

# Mining Engineers' Journal



Official Publication of Mining Engineers' Association of India

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Vol. 24

No. 10

MONTHLY

May - 2023



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ISSN 0975 - 3001



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## President's Message.....

**Dear Members,**

Greetings...

I wish to put forth the activities undertaken by our Association in the preceding month.

Our Barajamda Chapter hosted the 7<sup>th</sup> Council meeting on 14<sup>th</sup> April 2023 at TATA Steel Noamundi Officers' club and conducted a one day seminar on Best Practices & Digital Initiatives in Mining. On behalf of MEAI, I thank the management of Tata Steel and MEAI Barajamda Chapter for the best of arrangements & hospitality extended to the Council members.

During my visit to Goa, on 22<sup>nd</sup> April 23, I met Shri. T. Victor, Past President MEAI, Shri. Dhaveji, Senior Member and other Members of the Chapter, and discussed about the Mining scenario in Goa & Chapter's activities. It was a great opportunity to meet our members and sharing experiences & other technical matters.

I am extremely happy to share that MEAI Headquarters successfully completed the first batch of First aid Training for 25 people. The Certificate Award Ceremony for the candidates who successfully completed the training in First Aid was organised on 6<sup>th</sup> April 2023. Shri. B R V. Susheel Kumar, Director - Govt. of Telangana, Shri. N K Nanda-Former Director Technical and Officiating CMD of NMDC, Shri. V. Lakshminarayana - Former Deputy Director General of Mines Safety, DGMS, Shri. B. Sahoo - Executive Director, NMDC Hyderabad, Shri. M.S. Venkataramayya - Vice Chairman, Hyderabad Chapter were present.

As a part of MEAI TECH SERIES (MTS) monthly online program, the following talks were arranged continuously.....

**Conditional Bias in Resource estimation** was delivered by Dr Abani R Samal, Principal, Geo Global ,LLC,USA on 17<sup>th</sup> February 2023 as MTS-8.

**Application of Surpac in Surveying, Exploration, planning** was delivered by Shri. Pramod Sarangi, GM-Tech, EDS Technologies on 24<sup>th</sup> March 2023 as MTS-9.

**Smart Mining System for Safe & Sustainable Mining** was delivered by Shri. Suryanshu Chaudhury, Head Mine Planning, GMDC on 28<sup>th</sup> April 2023 as MTS-10.

I request all the mineral industry professionals to utilise this opportunity.

I am happy to note that, Ahmedabad Chapter had organised a knowledge sharing session on "Digitization in Mining Industry" by Kutch local centre on 4<sup>th</sup> April 2023. Conducting such knowledge sharing sessions will go a long way in enhancing the Knowledge and also providing the platform for networking among Mining professionals.

MEAI-NACRI had organised the 4<sup>th</sup> Professional Development Program on IMIC during 24-28 April 2023. I had the opportunity to be present during its inaugural function in which 43 delegates from 19 organisations participated.

During this program, Shri. Shri. B. Surender Mohan - Former Chairman cum Managing Director, NLC India Limited was present as the Chief Guest, Dr. P.V. Rao, Co- Chair, NACRI, Shri. M. Narsaiah - Secretary General, Shri. T. Rajasekar - Program Coordinator, Shri. Shameek Chattopadhyay - Faculty member shared the dais. Shri. VS Rao, former President MEAI was the Chief Guest in the concluding session held on 28<sup>th</sup> April 2023.

I would like to inform you that **MEAI Professional Development program (MPDP) -III** (virtual program) is scheduled from 5<sup>th</sup> May 2023 for 6 days (only on Fridays & Saturdays). This is a comprehensive program suitable for mining professionals. Request you all to utilise this Opportunity.

**May Day** is the day to Salute the hard work and dedication of strong-willed workforce in all industries. Wishing everyone a Very Productive & Safe May day.

Regards,

**K. MADHUSUDHANA**  
President





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## EDITOR'S DESK



**Dr. P.V. Rao**  
Editor, MEJ

Mining Engineers' Association of India (MEAI), the trusted voice of the Indian mineral industry, is the leading Professional Organisation (PO) recognised by the National Committee for Reporting Mineral Resources and Reserves in India (NACRI). MEAI accepts the obligation of offering Professional Development Programs (PDP) to its members and other resource industry professionals, registering Competent Persons (CP) and supervising their ethical conduct. NACRI is the National Reporting Organisation (NRO) of India recognised by the Committee for Mineral Reserves International Reporting Standards (CRIRSCO).

Three on-line training programs on IMIC were successfully conducted by NACRI in January 2021, April 2021, and April 2022 with the participation of over 25 professionals in each program, representing the mining companies, consulting companies and individuals from across the country and overseas. Most of the participants have successfully completed the training program and more than a third of them have registered as Competent Persons (RCP).

The fourth PDP on IMIC 2019, in-person, was successfully held by NACRI at MEAI Auditorium, Hyderabad during 24-28 April 2023. The training program received overwhelming response from the Indian Resource Sector with the registration of 47 professionals from 19 leading mining companies viz. NMDC, Tata Steel, MOIL Limited, Baldota, NLC India, APMDC, Hindustan Zinc, Adani Enterprises Ltd, JSWL, ArcelorMittal Nippon Steel, SCCL, Dalmia Bharat Cement, KSMC, Capstone, OMECL, Mining 3600 Services, ERM, Robotics Geoworld Consultancy etc.

NACRI roped in specialist faculty on reporting of Diamonds & gemstones, Sustainability (ESG) and Geotechnical aspects while engaging its in-house faculty for training on all key aspects of IMIC and industry best practices. Key topics articulated in the 40-hour IMIC training program include:

**Dr PV Rao**, Co-Chair NACRI & Editor MEJ

- Introduction to MEAI/ NACRI Charter/ IMIC
- Scope of IMIC & Code of Ethics
- Best Practices Guidelines in Mineral Reserves Estimation
- Updates from CRIRSCO Template 2019/ PERC 2021
- Discussion on UNFC Framework and IMIC

**Mr Shameek Chattopadhyay**, Director & Principal Consultant (Resource Geology), SRK

- Competence and Responsibility
- Concept of RPEEE
- Best Practices in Exploration
- Best Practices in Technical Studies - Drilling, Sampling, Storage

**Dr AK Sarangi**, Ex Executive Director, UCIL

- Reporting Terminology and Standard Definitions
- Reporting of Mineral Resources, Mineral Resource Classes and Selection
- Reporting of Mineral Reserves, Mineral Reserve Classes and Selection
- Table 2- Study accuracy ranges for Capital cost and Operating cost estimates
- Reporting of Mineralised Fill, Pillars, Stockpiles, Dumps and Tailings

**Mr Manish Tomar**, Group Head R&R, HZL

- Reporting of Exploration Results and Exploration Targets
- Criteria for estimation and reporting of Mineral Resources (Table-1)

- Best Practices in Mineral Resource Estimation
- Best Practices in Quality Control

**Mr TR Rajasekar**, IMIC PDP Coordinator

- Reporting of Coal Exploration Results, Resources and Reserves
- Reporting of Industrial minerals

