Met-Info

The Indian Institute of Metals
Delhi Chapter

Jawahar Dhatu Bhawan
39, Tughlakabad Institutional Area, M B Road
Near Batra Hospital, New Delhi-110062

E-mail: iim.delhi@gmail.com

Visit Us: www.iim-delhi.com

CONTENTS

Know Your Members

Editor-in-Chief: S C Suri
Associate Editor: S.K. Varshney

IIM DELHI CHAPTER
EXECUTIVE COMMITTEE: 2024-25

Executive Committee Members: Contact Details

Name / Designation	Affiliation	Contact No / E-Mail
Shri R K Vijayavergia *Chairman*	Ex. Executive Director Steel Authority of India Ltd	9650155544 rkv.sail@gmail.com
Shri Deepak Jain *Vice Chairman*	Former Dy. Director General (W) BIS	9868640986, 8368622619 deepakjain7177@gmail.com
Shri K R Krishnakumar *Hon. Secretary*	Consultant Ministry of Mines	9818277840; 01202773861 kuduvak059@gmail.com
Shri Ramesh Kumar Narang *Hon. Treasurer*	Consultant Odisha Coal & Power Ltd	9899298857 rknarang62@gmail.com
Shri M P Sharma *Hon. Jt. Secretary*	Scientific & Technical Consultant Aluminium Industries	9212202084; 9818508300 aluminiumconsultant@yahoo.com aflmps@rediffmail.com
Shri B D Jethra *Member*	Former Adviser Planning Commission	9818326878 jethra@yahoo.com
Shri K L Mehrotra *Member*	Ex CMD MOIL	9810203544;klm91048@gmail.com klmehrotra48@gmail.com
Shri K K Mehrotra *Member*	Ex CMD MECON Limited	9868112514; 01203645267 kishorekmehrotra@gmail.com
Shri Manoranjan Ram *Member*	Vice President, Head of Sales & Marketing Danieli Group	99100149989 manoranjanram@yahoo.com m.ram@danieli.com
Shri N K Kakkar *Member*	Former Vice President Somani Kuttner India Pvt. Ltd.	9871008505 nirmalkakkar@gmail.com
Dr. Ramen Datta *Member*	Consultant Steel Research & Technology Mission of India	9958084110 dattaramen@gmail.com
Shri N Vijayan *Member*	Director Technotherma India Pvt. Ltd.	9818695690 technothermaindia@gmail.com
Shri G I S Chauhan *Member*	Former ED I/c, RDCIS, SAIL	9717302437; 7048993116 gisc.delhi@gmail.com
Shri Ram Gopal *Member*	Former ED SAIL	9968605059 ramgopal.sail@gmail.com
Dr. Rahul Sharma *Member*	Director India International Zinc Association	9910299297 rsharma@zinc.org
Shri Anil Kumar *Member*	Ex Tata Steel	7763807077 kvsa2009@gmail.com
Prof. Nitya Nand Gosvami *Member*	Associate Professor Dept. of Materials Science & Engg., IIT Delhi	9958887964 ngosvami@iitd.ac.in
Prof. Suddhasatwa Basu *Special Invitee*	FIPI Chair Professor IIT Delhi	7838134181 drsbasu@gmail.com
Dr. Mukesh Kumar *Special Invitee*	Sr. Adviser JSP Group	9650080849; 9584032329 drmukeshkumar@gmail.com
Shri R K Sinha *Special Invitee*	Ex Director (Operations) Modern Steels Ltd	8968684955 rksinha555@gmail.com
Shri R K Singhal *Invitee*	Consultant Steel Research & Technology Mission of India	9910055630 rksh.singhal@gmail.com
Shri Sushil Kumar Varshney *Invitee*	Director/CEO Academy of Industrial Management Delhi	9312672831 acadim@gmail.com
Shri B R Jain *Invitee*	Sr. Adviser Engineering Council of India	9313190011 jainbinay@gmail.com
Shri Ashok Kumar Khatri *Invitee*	Director Technotherma India Pvt. Ltd.	9818695689 ashokkhatri10@gmail.com

International Conference on
Process and Product Innovations in Metal Production

Delhi Chapter of The Indian Institute of Metals, organized International Conference on **Process and Product Innovations in Metal Production** as a part of 14th edition of ***Mining, Minerals, Metals & Metallurgy*** event, **MMMM 2024** at recently inaugurated *India International Convention & Expo Centre* located at Yashobhoomi, Dwarka in New Delhi.

