction, energy, environment. With both demand and consumption of aluminium in positive territory, the time is now opportune for producers to move beyond their traditional strengths in electrical and building segments and shift gears to the emerging applications offered by the defence and aerospace domains. Aluminium is widely used in making various ammunition components, parts for missiles and missile batteries, tanks, and components used in spaceships and satellites.

A growing number of emerging applications make aluminium the metal of choice in the future. Indian Aluminium industry research and development focus should also be also on product development to support sustainable, profitable growth; manufacturing technologies to improve efficiencies and reduce costs; and on environmental risk reductions.

Converting Mining Waste to Secondary Resource was the presentation made by Hindustan Copper Limited. The speaker informed that HCL has taken projects to recover value minerals and metals from the concentrator plant tailing and find usage for the waste rock generated in open pit mining operation as construction material/railway ballast. Two concentrator plants tailings have been tested for the recovery of Copper Concentrate, Gold, Silver, Silica, Magnetite and Micronutrients. Based on the positive response of the laboratory scale tests, a pilot plant test carried out to validate the laboratory test results which proved success. It is found from the feasibility study that multi mineral and metal recovery from respective tailings is an economical proposition. Accordingly, HCL has undertaken construction of 3.29 MTPA tailing beneficiation plant for recovery of glass grade silica, magnetite, copper concentrate- ore grade and precious metals – Gold and Silver.





Presentation from Dr D De Sarkar, CEO, Indian Copper Development Centre highlighted the current and emerging applications of copper. Presently electrical sector is the largest user of copper in generators, transformers, motors, switchgears, power & control cables, etc. The other sectors using substantial quantity of copper are – transport including automobile, railways and marine; building & construction; process industry; general engineering; consumer durables; defence; coinage and of course, handicraft and metal art ware. There are a large number of emerging areas for usage of copper. These include e-vehicle (both for vehicles and charging stations); renewable energy sector as copper is the primary material for induction coils in wind turbine, in stator and rotors of giant turbines. Another newer application for copper tube is high efficiency gas thermal heat pumps. Solar panels will also need large quantity of wires. “Touch surface” concept based on copper's anti bacterial property is expected to open up new usages of copper based sheets, rods & tubes. Use of copper tube in hospitals' medical gas supply line is adding to copper tube demand substantially. Similarly another potential emerging area is aqua culture. Copper alloy netting improves fish productivity leading to heavier fish, higher yields and at lower cost. Additional benefits include less damage, long life and 100% recyclability. In hi-tech end use sector – copper finds its uses in coating of superconducting alloys, containers and pipe lines of cryogenic medium, cooling linings of rocket engines and magnet windings in high energy accelerators.

## Technical session – V

### Metals requirement of Strategic Sectors

The session was chaired by Shri A.C.R Das, Former Industrial Adviser, Ministry of Steel. Presentations were made by Indian Rare Earths Ltd., Midhani, Metal & Steel Factory, Ishapore, Centre for Engineering & Technology (CET), BSP Sub Centre, SAIL & Indian Stainless Steel Development Association.

Presentation from IREL focussed the importance of strategic minerals. It was explained that a critical mineral/material may or may not be strategic while a strategic mineral/material will always be critical. These minerals would also play an important role in nurturing the domestic manufacturing capacity to support the Government's low-carbon plans. Commercially, rare earth minerals find specialised use in a range of industries and modern applications, such as aerospace, automobiles, cameras, defence, entertainment systems, laptops, medical imaging, nuclear energy, smart phones, batteries, hybrid car batteries, and also a host of other new technologies that are skyrocketing in popularity and sales. Growing demand for magnets in automobiles, and energy generation will majorly contribute to the growth of global rare earth metals. The demand for rare earth magnets containing neodymium is expected to grow at a CAGR of 8.2% from 2017 to 2024. Rare Earth minerals are found in form of oxide, carbonates, phosphates or silicates from which individual high purity rare earth materials are produced. The production process involves several purification stages such as mining, mineral beneficiation, concentration by hydrometallurgy / pyrometallurgy, solvent extraction and molten salt electrolysis and vacuum reduction. Strategic minerals such as lanthanum, neodymium, dysprosium, terbium, beryllium, uranium, cobalt, chromium, manganese and platinum are expected to gain importance due to the bulk requirement. Based on a study released by the Council on Energy, Environment and Water (CEEW), a leading policy research body, twelve critical identified minerals could play an important role in the success of 'Make in India' programme and the sustainable growth of the Indian economy.