**Mr Pankaj Satija**, Managing Director, Tata Steel Mining

- Reporting of Metal Equivalents, Commodity Pricing and Marketing
- Technical Studies - Scoping, PFS and FS

**Mr AJ Rao**, Corporate Advisor and Consultant on Environment and Sustainability

- ESG-Community and Sustainability Issues; Permitting and Legal Issues

**Dr A Santharam**, Adjunct Professor, Andhra University

- Best Practices in Geotechnical Engineering

**Dr TM Babu**, Author & Independent Consultant

- Reporting of Diamonds and other Gemstones

**Mr A Vijay Singh**, Independent Consultant

- Latest Indian Acts, Rules & Regulations related to minerals

**Mr R Karthikeyan**, Principal Consultant, DMT Consulting Private Limited

- Estimating Capital Costs and Operating Costs
- Report Layout and Content
- Best Practices in Report Writing

The Chief Guest Mr B Surender Mohan, former CMD, NLC India Limited inaugurated the IMIC training program on 24<sup>th</sup> April 2023 at 9:30 am. Mr K Madhusudhana, President MEAI presided over the Inaugural function. The concluding function was held on 28<sup>th</sup> April 2023 at 3:00 pm where Mr VS Rao, former President MEAI was the Chief Guest. Out of the 47 registered delegates, 43 successfully completed the program and the Chief Guest presented the certificates of merit to them that are essential for registering as Indian Mineral Industry Code (IMIC) Competent Persons (CP).

The awesome response received by the IMIC program from the Resource Sector should be a revelation to the administrators from MoM, MoC, AMD etc. and SEBI; and they should strive to fulfil the expectations of the Resource sector in attracting investments for its growth. *It is high time for the Indian Government to recognise and formally adopt IMIC, the CRIRSCO recognised International Reporting Standard for the preparation of Mineral Resource and Reserve Reports, in mineral/ coal blocks auctioning as well as specify it as mandatory disclosure for the listing of Exploration and Mining companies by the Indian Stock Exchanges.*

- Editor

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## NEWS FROM THE MINING WORLD

### ► **India's NMDC explores lithium reserves for mining in Australia**

Indian iron ore miner NMDC Ltd is exploring lithium reserves, 124.3 miles (about 200 km) off Perth, Australia, company officials said on Wednesday.

"We are in the process of exploring (lithium) in Australia..." D K Mohanty, director production NMDC told reporters on the sidelines of an industry conference in Mumbai.

NMDC is the majority owner of a mine located in Mt Bevan in Australia, a second NMDC official, who is not authorised to speak to media, said, adding that the company hopes to start mining within two years.

India has been exploring ways to secure supplies of lithium, an important raw material used to make electric vehicle batteries, from some of the world's top producers by acquiring overseas mines, as part of the South Asian nation's efforts to push for making greener vehicles.

India in February found lithium deposits for the first time in the country and is planning to auction a block for mining.

*Reuters / April 19, 2023*

### ► **Three lignite mines in TN exempted from 7<sup>th</sup> commercial auctions: Minister Pralhad Joshi SECTIONS**

The government has exempted three lignite mines from the ongoing 7<sup>th</sup> round of commercial coal auctions launched last month, Union Minister Pralhad Joshi said. The three mines namely East of Sethiathope, Michaelpatti and Vadaseri are located in Tamil Nadu, the coal and mines minister said. On March 29, Defence Minister Rajnath Singh along with Joshi launched the latest tranche in a bid to increase availability of the dry fuel in the country. A total of 106 coal mines, including lignite were put on the block in the round. Of the total mines offered, 61 are partially explored and 45 mines are fully explored.

Post exemption of three mines, the total count reduces to 103. The minister said he had received a request from Tamil Nadu state BJP president K Annamalai to exclude three lignite mines from auctions in the seventh tranche. "In spirit of cooperative federalism & keeping in mind interest of people of TN, I have directed to exclude them from auction," he said. Directions have been given to the coal ministry to

take necessary steps in the regard, Joshi said. In his request letter, Annamalai has apprised the minister of these blocks being in the Protected Agricultural Zone. "The farmers in the region have unanimously voiced against coal/ coal-bed methane extraction from their region as it could affect the quality of groundwater and in turn, could affect agriculture in the delta region," Annamalai said in the letter.

*PTI / Apr 09, 2023*

### ► **NMDC surrendered Arki limestone mine as project became unviable: Faggan Kulaste**

State-owned NMDC surrendered the lease for Arki limestone mine in Himachal Pradesh as the project faced various challenges including logistics, Parliament was informed on Monday. NMDC had obtained a lease to mine limestone deposits at Arki in Solan district of Himachal Pradesh on April 23, 1991, Minister of State (MoS) for Steel Faggan Singh Kulaste said in a reply to Rajya Sabha.

"(However) due to several issues including logistics, the project became unviable. The Arki limestone mining lease has been surrendered by NMDC Ltd on 12.8.2021," he told the Upper House.

The request to surrender the mines was accepted by the state government on December 8, 2021, the minister said. NMDC, under the Ministry of Steel, is into exploration of a wide range of minerals like iron ore, copper, rock phosphate, lime stone, dolomite and gypsum.

*PTI / Apr 03, 2023*

### ► **Steel, power & cement companies bag major slice of blocks auctioned in 6<sup>th</sup> commercial coal auctions**

Steel, power and cement companies have bagged a sizable number of blocks auctioned under the sixth round of commercial coal auctions. As per an official note, JSW Steel has won Banai and Bhalumunda mines in Chhattisgarh, another block Parbatpur Central and Sitanala mines in Jharkhand, while JSW Cement bagged Marwatola - VI mine in Madhya Pradesh (MP).

Jindal Power won Gare Palma Sector-I, Gare Palma IV/2 and Gare Palma IV/3 coal mines located in Chhattisgarh. Rungta Sons Private Limited has bagged Sakhigopal - B Kankili and Chhendipada (Revised) blocks in Odisha, and Choritand Tiliaya in Jharkhand.

RCR Steel Works won Patal East (Eastern Part) located in Jharkhand, Orissa Metallurgical Industry has secured Kagra Joydev mine in West Bengal. Cement companies Ambuja Cements Limited won Dahegaon-Gowari mine in Maharashtra, Ultratech Cement got Arjuni East in Madhya Pradesh, Dalmia Cement (Bharat) won Mandla North in Madhya Pradesh, Rama Cement Industries got 1 Marwatola - VII mine in Madhya Pradesh, Shree Cement got Datima mine in Chhattisgarh. CG Natural Resources has won Purunga mine in Chhattisgarh and MH Natural Resources bagged North West of Madheri mine in Maharashtra, the list showed. Coal Pulz got Namchik Namphuk block Arunachal Pradesh, while Mahavir Coal Industries secured Dongeri Tal-II in Madhya Pradesh.