Honourable Minister of State for Steel & Heavy Industries: Shri Bhupathiraju Srinivasa Varma Ji, inaugurated the Conference. Former Secretary, Ministry of Steel, Shri NN Sinha Ji, also graced the inaugural program.

Shri Bhupathiraju Srinivasa Varma, Hon. Minister of State for Steel and Heavy Industries, spoke on imbibing the best practices in the metals ecosystem in India and the need to ensure resource efficiency and sustainability in production processes.

Souvenir and the *Conference Volume* (compilation of technical papers presented in the Conference), were released during Inaugural Program by Hon. Minister of State for Steel & Heavy Industries.

The Conference was also graced by Dr Sanak Mishra, Dr L. Pugazhenthy and Shri S. S. Mohanty, Former Presidents of The Indian Institute of Metals. Shri PK Singh, Former SAIL Chairman, Shri KK Mehrotra, Former CMD, MECON, Shri PK Bajaj, Former MD of Durgapur Steel Plant, Prof. S Basu of IIT Delhi and Prof. V. Ramaswamy from PSG College of Technology chaired various sessions in the Conference. Several other industry veterans and Brig. (Retd.) Arun Ganguli, Secretary General, IIM Kolkata, were also present.

Conference attracted delegates from many parts of the country. There were 32 presentations from experts from Industries, National Laboratories, Technology Suppliers and Academic Institutes covering both ferrous and non-ferrous sectors and also primary and secondary sectors.

Apart from Inaugural, Valedictory and Panel Discussion Sessions, the Conference included following seven technical sessions:

- **Product Development and Applications**
- **Process Innovations in Steel and Metal Sector**
- **Decarbonisation of the Metal Sector**
- **New Technologies**
- **Recovery, Recycling and Waste Management**
- **Raw Material Beneficiation Advanced Refractory Material**
  Digitalisation and Smart Technologies


International Conference on
“Process & Product Innovations
in Metal Production”
27-29 September 2024
Yashobhoomi (IICC), Dwarka, New Delhi
MONOJIT DUTTA
ABHINANDAN CHATTERJEE
DR L PUGAZHENTHY
ASHWANI KUMAR
PRADYUT SENGUPTA


International Conference on
“Process & Product
Innovations
in Metal
Production”
The Indian Institute of Metals
Delhi Chapter
MONOJIT DUTTA
DR L PUGAZHENTHY


Organized By
IIM
GOLD SPONSORS
DANIELI
SILVER SPONSORS
SRTMI
"Process & Product Innovations in Metal Production"
PRADYUT SENGUPTA


MINERALS METALS METALLURGY MATERIALS
Process optimization through numerical simulations and advanced extrusion press capabilities for high strength alloy extrusion
VNSU Viswanath Ammu*
Senior Scientist
Hemendra W, Immanuel Raju, R N Chouhan, A Agnihotri
Jawaharlal Nehru Aluminium Research Development and Design Centre
International Conference on
"Process & Product Innovations in Metal Production"


IIM
International Conference on
"Process & Product Innovations in Metal Production"
KUMAR ABHISHEK
ANISH A. SURYA


International Conference on
"Process & Product Innovations in Metal Production"
27-29 September 2024
Yashobhoomi (IICC), Dwarka, New Delhi
GOLD SPONSORS
DANIELI
SILVER SPONSORS
calderys
NMDC
KIT SPONSOR
REFRESHMENT
KNOWLEDGE PARTNER
SRTMI
MEDIA PARTNERS
EVENT PARTNER
NIRMALYA DEB
INDERPAL DHULL
BISHNU KUMAR DAS
SHILPI KAPUR
S S MOHANTY