Paper from OFB, Ishapore stressed the need for advanced materials for Defence sector under Make in India initiative. The speaker explained that with the current economical growth, India is likely to become the second largest economy in the world by 2050. As India is dislodging many countries to move to the second position, non-cooperation in strategic sector is likely to be faced from those countries. To counter the same, India has to be self-



reliant in the strategic sectors like Defence. It is felt that the absorption or development of advanced Defence technology is a slow process due to its complexity and business risk involved even though the Government is committed to transform India to a Defence Industry hub. The advance material will play a key role for the efficiency and effectiveness of the current/future technology. The advance material need to have improvements in strength, stiffness, toughness and able to be produced in large quantities at a reasonable cost. The advanced materials need to have light weighting, improved thermal stability and excellent performance at high strain rates.



The advanced materials cover metallic and non-metallic like composites. Composites include MMCs, PMCs, CMCs and CCs. Today, the Defence sector is heavily using various types of steel like carbon steel, stainless steel, other alloy steels and aluminium & its alloys. At present the steel being used are having strength 0.5 to 1.5 GPa but future requirements being forecast for ultra high strength steel beyond 2GPa and toughness about 50 joules. Metal & Steel Factory, Ishapore has already carried out developmental work and in a pilot scale could achieve strength close to 2 GPa in Micro Alloyed Steel. Wherever drastic weight reduction is required, Ti and its alloys are being slowly replacing steel. Development is also going on for developing new Aluminium based alloys and Nickel alloys. Each material choice is application specific and is selected based on its strengths and weaknesses. Today the need is to develop advanced materials for strategic Defence Sector to improve the performance of the current technologies as well as to adopt new technologies.

The presentation from CET, BSP Sub Centre, SAIL has highlighted the salient features of newly commissioned Universal Rail Mill. The state-of-art 1.2 Mtpa capacity URM will enhance BSP's overall capacity to produce rails to more than two million ton per annum. It will be the largest production capacity for rails in any single location for a plant world over. The rails rolled from new URM will be of good surface quality having less residual stresses and improved overall quality. The URM complex would equip SAIL to meet Indian Railways' specific demand of 260 meter long rails.

The presentation from ISSDA discussed the importance of nickel alloys and stainless steel for strategic sector applications. India has emerged as the fastest growing economy of the world. Most crucial to this development is the need to have a strong and robust "strategic" sector industries. One of the key parameters for the performance and capability of these strategic industries such as nuclear and defence, aerospace, power, oil and gas, chemical and other key industries is the availability of high performance materials. Nickel alloys and stainless steels, being corrosion resistant and high temperature alloys, have been the backbone of these industries. Over the last few decades extensive research and development has been done to design and produce these alloys strategically to fulfil the need of this industry, demanding cutting-edge alloys for enhanced performance. Over the time Nickel alloys and stainless steels are of considerable economic and strategic importance to many countries, as can be appreciated from the wide diversity of end-use industries which it serves.



## Technical Session- VI

### Secondary Steel Sector – Its Contribution and Challenges

The session was chaired by Ms Ruchika Chaudhry Govil, Jt. Secretary, Ministry of Steel, Govt. of India.

The presentations were made by MECON, SRTMI, All India Induction Furnaces Association.

Mecon presentation highlighted the future opportunities for the growth and sustainability of secondary steel sector for achieving the steel capacity build up of 300 MTPA by 2030-31 as per the National Steel Policy (NSP) -2017. Moreover the contribution of secondary sector through Electric Arc Furnace (EAF) and Induction Furnace (IF) route shall be 35-40% that is an addition of 60 MTPA steel. The ambitious infrastructure projects and the thrust in manufacturing through the “Make in India” campaign are steps in the right direction. The plan for smart cities, improved road and rail connectivity by building highways, bridges and dedicated freight and superfast rail corridors have huge potential to spur domestic steel demand. The secondary sector has an important role in bridging the steel demand gap by setting up of compact, energy efficient and environment friendly steel making units spread out over the entire country. Presentation covered the various challenges being faced by conventional IF steel making route and how it can be updated with adoption and adaption of advanced technologies to improve the quality of steel, make it more energy efficient and environmental friendly. Quality issues like Ladle Dephosphorization, adoption and integration with ladle furnace and other secondary refining units ensuring quality steel production has also been covered in the presentation.