Samlok Industries has bagged Kalambi Kalmeshwar (Western Part) in Maharashtra and MP Natural Resources Gondbahera Ujheni block in Madhya Pradesh. Gujarat Mineral Development Corporation (GMDC) has won Burapahar and Baitarni West mines in Odisha. In Jharkhand, Shreesatya Mines has bagged the Burakhap Small Patch mine and Assam Mineral Development Corporation (AMDC) Binja coal block.

Ganga Khanij won Arjuni West block in Madhya Pradesh. Last month on March 29, the Ministry of Coal signed agreements for the 29 coal mines auctioned under the sixth round of auction. The cumulative PRC (peak rated capacity) of the coal mines auctioned under the sixth round is 74 million tonnes per annum (MTPA), and these mines are expected to generate annual revenue of Rs 14,497 crore calculated at PRC of these coal mines. Upon operationalisation, these mines are expected to generate employment for 1 lakh people.

*PTI | Apr 02, 2023*

➡ **Rare-earths miner IREL eyes 400% expansion for clean energy**

India's sole rare-earths producer wants to boost its mining capacity by 400% in the coming decade to help the country lock in supplies of key minerals for its clean-energy transition. State-owned IREL (India) Ltd. aims to mine 50 million tons a year of rare-earths bearing ore by end-2032, up from 10 million tons now, Chairman D. Singh said in an interview. That would allow it to produce 13,000 tons annually of refined rare earths, versus 5,000 tons at present. Like other major economies, India is grappling with how to secure supplies of materials like rare earths and

lithium that will be needed in bigger quantities in the shift away from fossil fuels. Geopolitical tensions also mean there's concern about China's grip over commodities used in everything from electric vehicles to wind turbines. "In future, the non-availability of these materials could hold back India from achieving its clean energy goals," Singh said, while urging authorities to fast-track permits for the company's planned new mines.

Building a domestic rare earths industry in India faces numerous challenges: from a historically cautious approach to mine permitting, to the low quality of ore and relatively undeveloped downstream capacity. IREL's own refineries are stuck at no more than 40% of capacity because there's not enough mined ore to feed them, he said. India holds the world's fifth-biggest rare earths reserves but is a only a modest producer, according to US government data.

**China dominance** Singh also said he hoped the country could develop more downstream capacity for rare-earths, noting that this was key to China's dominance of global activity. "While mining, processing and refining capacity is available in India, the midstream and downstream segments in this sector are absent," he said. It would cost between 30 billion rupees (\$365 million) and 50 billion rupees to develop downstream plants to absorb IREL's planned output, he said.

At the moment, Toyotsu Rare Earths India Pvt., a unit of Japan's Toyota Tsusho Corp., is the only private refiner, and takes concentrate supplied by IREL, Singh said. The quality of ore in India presents a major challenge, with China's ore grades often some 100 times higher than those present in India, according to Singh. That makes processing more demanding and costly, he said. When IREL tendered a few years ago for partners to build a downstream plant, there were no takers despite some initial interest.

IREL — a unit of India's Department of Atomic Energy — was established in 1950 to process monazite that hold rare earths and thorium used in the nuclear industry. It operates eight mines across the Indian states of Odisha, Tamil Nadu and Kerala, and is in the process of adding another three leases in the next four years.

*Swansy Afonso, Bloomberg | Apr 12, 2023*

➡ **Government developing portal to expedite clearances for newly allocated blocks: Coal Secretary**

The government is in the process of developing a portal for monitoring and expediting clearances



for newly allocated coal blocks, Coal Secretary Amrit Lal Meena said on Wednesday. The secretary along with Additional Coal Secretary and Nominated Authority M Nagaraju held an interaction with the representatives of captive and commercial coal block allottees to discuss ways to increase coal production and other issues.

“Timely availability of land and other clearances are of paramount importance in ensuring early production of coal from newly allocated blocks. The nominated authority in the ministry is in the process of developing a portal for timely monitoring and resolution of issues in this regard,” the secretary informed stakeholders.

M Nagaraju highlighted the policy-level initiatives carried out by the ministry to increase coal production and facilitate ease of doing business to make the sector more appealing. He also underlined the key reforms implemented by the ministry in various tranches of commercial coal mine auctions in order to make the auction regime more appealing and rewarding. The ministry launched the first ever tranche of commercial auctions of 38 coal mines on June 18, 2020. Till now, six tranches of commercial coal mine auctions have been completed and a total of 87 coal mines have been auctioned. They have a cumulative Peak Rate Capacity (PRC) of 220.52 million tonnes per annum with annual revenue generation estimated at Rs 33,231 crore.

*PTI | Apr 12, 2023*

#### ► **China to speed up iron ore projects to secure domestic supply**

China’s state planner on Wednesday said it will accelerate the construction of iron ore exploration projects and improve its capability to ensure iron ore supplies.

The National Development and Reform Commission will also closely monitor iron ore market dynamics and take steps with relevant departments to limit irrational price increases, spokeswoman Meng Wei told a regular news briefing.

The government has been vexed about heavy dependence on imported iron ore, with more than 70% of China’s needs coming from overseas, and intends to increase domestic supply.

The government-backed China Iron & Steel Association began an initiative last year to boost domestic supply to 370 million tonnes by 2025.

China’s annual iron ore output is set to hit an eight-year high of 290 million tonnes in 2023, analysts estimated.

Consultancy Wood Mackenzie said domestic output may not increase much further in the near term given many new projects are underground mines and that complex geological conditions and high costs are likely to complicate construction.

The world’s largest iron ore consumer produced 44.50 million tonnes of iron ore concentrate in the first two months of 2023, showed data from the Metallurgical Mines’ Association of China.

*Reuters | April 19, 2023*

#### ► **Conservative design central to meeting tailings standards – report**

With the first *Global Industry Standard on Tailings Management (GISTM)* deadline approaching in August 2023, SRK Consulting is delving into the key areas that engineers should be focusing on to comply with the standards.

SRK hosted an international training course in South Africa last year to improve the fundamental understanding of the engineering properties of mine and industrial waste geomaterials.

The evaluation of static and cyclic liquefaction of mine tailings and soils is a key focus for tailings dam engineers, in response to the Global Industry Standard on Tailings Management, SRK notes.

The pressure on International Council on Mining and Metals (ICMM) member mining companies to comply with the GISTM is growing.

By the August 2023 deadline, all tailings storage facilities (TSFs) classified as having ‘Extreme’ or ‘Very high’ potential consequences will need to conform with the standard. In just two years after that date, all other sites will also need to demonstrate conformance.

The issue of liquefaction of mine tailings is among the key areas of concern in the industry, as it still presents itself as an important risk factor for TSF failure.

“Static liquefaction is the sudden loss of strength when loose soil – typically granular material such as sand or silty sand – is loaded and cannot drain. Strength loss due to undrained failure can also be associated with fine-grained materials of low hydraulic conductivity, such as clays or plastic silts,” said SRK.

In the 2018 Jennings Lecture entitled “Critical State Soil Mechanics: 125 years of history to current use”, instructor and civil engineer Mike Jefferies pointed out that soil liquefaction has been a concern to civil engineers for over 100 years, but that our understanding was continuing to evolve.