BIGMINT
Formerly STEELMINT / COALMINT
ecarbonisation challenge for Indian Steel Industry
Organized By
IIM
GOLD SPONSORS
DANIELI
SILVER SPONSORS
calderys
SRTMI
International Conference on
"Process & Product Innovations in Metal Production"
27-29 September 2024
Yashobhoomi (IICC), Dwarka, New Delhi


Organized By
IIM
GOLD SPONSORS
DANIELI
SILVER SPONSORS
calderys
SRTMI
SHILPI KAPUR
International Conference on
"Process & Product Innovations in Metal Production"
27-29 September 2024

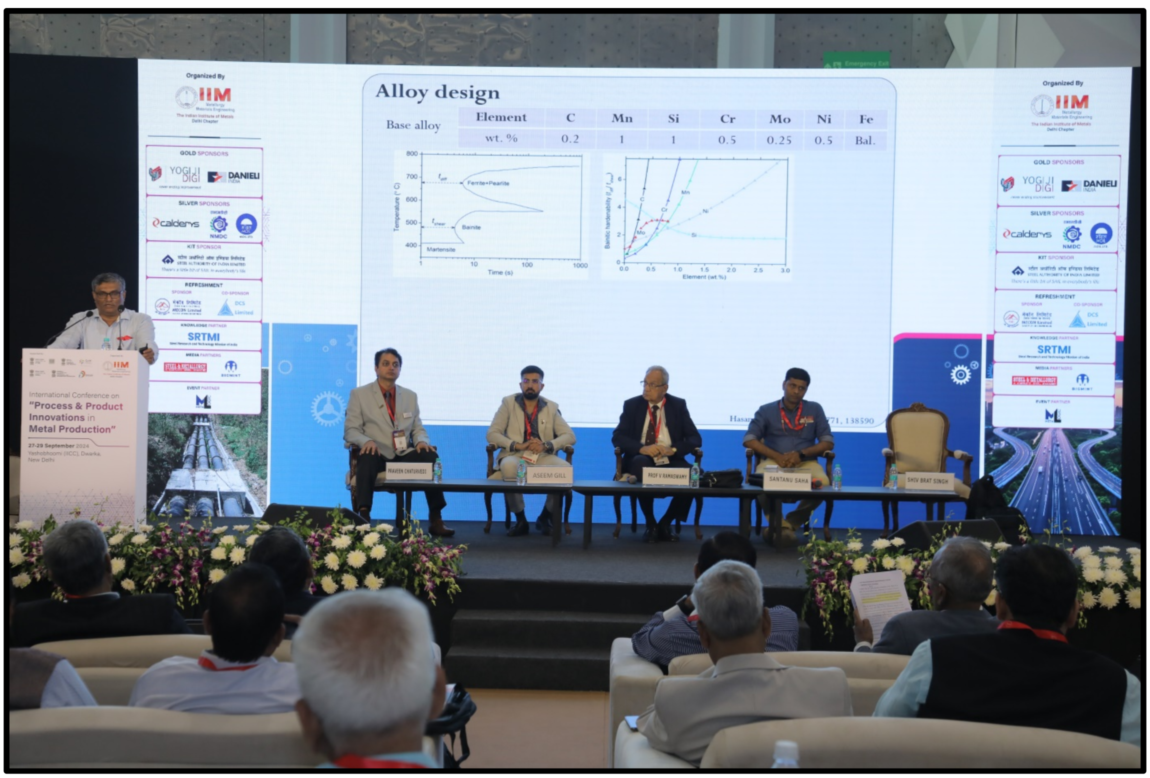

Brazil
France


IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter
in Metal
Production”
International Conference on
Innovations
in Metal
Production”


International Conference on
"Process & Product
Innovations in
Metal Production"
27-29 September 2024
Yashobhoomi (IICC), Dwarka,
New Delhi