Dr. Mukesh Kumar, Director, SRTMI discussed the issues & imperatives of secondary steel sector. He pointed out that during last few years the entire secondary sector has undergone



tremendous stress because of raw material issues arising mainly due to some legal mining issues, high energy cost, lack of financing options and surging imports of steel products into the country. Although, a number of initiatives have been undertaken by the Ministry of steel, Government of India to provide support to the secondary sector but still the secondary sector is under stress and more than 50%



of the capacity based on DRI route is lying unutilized. To achieve target of 300 My/yr by 2030, 35-40% of the steel production is envisaged from the secondary sector. Such mammoth target is difficult to achieve unless development is driven by Technological interventions so that secondary sector not only can produce quality steel in the most cost effective manner with continuous reduction in greenhouse gas emission but also can contribute in producing alloy steels also. Now the main focus will be on the adoption of best available technologies including use of coal gas, introduction of refining technique to control Phosphorous and Sulphur, heat recovery system, use of plastics and polymers, scrap preheating, EAF slag utilization, direct charging of hot DRI etc. Since, majority of the secondary sector is dominated by small players, there are corporate issues also like lack of incentives, awareness and motivation to upgrade and innovate for enhanced productivity and profitability. Hence, confidence building along with technological intervention may be the only way for the future development of the secondary steel sector to ensure that the expectation from the secondary sector is fully achieved and India can be one of the lowest cost producers of steel.

Secondary Steel Sector is presently contributing more than 50% of the total steel production of India. Shri Kamal Agarwal of All India Induction Furnaces Association presented a paper on “Road Ahead for Induction Furnace Segment – Challenges and Prospects”.



## Technical session – VII

### Energy / Environment Issues in Mineral and Metal Sectors

The session was chaired by Shri K.K.Mehrotra, Former CMD, MECON Ltd. Presentations were made by RINL, Paul Wurth, JSW Steel, Primetals Technologies, Nippon Steel, Sagta Engineering Ltd, China & Kluber Lubrication.



The presentation by RINL focused on experience of RINL in deploying energy conservation technologies in the new business environment. Policy framework, enablers for implementation of policy, deployment of eco friendly state of art energy efficient technologies, Bench Marking and adopting technologies to minimize gap, harnessing waste energies in all processes to generate electricity and process heat to reduce reliance on grid, making road map to comply PAT 2nd cycle targets, Renewable Power Purchase Obligations (RPPO). GHG inventorisation



and reducing GHG emissions through above technologies. Deploying technologies through international cooperation mechanism (Clean Development Mechanism and BOCM) where capital is not available and projects which are not feasible. Institutionalization of energy management system through ISO: 50001 to make energy conservation as a way of life has created foundation stone for optimizing energy at shop floor level. The plant has achieved highest level of waste heat recovery (62%) in Indian Steel Industry. The plant has installed majority of energy efficiency technologies. These measures resulted in reduction of overall specific energy consumption by more than 5% during the year 2017-18.

Presentation from M/s Paul Wurth described that how modern coke plant technology can fit in pollution reduction in coke plant. A coke oven plant is an industrial plant, which will always influence the environment. With this in mind and using the best available technology as mentioned below it is possible to reduce the pollution drastically.

- Sealing system for coke oven doors.
- Coke oven door cleaner

- Sealing lids during charging of top charged coke oven
- Single Oven Pressure Control valve for smokeless charging system for both top charged and stamp charged Battery.
- Sealing frame at SCP machine
- On-board de-dusting system at Pusher Machine/SCP machine

Presentation from Primetals deals with four different environmental saving technologies from its entire product spectrum:

1. Selective Waste Gas Recycling (SWGR) which features the partial diversion and reuse of hot Sinter off-gas from selected wind boxes along the Sinter strand.
2. Maximized Emission Reduction Of Sintering (MEROS<sup>®</sup>) wherein hot flue gas from sinter plant is adsorbed in a reagent to remove SO<sub>x</sub>, NO<sub>x</sub>, VOCs and heavy metals to meet regulatory standards.
3. Dry De-dusting System and the Energy saving module in ESP (“Precon”) for gas collection and cleaning in the BOF steel-making route.
4. Dynamic damper control in secondary de-dusting wherein real-time mathematical models reduce the absorbed electrical power.