As far back as 1936 Casagrande had come up with his concept of a critical void ratio, above which liquefaction failure could be expected.

“Today we know that the potential for liquefaction can be generally related to five important factors: relative density, confining pressure, peak pulsating stress, number of cycles of pulsating stress applied and the over-consolidation ratio,” said Jefferies.

Cyclic liquefaction refers to a loss of strength in a soil as a result of a buildup of porewater pressure caused by a seismic or dynamic loading.

According to Tinus Grobler, senior engineer at SRK Consulting, GISTM requirement 4.6 demands that mines ‘identify and address brittle failure modes with conservative design criteria, independent of trigger mechanisms, to organise their impact on the performance of the tailings facility’.

“These requirements necessitate the selection of conservative design criteria and operational material properties, so that risk related to all credible failure modes is organised,” said Grobler. The importance of static and cyclic liquefaction analysis in fact made it a focus of an international training course held in South Africa last year – attended by over 120 industry specialists. He said various methods of determining material parameters and analysis techniques were presented.

“It is important that material parameters are determined through a combination of both in-situ and laboratory testing,” Grobler said. “Also, analyses should be undertaken with carefully selected modeling methods and parameters.”

He noted that there was very limited availability of seismic data and research within the southern African region.

“With the GISTM calling for design criteria of up to the 1 in 10,000-year event, this calls for careful consideration of how seismic analyses are undertaken – as well as

the increasing requirement for further research to firm up seismic parameters,” said Grobler.

The training course was organised by the Geotechnical Division of the South Africa Institution of Civil Engineering (SAICE) in collaboration with the Tailings and Industrial Waste Engineering Centre (TAILENG).

A consortium of faculties at four US universities, TAILENG brings together expertise from Georgia Tech, Colorado State University, University of California Berkeley and the University of Illinois. It seeks to improve the fundamental understanding of the engineering properties of mine and industrial waste geomaterials – to promote resilient and sustainable infrastructure in the mining and power industries.

A big take-away for delegates was the need to surround engineering problems and material characterisation with multiple tests and multiple approaches, to gain confidence in analyses, he said.

The world’s top names in this field were among the course presenters, including Professor Jonathan Bray of UC Berkeley, Professor Scott Olson of the University of Illinois, and Professor Jorge Macedo of the Georgia Institute of Technology.

Sessions were also presented by John Stiff of SRK Consulting South Africa, Ivan Wong of Lettis Consultants International in California, Colleen Crystal of SRK Consulting in North America, Christina Winckler of Anglo American Platinum, Gordon McPhail of Water, Waste and Land in Australia, Louis Geldenhuys of Jones and Wagener in Johannesburg, and Professor Eben Rust of Osimo.

*Staff Writer, Mining.Com | April 19, 2023*

➡ **Fresh blow to cobalt bulls as prices sink below \$20,000**

The dispute between China’s CMOC and Congo’s state-owned Gècamines appears to be over paving the way for its massive stockpile of cobalt to start entering the market.

Tenke Fungurume, split 80-20 between CMOC and Gècamines, continued to produce the battery and aerospace metal after its export permits were pulled in July.

According to Benchmark Source, stockpiles of at least 16,000 tonnes of cobalt hydroxide will take a year or



more to be cleared and are likely to put further pressure on the cobalt prices already down by 75% since the peak a year ago to trade below \$20,000 a tonne in April.

“On the one hand, this pending tsunami of product has already been baked into today’s bearish prices,” Daniel Fletcher-Manuel, head of prices, data and indices at Benchmark, said.

“However, further price erosion through quarter two is likely as suppliers race to offload tonnage before CMOC fully resumes exports.”

CMOC has been expanding Tenke, currently responsible for some 15% of global output, and expects the additional tonnes to hit markets this year on top of the released inventories. Congo produces more than 70% of the world’s cobalt and mining inside the country is dominated by Chinese firms.

Benchmark Mineral Intelligence Cobalt Price Assessment expects the cobalt market to be in oversupply over the next three years as annual global production tops 250,000 tonnes by 2025, before a small but growing deficit appears through 2030.

*Frik Els, Mining.Com | April 19, 2023*

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many new projects are underground mines and that complex geological conditions and high costs are likely to complicate construction.

The world’s largest iron ore consumer produced 44.50 million tonnes of iron ore concentrate in the first two months of 2023, showed data from the Metallurgical Mines’ Association of China.

*Reuters | April 19, 2023*

### ► **Iron ore price lowest in 3 months on China’s rumored plan to cap steel output**

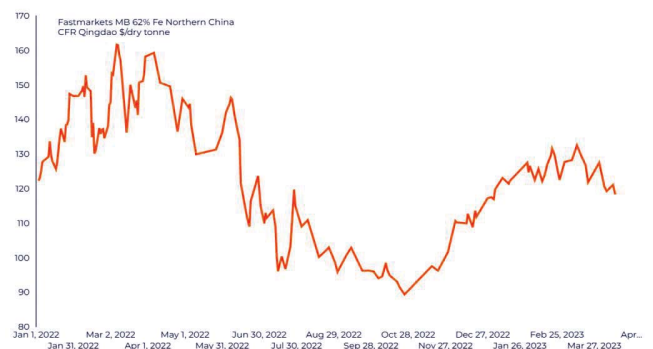
Pessimism about steel demand in China weighed on iron ore prices on Thursday, even as traders watched a powerful cyclone that could disrupt shipments from top supplier Australia.

China’s unconfirmed plan to limit annual crude steel output, as it seeks to curb iron ore price speculation, has been a drag on the market.

China is set to release the plan by the end of this month, capping domestic steelmakers’ output at 2022 levels, *Bloomberg* reported.

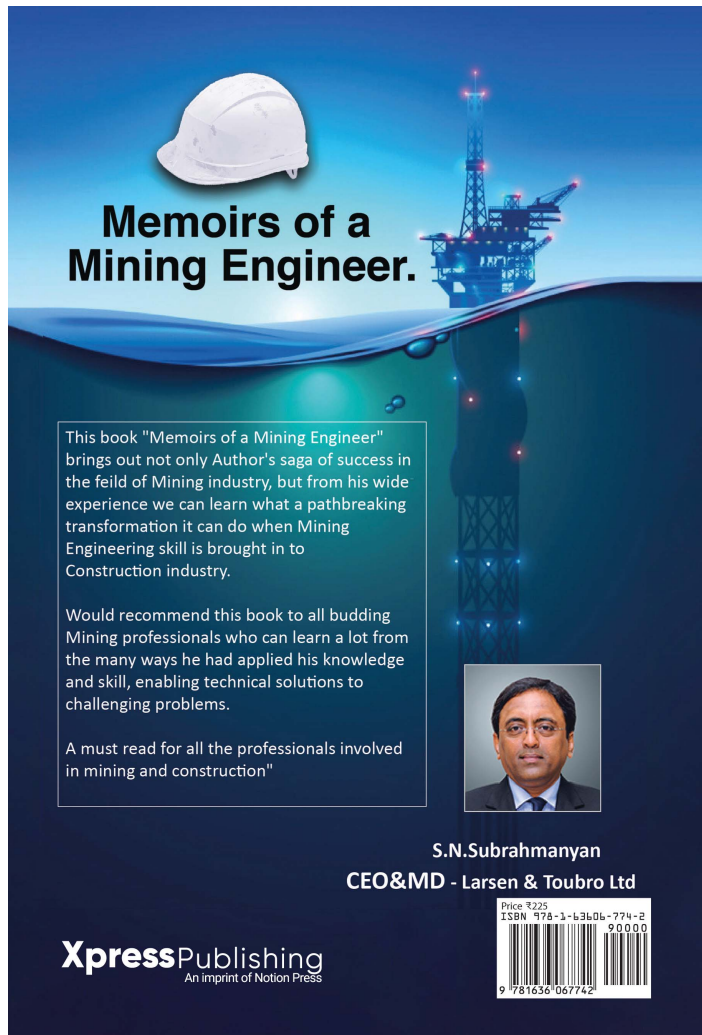
Struggling to reduce carbon emissions and meet climate commitments, the Chinese government has long had the heavily polluting steel sector in its sights. The industry accounts for about 15% of national emissions, second only to electricity generation.