PROF S BASU
DR ARUN GIRI
R K SINGHAL


IIM
International Conference on
"Process & Product Innovations in Metal Production"
Organized By
GOLD SPONSORS
DANIELI
SILVER SPONSORS
NMDC
SRTMI


Alloy design
Base alloy
Element C Mn Si Cr Mo Ni Fe
wt. % 0.2 1 1 0.5 0.25 0.5 Bal.
Ferrite+Pearlite
Bainite
Martensite
Time (s)
Element (wt %)
Organized By
IIM
GOLD SPONSORS
DANIELI
SILVER SPONSORS
SRTMI
International Conference on
"Process & Product Innovations in Metal Production"


International Conference on
"Process & Product
Innovations
in Metal
Production"
IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter


International Conference on
"Process & Product
Innovations
in Metal
Production"
IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter
GOLD SPONSORS
SILVER SPONSORS
KIT SPONSOR
NMDC


International Conference on
"Process & Product Innovations in Metal Production"
27-29 September 2024
IIM


BHUPINDER SINGH
ALOK KUMAR MATHUR
K K MEHROTRA
MOHINDER K SINGHANIA


"Process & Product
Innovations
in Metal
Production"
IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter
International Conference on


IIM
International Conference on
"Process & Product
Innovations
in Metal
Production"
GOLD SPONSORS
SILVER SPONSORS
KIT SPONSOR
REFRESHMENT
KNOWLEDGE PARTNER
SRTMI
MEDIA PARTNERS
EVENT PARTNER
DANIELI
NMDC