Thus all the process technologies for sintering, iron making, steel making etc. can be modified to recover energy (thermal, steam etc.), minimize emissions and reduce the carbon footprint while the return of investment for this CAPEX is very short period of time.



Presentation from Nippon Steel was on Dry Type Vessel Electrostatic Precipitator System for Blast Furnace Gas Cleaning Technology. In order to meet the growing momentum for “ZERO Effluent discharge”, NSENGI has developed a completely new dry gas cleaning system “Dry type Multi-Vessel Electrostatic Precipitator system (Dry-MVEP system)” in 2016. The system has huge advantages such as, high dust collecting efficiency to reduce the dust content in cleaned gas below 5 mg/Nm<sup>3</sup>, increasing the TRT power generation (approx. 25%-30% higher than conventional wet-type.), saving the required site area and reducing the maintenance frequency. Furthermore, it contributes a stable operation in any case of low and high gas temperature. The integrated dust transportation technology had installed in 4 units of large blast furnaces in Japan and they have been operating successfully.



Another presentation from Nippon Steel was on KR De-sulphurisation Technology. As there has been a rapid increase in the demand for high-quality steel in India. Hot metal with sulphur concentration as low as 10-20 ppm is being required for various applications. KR De-Sulphurisation is a hot metal pre-treatment system that removes Sulphur from hot metal to lower levels at a cheaper cost than conventional systems. The Kanbara Reactor (KR) was developed by Nippon Steel & Sumikin Engineering Co., Ltd. (NSENGI) and this technology has been successfully performing in Japan, India and abroad. This is an ideal technology for efficient and economical De-Sulphurisation of Hot Metal by maximizing the contact between the desulfurizing agent and the hot metal. In the KR process lime (CaO) is used as the main reagent, which reduces the operation cost drastically (approx. 30%) as compared to other De-Sulfurization systems.

The pellet and sinter quality characteristics depend, to a large extent on aerodynamics parameters prevalent in the pellet and sinter making. A presentation on “Optimisation of Pellet Car Aerodynamics for Improvement in Quality and Yield of Sinter” was made by representative of JSW Steel.

Sagta Engineering in their presentation highlighted the technology for Real Time Condenser Cleaning System. This is a solution for efficient cleaning of heat exchangers.

Some of the highlighted features are as follows:

- Real-time equipment cleaning with simultaneous heat transfer improvement.
- Improvement of condenser efficiency by a 300 MW generating unit heat transfer by over 20%
- compared ball cleaning systems, the savings may amount to over 1.5 g/k Wh of coil for a 600 MW generating unit



M/s Klüber presented the lubrication methods for continuous caster. For decades, continuous caster bearing lubrication (considering billet, bloom, slab) with grease through centralized grease lubrication system is a challenge for maintenance persons in steel plants. Many times they spend sleepless nights to overcome bearing failure and line clogging issues. Moreover these issues cost heavy mechanical downtime with man-hour losses with premature bearing failures. Modern CCP segments are having multiple split rollers with increasing number of lubrication points. With higher slab width, increased metallurgical length with higher exit slab temp the performance of lubricant is also in a demanding position. At Klüber Lubrication 3 greases were tested ( one existing product of Klüber which

is in use at different slab casters across India , one competitor equivalent product , one developed test grease ) for high temp pump ability. As per the trial report and pilot grease performance for last eight months, the grease is successfully used in all slab casters and customer is highly satisfied. This newly developed grease will not only solve bearing starvation or line clogging problem but also reduce consumption dramatically. The other intangible benefits are like less mechanical downtime, higher productivity, enhanced bearing life, less grease accumulation at pulpit etc.

## Valedictory Session

Shri Manoranjan Ram, Member, Executive Committee, prepared a brief summary of the papers presented in the Conference. This Summary was presented by Shri P K Bajaj, Vice Chairman, IIM Delhi Chapter, in the Valedictory Session. Shri Gagan Sahni, Director, International Trade and Exhibitions (India) Pvt. Ltd (ITEI) presented the Summary of the Exhibition. Shri B D Jethra, Chairman of IIM Delhi chapter, gave away the awards to the distinguished exhibitors in the Valedictory Session.