Benchmark 62% Fe fines imported into Northern China fell 1.47% on Thursday, to \$118.29 per tonne, the lowest since January.



The most-traded September iron ore contract on China’s Dalian Commodity Exchange ended daytime trade 3.1% lower at 769 yuan (\$111.89) a tonne.

“Iron ore is facing price control pressure, and policy risks continue to increase,” Sinosteel Futures analysts said in a note.




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5.0 out of 5 stars **A GOOD PROFESSIONAL GUIDE FOR YOUNG MINING ENGINEERS**



Reviewed in India on 13 July 2021

I have read it thoroughly and felt it should be read by not only mining engineers but other professionals also. The importance given to practical training in mines in those days is appreciable which has diluted in the present days. The author has presented so systematically about his career in general terms which can be understood easily. His life journey shows that ambition and hard work is more important than very high-level degrees from prestigious Institutes. His presentation of many civil and infrastructure projects shows the role of a mining engineer in infra projects. It shows there are a lot of scopes for Mining engineers to contribute to infrastructure projects.-- **Dr. Karra Ram Chandar, Dept. of Mining Engineering, NITK- Surathkal**

"I am sure that the Book will help students in Mining Engineering and practicing engineers a source of inspiration to excel in their career "-- **Dr. K Sreenivas Professor and Head of Dept of Mining Engineering, Malla Reddy Engineering College, Secunderabad.**

"I am really happy that the book has come out as I am yet to find a book of this genre in the public domain. The general public will find this book interesting, budding and practicing engineers find it inspiring"-- **K K Biran Past President MEAI**

Meanwhile, Port Hedland in Australia's northwest region, braced on Thursday for Cyclone Ilsa, the area's most powerful tropical cyclone in a decade, potentially disrupting supply and providing support to iron ore prices.

Port Hedland is the world's biggest export point for iron ore.

*MINING.COM Staff Writer | April 13, 2023*

### ➡ **Theft of \$1 million in gold suspends Argentina mine project**

Thieves heisted about \$1 million of gold from a mining project in southern Argentina run by Vancouver-based Patagonia Gold Corp.

Thieves broke into the gold room at the company's Cap-Oeste project in the province of Santa Cruz in the early hours of April 17 and escaped with about 500 ounces of gold, the company's CEO Christopher van Tienhoven said in a statement.

The robbery represents about one month of production from the company's Lomada and Cap-Oeste mining projects. The company has suspended production pending an investigation and as it implements additional security measures.

*Bloomberg News | April 17, 2023*

### ➡ **Australia forging ahead on critical minerals accords with allies**

Australia is seeing early success in attracting investment from key diplomatic allies in its nascent critical minerals industry amid a global push to reduce reliance on dominant producer China, the country's resources minister said on Thursday.

Speaking at an event in Darwin, Madeline King said Australia is well placed to play a significant role in both the extraction and processing of mineral resources and is forging ahead with agreements to encourage investment from allies.

*(Continued on Page 20)*



# RESOURCING FOR FUTURE GENERATIONS AND AATMANIRBHAR BHARAT – IMPLICATION FOR MINERAL EXPLORATION AND MINING SECTOR

Dr. Sudesh Kumar Wadhawan

## *Abstract*

*The Resourcing Future Generations (RFG) programme of IUGS is aimed at meeting the multigenerational needs for raw materials (minerals and rocks), energy and water while ensuring social equity. It is pertinent to consider mineral economics for making comprehensive evaluation and quantification of 21<sup>st</sup> century supply and demand; and emphasise on imparting and building much needed advanced skills capacity, particularly in lesser developed nations and to discover and responsibly develop mineral resources for furthering objectives of Aatmanirbhar Bharat. Strategic implications of RFG on adopting modern integrated techniques for mineral exploration and promoting sustainable mining sector are elucidated in this contribution.*

**Keywords:** *Aatmanirbhar Bharat, Resourcing Future Generations (RFG), Mineral economics, Skills development*

### 1.0 Introduction

Presently, 7.5 billion people inhabit Earth, that is nearly triple the world's population in 1950. And by 2050, Earth's population will be between 8.3 and 10.9 billion, according to estimates by the United Nations' Population Division — an increase, in just four decades, of 17 to 54 percent (UN, 2013). With rising expectations and economic growth, increases in demand for natural resources is imperative. However, supplies of readily available mineral commodities appear to be diminishing. Demand for raw materials like iron ore and metals for advanced technological applications — platinum group or rare earth elements (PGE & REE), for example — has been growing steadily, often outpacing the rate at which new ore discoveries are made. How can the needed mineral resources be delivered to accommodate not only the growing global population, but their right to improve their standard of living? Mineral resources in particular need to be extracted in ways that are economically feasible, environmentally sound and socially responsible (Wadhawan, 2017; 2021). International concern for augmenting mineral security and search for new mineral deposits stems from the fact that known shallow depth mineral occurrences are fast getting depleted and in order to sustain their current living standards, it is imperative to locate and exploit new mineral resources. Nevertheless, the search for new mineral wealth in India is based on huge untapped geologically favourable potential and concept-oriented practices in geoscientific data acquisition and mineral system approach in exploration for concealed and deeper level continuity of the known metallic minerals and greenfield occurrences (e.g., Deb. and Thorpe 2004; Shekhawat, et al. 2017, Golani, 2021). Considering the global spread of occurrence of the minerals and metallogenic

provinces, it is realized that no country is self-sufficient in its mineral resources. India has a geological and metallogenic history similar to the mineral rich shield area of Antarctica, Australia, South Africa and South America. India's geological domains are well endowed with mineral resources; however, they are yet to be fully explored, assessed and exploited. Besides, most of the exploration activities in the country have been of conventional type (based mostly on geological data) with restricted input from geochemistry, geophysics and remote sensing. There is urgent need to expeditiously integrate all such basic geoscience data for ore-deposit modelling to target potential areas for further detailed mineral exploration. Out of India's entire Obvious Geological Potential area [0.571 million sq km] only 10% has been explored and barely 1.5-2% is being mined. Mining in India is largely public sector driven with Public Sector Undertakings (PSU's) accounting for around 66 per cent of the value of mineral production; the rest emanates from medium and small-scale mines that dominate the industry are largely privately operated. Exploration has been carried out mostly to assess the resources up to depth of 120 m even though exploration and exploitation techniques for deep seated bodies exist up to a depth of 2,500 m. Further, it requires quality geological, geophysical and geochemical data. Synergy amongst key stakeholders (states, industry, concerned ministries and departments, local communities) is to be ensured for hassle free sustainable mining (Schoenberg, 2016; Nathalie et al. 2019; Wadhawan, 2020; 2021). Relevant aspects of RFG and implications on adopting modern integrated techniques for mineral exploration and promoting green and sustainable mining practices are elucidated in this contribution.