PITAMBER ADHIKARI
RAHUL KUMAR
PITAMBER ADHIKARI
DR RAMEN DUTTA
RAHUL KUMAR
JEETENDRA NATH PANDA

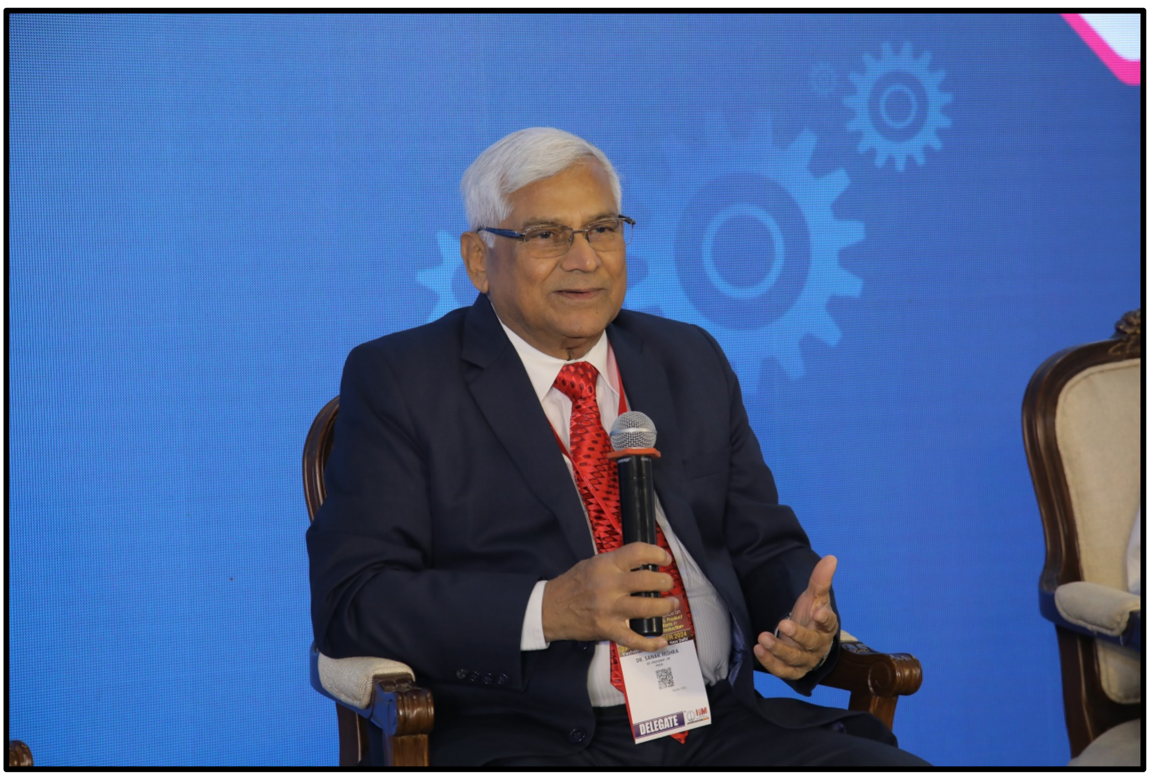

IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter
International Conference on
"Process & Product
Innovations
in Metal
Production"


IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter
International Conference on
"Process & Product
Innovations
in Metal
Production"
RAHUL


Session Chairman
Dr. Sanak Mishra
Ex MD, RSP
VAIBHAV VERMA
DR SANAK MISHRA
VIKAS AGNIHOTRI


VAIBHAV VERMA
DR SANAK MISHRA
VIKAS AGNIHOTRI


Business Context
Challenge
Objective
Outcome
Coke rate
1-1.5% reduction
Production yield
1-2% improvement
Solution
"Process & Product Innovations in Metal Production"


DELEGATE


International Conference on
"Process & Product Innovations in Metal Production"
IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter


International Conference on
"Process & Product Innovations in Metal Production"
IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter
VIKAS AGNIHOTRI


International Conference on
"Process & Product
Innovations in
Metal Production"
27-29 September 2024
Yashobhoomi (IICC), Dwarka,
New Delhi
SRTMI
R K NARANG
P K SINGH


Innovations
in Metal
Production"
The Indian Institute of Metals
Delhi Chapter
IIM
Metallurgy
Materials Engineering


International Conference on
"Process & Product
Innovations
in Metal
Production"
IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter


International Conference on
"Process & Product
Innovations
in Metal
Production"
IIM
Metallurgy
Materials Engineering
The Indian Institute of Metals
Delhi Chapter


International Conference on
"Process & Product Innovations in Metal Production"
IIM
Metallurgy Materials Engineering
The Indian Institute of Metals
Delhi Chapter


International Conference on
"Process & Product Innovations in Metal Production"
IIM
Metallurgy Materials Engineering
The Indian Institute of Metals
Delhi Chapter
DANIELI
NMDC
P K SINGH

The challenges confronting the metals sectors demand collective thinking and action. Inter-disciplinary research and collaboration is not just a choice but also a necessity in navigating the complexities in metal production. This conference aimed to be an ideal platform for fostering inter-disciplinary research in technology and innovation.

The Conference showcased some of the most path-breaking and innovative research currently underway in the metals space, with specific and in-depth focus on product and process efficiencies, sustainability and circularity, as well as the roadblocks towards development and adoption of cutting-edge technologies.

New-age product research

A thought-provoking paper by SAIL was presented on the development of indigenous capability in the production of electrical steels in the country (CRGO, CRNO), which might turn out to be a major substitute to imports of specialty steels. Demand currently is projected at around 0.3 million tonnes (mnt) per annum.

The automotive sector has the major technological challenge of light-weighting, which can be addressed with AHSS. A perceptive presentation by Tata Steel focussed on the different metallurgical processes involved in dealing with the requisite steel microstructure and desired properties for the auto sector.

Steel & sustainability

An insightful paper from Linde plc. focussed on hydrogen, syngas and carbon capture as the three major ways to mitigate emissions from ironmaking.

CCUS technologies will be required in the Indian context to capture emissions from primary steel production, a paper from M.N. Dastur pointed out. However, challenges still persist with respect to utilization of captured CO_2, as well as geological storage capacity.

Against the backdrop of the Steel Ministry's 'green steel' roadmap and recognition of biomass-based sustainable resources as a low-CO_2 alternative in iron production, an insightful paper was presented on ongoing research being conducted by SAIL.