# RECOMMENDATIONS

## RECOMMENDATIONS OF MMMM - 2018 CONFERENCE

The Indian Steel Sector has grown over 8.6% during 2010-2015. In case ,India has to achieve steel production capacity of 300 MT by 2030 as envisaged in National Steel Policy-2017, the growth rate would be around 6.6%. This seems to be achievable target.

The increase in installed capacity from current level of 126 My/yr to 300 Mt/yr is close to 2.5 times in little over 10 years time can be achieved by expansion of existing steel units both in primary and secondary sector as well as installation of 3-4 mega green field integrated steel units of 6-12 Mt/yr capacity. In order to achieve the above target, Government, steel producers and all associated stake holders have to work keeping the recommendation suggested below.

### Recommendations

#### Raw Materials

- Limited auction of iron ore resources amongst end users and provision of renewal of captive concession.
- Facilitate auction of mineral blocks in a regular manner.
- Utilization of low grade fines must be promoted
- Methods of exploration & exploitation of magnetite resources to be developed through eco friendly techniques.
- Transportation of iron ore fines to pelletization units should be through cost effective slurry pipelines and conveyors.
- Acquisition of mineral assets overseas.
- Facilitate exploration & optimal utilization of deep seated coking coal reserve.
- Coking coal blocks should be allocated through limited auction amongst end users in steel industry.
- Semi coking / coking coal should be given to only steel producers.
- CIL should create e-auction windows for steel producers .
- Installation of number of coal washeries for low ash coal production
- Explore the efforts to raise resources of iron ore, limestone, manganese and chromite ore.
- Availability of rare earth material is huge in India. But exploitation of the same is poor. Special attention needs to be given to rare-earth material for its exploitation.





## Infrastructure & Logistic Facilities

- Modernisation & Expansion of major existing ports as well as development of new ports in time bound manner to handle the increased tonnage of imported raw material and export of finished products.
- Railways to improve last mile connectivity to mines for faster evacuation of ores
- Increasing the haulage capacity by introducing higher axle load wagons for faster movement of raw materials & finished products.
- Reduction in power tariff for environmental friendly processes like EAF & IF process for steel making
- Faster completion of NHAI National Grid & Bharatmala road projects for faster & smooth transportation of material by road.
- Formation of Slurry Transportation Authority under Ministry of Steel in line with NHAI for laying & operation of slurry pipeline.
- Reduction in logistic cost as the same is very high in India compared to other countries
- Development of waterways for cheaper mode of transportation

## Technology & R& D

- Adoption of technologies for value added and import substitution steel products like CRGO, API X100, higher dia seamless pipes,
- Adoption of energy efficient & higher module units for production of steel at competitive cost.
- Development of advance materials required for defence , space & aero sectors.
- Technical tie up with leading technology / process providers for absorption of technology to reduce the Capex and gestation period for adoption of same technology in other units
- R&D efforts towards conversion of non coking coal into coking coal
- Increase in R& D expenditure by Mineral & Metal sectors to develop indigenous technology.
- Adoption of smart modernisation technique for expansion / modernisation with lesser Capex



- R&D efforts in collaboration between industries, academia & R&D institutions with Government of India in non ferrous sector for development of number of strategic project in defence, space, aero & automobile sectors.
- Use of coal gas, introduction of refining techniques for control of phosphorus/ sulphur, heat recovery system in secondary steel sector
- R&D for recovery of precious metals from red mud, a waste generated from Alumina plant

### Energy & Environment

- Incentivise zero discharge concept adopted by industries recycling & recovery of process waste.
- Adoption of energy efficient & environment friendly green technologies / processes for reduction of energy and carbon foot print for mineral / metal production
- Conversion of mining / plant waste to secondary resources
- Effective use of slimes

### Capital & Finances

- Capital requirement is the first priority in creation of new capacities in metal production. Interest rate on borrowing therefore should be attractive to raise capital
- Reduction in freight cost by Railways both for inbound materials & outbound finished products
- Attractive power tariff for environment friendly & less capital intensive processes like Electric Arc Furnace & Induction Furnace.

### Government Policies

- Reduction in time span for getting faster clearances from State / Centre Government Agencies.
- Encouraging the metal & mineral sector to reduce carbon foot print in their operation by providing various tax concessions.
- Provide tax concession / incentive to plants adopting indigenous developed technologies / processes.