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### 2.0 Methodology

Present contribution is prepared based on extensive literature survey, personal field surveys, mineral investigations and visit to several mining centres, interactions in Conferences and appropriate integration of culled data in insightful ways to provide a considered perspective on ways forward to achieve sustainable growth of modern geoscience applications and zero-waste green mining practices for RFG. Concluding remarks are presented with a view to improve understanding of demand-supply issues for mineral-water-energy resources and urgent need for capacity building and to upgrade skill levels to meet emerging challenges through synergy amongst stakeholders: industry, academia, and national geological surveys and exploration agencies.

### 3.0 Resourcing Future Generations (RFG)

In the context of ensuring mineral resource availability and security, International Union of Geological Sciences (IUGS) believes that, “a collaborative, international and broad-based program comprising research, data mining, technical development, outreach and education, among other approaches, can help facilitate the process”. Such an initiative has been referred to as Resourcing Future Generations (RFG). The proposed collaborative broad umbrella initiative was first discussed during the 34<sup>th</sup> International Geological Congress at Melbourne, Australia in 2012 and focused to begin on global security of minerals, water and energy resources security for the long term (Lambert et al., 2013). The RFG initiative has been providing a bridge between industry, academia, and national geological surveys and exploration agencies. It emphasises integrated systems research based on comprehensive understanding of the metallogeny, and on applications of advanced modern technology for judicious, safe and sustainable mining practices.

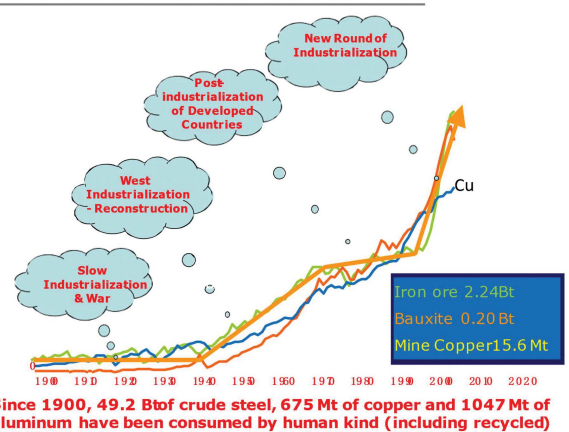
The global mineral consumption has shown a steady increase since the industrialisation, particularly the key mineral commodities required for steel (iron ore, etc.), aluminium (bauxite) and copper ore (Fig.1). Similarly, the global demand including India’s, has also experienced a sharp rise and is projected to grow manifolds (IUGS - Lambert et al. 2013, Fig.2).

RFG is aimed at meeting the multigenerational needs for raw materials, energy and water while ensuring social equity. To meet these challenges, the geoscience community prognosticates the following four fundamental actions.

- 1) Assessment of supply and demand - comprehensive evaluation and quantification of 21<sup>st</sup> century supply and demand of minerals and rocks;
- 2) Improved geoscientific understanding of the subsurface as it relates to mineral-water-energy resources and economic deposits;

- 3) Identification of geologically potential areas and assessment of metallogeny domains and geographies where new resources are likely to be found; and
- 4) Imparting and building much needed advanced skills capacity, particularly in lesser developed nations, to discover and responsibly develop and mine mineral resources.

### History of Global Key Minerals Consumption (post 1900)



Research Center for Strategy of Global Mineral Resources, CAGS

Fig.1: History of global key minerals consumption by humans, post 1900, including recycled metal scraps for crude steel, copper and aluminium (Source: IUGS - Lambert et al., 2013)

### Global Demand - India

In the next 20 years, Indian demand for resources will increase quickly and its proportion of the world consumption will enlarge.

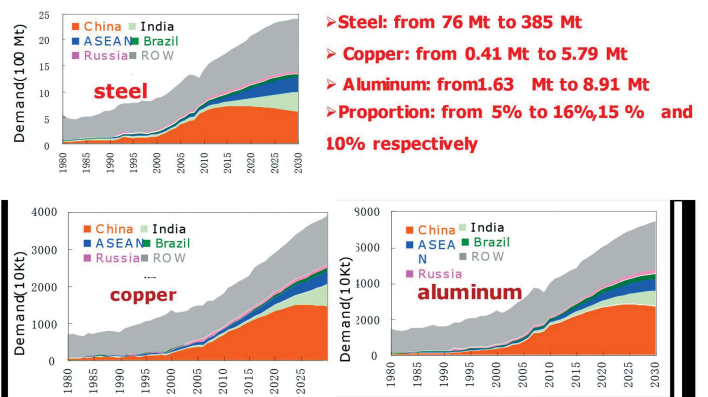


Fig.2: Global demands, including that of India, have also experienced a sharp rise and are projected to grow further (Source: IUGS - Lambert et al., 2013)

### 4.0 Indian Scenario - Suggested Actions for RFG

From Indian perspective, two broad areas where Indian participation in RFG programmes can be taken advantage of include Para-1 above on detailed analyses of the database for advanced mineral prognostication and setting up of the India specific priorities and on Para-4 on development of



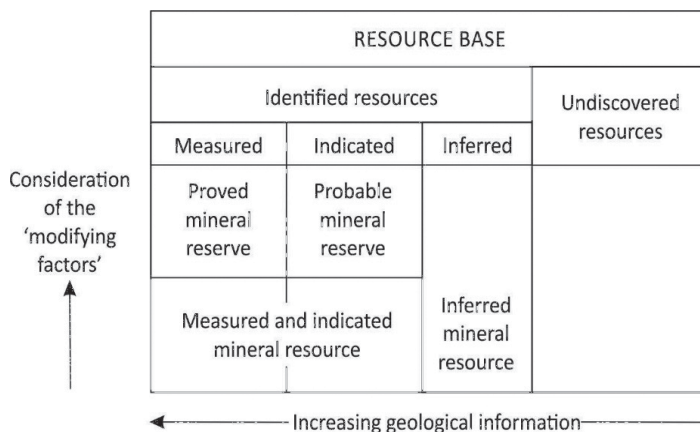
the needed advanced skills and capacity building in modern mineral exploration techniques and mining methods. In order to meet such challenges, formal MoUs and tie-ups can be worked out between the Ministry of Mine, through Khanij Bidesh India Ltd. (KABIL), with active and synergistic involvement of GSI-MECL and IBM, and the IUGS recognised international agencies with possible financial assistance from the World Bank to establish and upgrade modern laboratories at R&D centres in India.