Interestingly, while hydrogen is often considered the silver bullet in decarbonisation of ironmaking, it is important to reconsider the metallurgical complexities of H_2-based iron reduction compared to traditional reductants such as CO in DRI vertical shaft furnaces and coke in the BF.

Presentation by SRTMI focused on the domestic steel industry decarbonisation challenge and the role of best available technologies in low-CO_2 transition of the BF-BOF route of steelmaking, which is so critical a factor in the Indian context.

Leading technology solutions providers, such as Danieli and Tenova, presented on potential ways of transitioning to low-CO_2 operations. Moreover, perceptive papers on recycling of slag (BF/BOF/VOD, etc.) attracted particular attention as a key lever for leading steel mills to cut down on CO_2 footprint.

BigMint presented a paper on decarbonisation challenges in the Indian steel industry and technology pathways that shine a light on future roadmaps for steel producers.

Key takeaway

As the experts at MMMM 2024 so presciently highlighted, the need of the hour is to drive innovation, energy savings and sustainability in the domestic metals ecosystem to drive collective growth, while technical innovation has to be embraced whole-heartedly in driving the metals ecosystem forward.

Nations with Mineral Reserves Needed for Energy Transition

The world's energy system is mainly powered by fossil fuels. The transition to a low-carbon one will shift its underpinnings away from coal, oil, and gas to the minerals needed for solar, wind, nuclear, and other technologies. Which countries have such mineral reserves that can be minded? Below importance of each mineral is explained. The graphic shows the share of the world's reserves in each country.

Bauxite: Primary source of aluminum. Essential for wind turbines, solar panels, batteries, electrolyzers, and transmission cables.

Chromium: Key for geothermal and concentrated solar power. Used in wind turbines, and for radiation shielding in nuclear power plants.

Cobalt: Used in consumer electronics, catalysts for the oil industry, resistant metal alloys, critical components in many lithium-ion battery technologies.

Copper: Critical element in solar photovoltaics, wind power, battery storage, and electricity grids.

Graphite: Key component of battery anodes and therefore important for the transition to electric vehicles, and stationary batteries for balancing electricity grids.

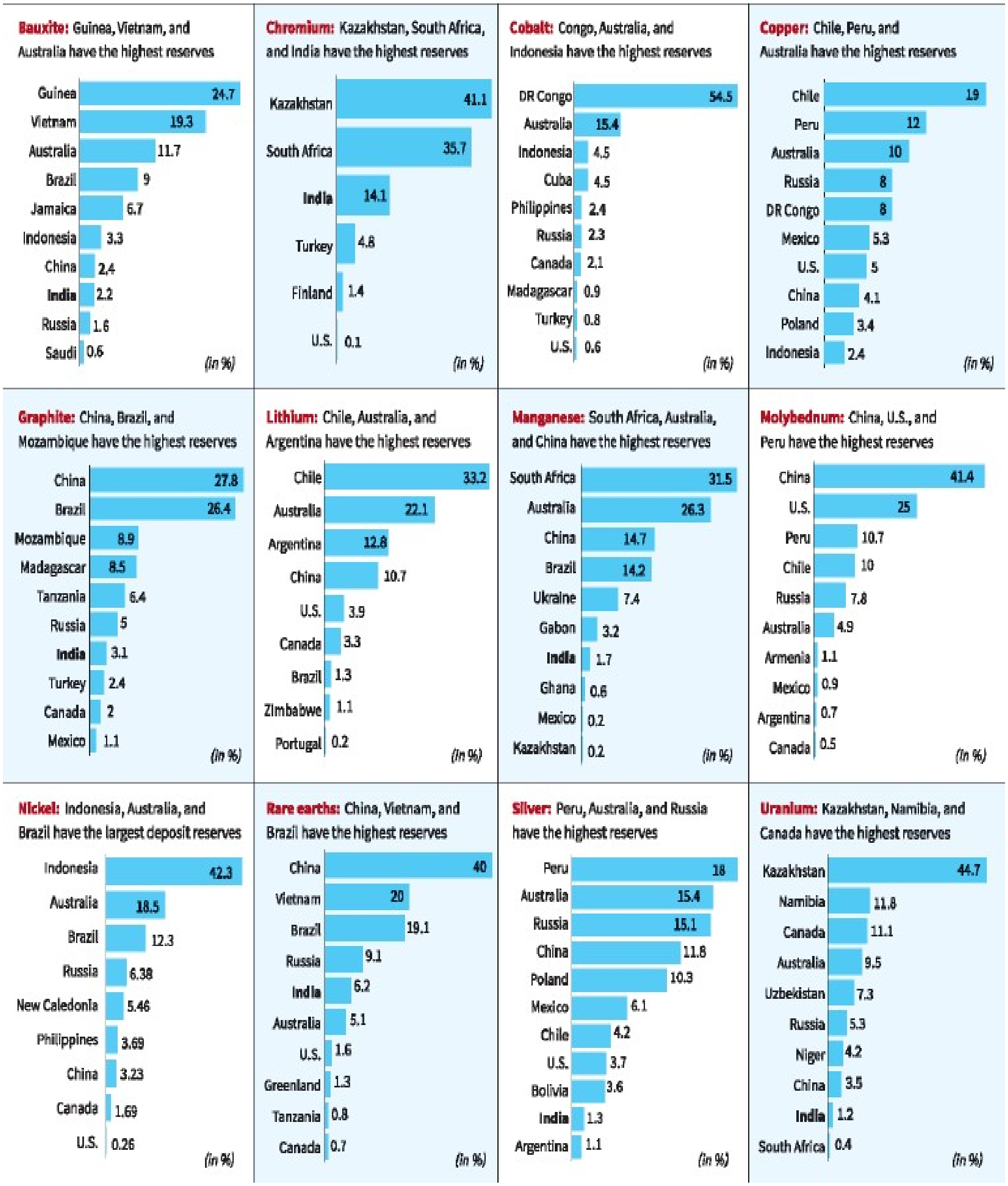
Lithium: Core component of lithium-ion batteries.

Manganese: Widely used in solar and wind power, and in lithium-ion batteries for electric cars.

Molybdenum: Has a very high electrical conductivity but expands little when exposed to heat

Minerals for a clean and green future

The data for the charts were sourced from Our World in Data. The data shows the reserves as a share of the global total as of 2023



Nickel:	Key component in the cathodes of lithium-ion batteries in electric cars.
Rare earths:	Used in wind power for permanent magnets.
Silver:	It's most important role in clean energy is in solar photovoltaics and electric vehicles.
Uranium:	Primary fuel for nuclear energy production.

CCS Hype and Hopes Sinking

Stubbornly high costs and performance issues threaten the prospects for carbon capture and storage (CCS), which is considered as vital to reducing global greenhouse gas emissions.

CCS uncompetitive with alternatives in many sectors

The main reason for this projected decline is a lack of cost competitiveness with renewable-based solutions.

In the power sector, the IEA estimates the fossil fuels with CCS will only generate about 1.5% of global electricity by 2050 in both its 1.5°C and 1.7°C global warming scenarios. In the NZE scenario, the capital cost of coal generation with CCS is expected to be about six times higher than large solar plants in 2030, making it uncompetitive with renewables even when associated with firming (complementary flexible energy supply).

In the hydrogen sector, blue hydrogen (made from gas with CCS) is likely to have carbon emissions well above clean hydrogen benchmarks, and to be more expensive than green hydrogen (made from renewable electricity) by 2030 in most markets.

In the steel sector, CCS has never been used at commercial scale in coal-based blast furnaces, and only three CCS projects are being considered, all at early development stages. The pipeline of low-carbon steel projects is dominated by electric arc furnace (EAF) and direct reduced iron (DRI) projects powered by gas and green hydrogen.

CCS cost estimates likely to increase

CCS's competitiveness is likely to worsen as its actual costs become apparent. An IEEFA review of 13 global flagship CCS projects found most had either failed or underperformed by 20%-50%. Of the three CCS projects that met their targets – one experienced a geological fault while another had to find a new storage location after only 18 months – at a high additional cost.