This necessarily entails describing current approaches to quantifying available resources and to projecting future supply. Several techniques are available to assist with planning for future resource availability to support investment decisions. These include resource / reserve estimation techniques that identify the occurrence of resources and how economically viable they would be to extract from the ground. However, they are reliant essentially on the quality of geological data and its understanding, which is sparse, variable or uncertain in different parts of the world. Although Indian geoscience scenario is relatively better in generation of basic geological, ground geochemical and geophysical parametric data, yet its proper integration and syntheses into a tenable metallogenic model in spite of establishment of Data Analysis Divisions in Geological Survey of India (GSI), have been persistent challenging tasks.

It is pertinent to state here that a mineral ‘resource’ is a natural concentration of material in or on the Earth in such form and quantity that economic extraction of a commodity is potentially feasible (USGS 2013). Resources can be subdivided into different categories, reflecting the level of geological knowledge and associated confidence in their existence (Fig. 3). Reserves are that part of an ‘identified’ resource that could be economically extracted at the time of assessment (USGS 2013). Accordingly, reserves are economic entities that represent only a very small proportion of the total amount of a mineral or metal in the Earth, sometimes referred to as the ‘resource base’ (Fig. 3; Nickless, et al. 2014).

India produces around 95 minerals, which includes 4 fuel, 10 metallic, 23 non-metallic, 3 atomic and 55 minor minerals (including building and other materials). As on 31 March 2021, the country had around 1,340 reporting mines — excluding mining areas for minor minerals, crude petroleum, natural gas and atomic minerals (Ministry of Mines, 2022). The country’s barite, bauxite, chromite, coal, limestone and manganese reserves or resources are among the ten largest mineral reserves in the world. India, today, is a major minerals producer ranking among the world’s leading producers of chromite, coal (bituminous), iron ore, manganese, bauxite and zinc. However, we need to conduct a 30-year demand supply analysis for India and prioritise the resources to be

acquired. Current hypotheses are that production of copper ore, fertilizer minerals like rock phosphate, potash, etc., will peak by 2030 (Nickless, et al., 2014). It is worth noting that the Indian mining industry is characterized by a large number of small operational mines.



**Fig. 3:** The relationship between mineral resources and reserves. Mineral reserves generally only represent a very small fraction of resources. Resource base refers to the total amount of a mineral or metal in the Earth’s crust. \*‘Modifying factors’ include prevalent mining, processing, metallurgical, marketing, social, environmental, legal and governmental considerations (Source: International Union of Geological Sciences, Nickless, et al., 2014).

The number of mines which reported mineral production (excluding atomic, fuel, and minor minerals) in India was 1,332 in 2020-21 as against 1,385 in the previous year. Most of the mines reported are in Madhya Pradesh followed by Gujarat, Karnataka, Odisha, Andhra Pradesh, Chhattisgarh, Tamil Nadu, Rajasthan, Maharashtra, Jharkhand and Telangana. India’s ranking in 2019 in world production was 2<sup>nd</sup> in Steel (crude/liquid), 3<sup>rd</sup> in Aluminium (primary) & Chromite; 4<sup>th</sup> in iron ore, Lead (refined) & Zinc slabs; 5<sup>th</sup> in Bauxite, 7<sup>th</sup> in Manganese ore, 13<sup>th</sup> in Copper (refined), 16<sup>th</sup> in apatite & rock phosphate and 17<sup>th</sup> in Magnesite. During 2021-22, mineral production was reported from 21 States/Union Territories of which the bulk of value of mineral production (excluding fuel and atomic minerals, and minor minerals) of about 88.7% was confined to four States. Odisha is in the leading position, in terms of estimated value of mineral production in the country and has a share of 47.2% in the national output. Next in order was Chhattisgarh with a share of 16.2% followed by Karnataka (14.31%), Rajasthan (11%) and Jharkhand (4.5%) in the total value of mineral production (Ministry of Mines, 2022).

**5.0 Acute Shortage of Skilled Workforce**

It is recognised that the number of participants in the Indian Mineral Exploration Sector must be increased from the current 11 (compared to 400 or more for Canada and Australia each, Wadhawan, 2017). Besides, a thorough professional approach is needed in mineral exploration - utilising interdisciplinary competency, multiple skills and

nurturing risk appetite attitudes. Unlike a private sector explorer, which is usually small and agile, the Government functions through multiple-layers of decision making, allocated resource crunch for upskilling and technological modernisation and large number of departments and representatives and hence, the impact of their action or otherwise, is a consequence of the weakest of those links. Multiple authorities, lack of 'ownership' and result in delays. Therefore, as emphasised earlier in the Para-4 of RFG, there is an urgent need to invest in human resource development and increase the skilled workforce.

Acquired skills and knowledge are considered the major driving forces for adopting modern technological innovations for sustainable development and socio-economic growth of any country. It is estimated that only 5% of the total workforce in India has undergone formal skill training [compared to 46% in China; 68% in UK; 75% in Germany, 52% in USA, 80% in Japan and 96% in South Korea]. Only investment in technology will not help, because the machine is only as good as the skill of the user of that machine. Mineral commodity specific research is required to take advantage of the database, resource assessment and prognostication models including for mineral beneficiation and zero-waste mining (Wadhawan, 2022). Detailed follow-up of investigations is needed to correlate and match the three-dimensional exposures of ore body in the open-cast and underground mines with those ore-body profiles and configurations that were visualised / estimated (ore-body modeling) and projected or predicted based on detailed drill-hole line intersection and analyses as the proved reserves. Such understanding will necessarily improve ore-body modelling and provide additional explanations for geological controls on metallogeny. Besides, it is imperative to strengthen identification of lean ores or waste-dumps of important technology metals and development of beneficiation techniques in collaboration with other laboratories and institutions. Upgradation of existing processes and mining practices to make them more environment friendly will further the objectives of RFG.

A steady pool of skilled man-power and a group of mentors including international exposures for different mineral commodities need to be nurtured through training and capacity building. Educational institutes/ Skill Development Centres need to be suitably geared to meet emerging challenges on Mechanisation, Computerization and Automation of existing and new mines. Presently 23 Institutes in India offer BE/ME courses in mining. A total of about 1300 seats are offered and 70-80% of the graduates are assumed to join the mining sector. 42 Institutes in India offer post-graduate courses in Geology/ Geophysics. Out of about 1469 seats offered by these institutes, 60-70% of the graduates are assumed to join the mining sector. It is estimated that the supply gap for

mining engineers will be acute, at around 42,000 to 59,000 (compared to demand of around 70,000) by 2030 (IMaCS-CII, 2010). The HRD Ministry can facilitate tie-ups between top universities in India (IIT-ISM, IITs, etc.) and major mining companies in India and abroad, e.g., in Australia and Canada with specific course curricula on Advanced Exploration Geology & Mining Geology. Geosciences or Earth System Science are essential field-based endeavours; therefore, field surveys must be encouraged for university students to improve quality of comprehension and creative involvement. Skill Plan for Mining Sector (2016) also states that quality conscious and outcome-based approach in imparting modern skill-sets for sustainable mining techniques can be an effective tool for enhancing productivity and safety at work place. Mining related development of skills has to be a shared responsibility of both the government as well as the mining industry. These capacity building measures need to be strengthened on a systematic and regular basis, particularly in mineral rich territories and States in India.