Australia is home to the world's largest CCS project at Chevron's Gorgon LNG facility on Barrow Island in Western Australia. In its first five years, Gorgon has been beset by delays and operational challenges, capturing just 43% of the CO_2 removed from its reservoir, well short of its 80% target.

The impact of delays, technical challenges and underperformance on costs is high. Those challenges have both decreased the volume of CO_2 captured and increased capital costs for the project, making actual costs much higher than theoretical costs.

IEEFA calculates Gorgon delivered a cost of A$206 (US$138) per tonne of CO_2 captured in the past two years. Since it started operations, the cost amounts to about A$159/tCO2 (US$106). This is four to six times higher than IEA's median cost estimate for the sector.

Today, about three-quarters of CO_2 captured is used for enhanced oil recovery, which provides a revenue stream but increases global emissions. Shifting to permanently storing CO_2 to reduce global emissions makes the financial case much more challenging.

Due to its high cost and low performance, CCS associated with fossil fuels is unlikely to be competitive with renewable alternatives. IEEFA expects the outlook of CCS will continue to decline in coming years.

Source: IEEFA (Institute for Energy Economics and Financial Analysis) Friday Week in Review, 12 Oct. 2024; IEEFA.org

Know Your Members

Sushil K Varshney

Academics

- B. Tech in Mechanical Engg. (1973) from Pantnagar University
- Masters in Total Quality Management
- Certificate Course in Business Management from I.I.T. Delhi
- Certificate in 'Machine Monitoring & Diagnostic Engineering'
- Chartered Engineer of Institution of Engineers
- Lean Six Sigma Belt
- Qualified Master Trainer of the Govt.'s ZED scheme

Experience & Expertise

Starting his career at Rourkela Steel Plant, SAIL in 1975, Mr. Varshney, is now a reputed international consultant / trainer on *Industrial Operation, Maintenance* and *Lean Manufacturing* with 50 years industrial experience. Since 2004, he is Director/ CEO of *'Academy of Industrial Management', New Delhi*.

He has personally conducted 700 training and consultancy assignments in 100 industrial units all over India, including 400+ training programs for engineers / technicians of India's largest power generation company- NTPC - on various maintenance topics. He has also conducted 36 international training programs of 4 or 5 days each in Qatar, Dubai, Saudi Arabia, Mauritius, Bahrain and Bhutan, most of them being successful repeats.

He has presented 27 technical papers in reputed national conferences of IE(I), FICCI, CII, IIPE, NPC, UNDP etc. In 2019, he presented a paper at International Maintenance Conference in Florida, USA. on 'Design Out Maintenance Strategy'

He firmly believes that most repetitive equipment problems which adversely affect the quantity and quality of production, result from deficiency of technical skills at technician as well as the engineer level. Regular technical training helps bridge this gap - which he is actively pursuing through his academy's training programs.

Career History

1. SAIL - Rourkela: (1975-98) 23 yrs as Sr Design Engr and Sr Maintenance Manager. Left on VRS
2. Jindal Stainless Ltd, Hisar: Senior Consultant (Technical Development) & Technical Advisor (Operation)
3. Bhushan Steel Strips: (Now Tata Steel) - DGM (Head of Maintenance)
4. Indian Institute for Production Management (IIPM) – Asst. Director and Sr Faculty
5. ABES Institute of Technology, Ghaziabad: ex Visiting Professor
6. Served as Executive Committee Member of the Research Council of I.I.T. Delhi
7. Since 2020, working as General Secretary of IIPE- Delhi Haryana Chapter
8. Presently associated as Technical Editor with TreeSub Media Group producing India's leading monthly magazines, 'Electrical Mirror', 'Renewable Mirror' and 'Construction Mirror'

Membership of Professional Bodies

- Life fellow (FIE) - The Institution of Engineers(India)
- Life Member (LMIIM) - The Indian Institute of Metals
- Life fellow (FIIPE) - Indian Institution of Plant Engineers