#### 6.0 Aatmanirbhar Bharat – Mineral Exploration and Mining Sector

The Government of India had earlier launched “**Make in India** and **Skill India**” Missions in 2015. Make in India mission focuses on building an effective physical infrastructure and Skill India mission is to ensure availability of skilled manpower. Skill development and capacity building can be an effective tool for enhancing productivity and safety at work place, and prepares human resources to foster adaptation of new state of art technologies in mineral exploration, mining and conservation of resources. Aatmanirbhar Bharat Abhiyan is the mission started by the Government of India on 13<sup>th</sup> May 2020, towards making India self-reliant (Government of India, 2020). It is understood that India becoming self-reliant would advocate a concern for the whole world's happiness, cooperation and peace through sustainable production and consumption of basic necessities including minerals, water and energy. Essential contributors to achieving this mission include raising awareness, skilling and capacity building for various levels of human interventions with nature and productive outcomes.

Integration of geophysical, geological and geochemical data using advanced software is crucial for success of the investigation. Special attention has to be paid for exploration and search for strategic, scarce and deficit minerals to reduce imports. Besides, new mineral exploration techniques are needed to find remote or deeply buried deposits. Major investment at a scale only realizable through private-public cooperation is needed to develop these techniques. Industry is developing technology to maximize efficiency, minimize waste and reduce the consumption of water. This should be encouraged as it supports economic growth, not only of the resources sector, but also of the service providers and



manufacturing sectors supplying to the industry. Furthermore, technology offers the potential for opening up previously inaccessible resources. Green mining technological evolution needs to be reinforced by the development of global good practices for responsible resource development that balance the long-term value of any mineral assets against alternative land uses, such as biodiversity protection, agriculture and urbanization. Examples of good environmental practices and co-existence for successive land use exist on which to model such global guidelines and need to be balanced by asking community/society to gear-up to the changed aspirational requirements in terms of understanding the short- and long-term consequences of their/our role in consumption patterns (Wadhawan, 2021). Success in mineral exploration is a necessity to keep the flow of auction-able mining blocks into the market and meet India's internal demands for industrial growth and economic well-being.

### 7.0 Concluding Remarks

Challenges and opportunities exist in exploring concealed terrains especially in the obvious geological potential areas. While adopting approaches for RFG, the following observations and recommendations are made for effective implementation and ways forward:-

- 1] It becomes imperative to mount meaningful mineral exploration programmes based on sound geo-scientific knowledge base and integrated multi-disciplinary applications. Infusion of modern technology in mineral exploration [e.g., heliborne geophysical sensors systems, hyper-spectral large-scale mapping of targeted areas] ore-deposit modelling and deep drilling with state-of-art chemical/ petrochemical, isotopic geochemical analytical laboratory back-up, systematic sustainable mining methods, mineral beneficiation and multi-elemental extraction techniques are pre-requisite in such efforts to strengthen mineral and mining sectors in India.
- 2] Besides, a steady pool of skilled man-power and a group of mentors for different mineral commodities needs to be nurtured through training and capacity building, Training for Trainers [ToT] programmes with focus on accepted best international practices needs to be adopted on a continuing basis.
- 3] Expedient availability and sharing of geoscientific data to prompt concept oriented mineral exploration and 3-D ore genetic modelling. It is imperative to urgently revisit known mineralised zones for grade/ tonnage upgradation and encourage use of Core Libraries for R&D works, possibly in collaboration with research organisations and leading University Departments of Geosciences.
- 4] All the known and mapped about 150 mineral belts by GSI in India must be digitized as geospatial maps on priority by GSI so as to re-evaluate its worth and correlate related land-cover ground truths by stakeholders. This would help lead to identification of brownfield areas with potential for detailed mineral explorations.
- 5] Detailed follow-up of investigations are needed to correlate and match the three-dimensional exposures of ore body in the open-cast and underground mines with those ore-body profiles and configurations that were visualised / estimated and projected or predicted based on drill-hole line intersection and analyses as proved reserves. Such understanding will necessarily improve ore-body modelling and provide additional explanations for geological controls.
- 6] Intensify search for deep seated and covered deposits. Collaborative and international ventures are required for application of modern technology and geostatistical tools to interpret integrated data sets.
- 7] It may also be ensured that the geosciences data generated by Exploration Companies is submitted back to GSI [Mission-II] data bank and is documented for future reference and geostatistical modeling. As a national priority, it is imperative that implementation support mechanisms are put in place such as proper quality checks, measures to coordinate between multiple sub-contractors, prioritise funding support, promote time-bound specific exploration strategies and recycling technology, etc.
- 8] It is also recommended to create and nurture a dedicated centre for R&D in Mineral Exploration that can be established to act as '**National Centre of Excellence in Exploration Geosciences**'. An attempt was made at GSI Training Institute, Hyderabad in 2013 in collaboration with leading University. Besides, there is an urgent need to ensure capacity utilization of installed modern laboratory equipment. As the stress towards blind and deep-seated deposits has been building, the Centre of Excellence may work in tandem amongst GSI, IBM, MECL and academic institutes like and IITs, IIT-ISM, PSUs, etc.
- 9] There is a need to create a separate Mineral Resources Planning Cell under PMO or NITI AAYOG to provide single window coordinated achievement of goals. The 'Central Resource Planning Cell' needs also to focus on International Resource Acquisition based on R&D in mineral economics and prognostication on dynamic demand and supply situation in India. KABIL under the Ministry of Mines can also play a coordinating role for reaching RFG goals.
- 10] It is suggested to develop stronger synergy amongst geosciences' communities - be they in Universities or Research Organisations or Professional Govt. Departments or Geoscience Societies. A

participatory approach by all concerned will truly make Aatmanirbhar *Bharat* in conformity with principles of RFG.

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(Continued from Page 14)

Australia supplies nearly half the world's lithium, is the world's third-largest cobalt exporter and is a significant producer of rare earths; copper; graphite; manganese and other minerals key to the global green energy transition.

The government has signed new agreements with Japan, Germany, the UK and India since late last year to encourage funding for project development, as it prepares to soon release its own national critical minerals strategy.

"The events of recent years have seen Covid-driven supply chain disruptions, energy price spikes, and geopolitical tensions spilling over into armed conflict," King said.

Such events show that market concentration leads to unreliable supply chains, she told the event, run by think tank The Australian Strategic Policy Institute.

"China enjoys an unchallenged position across many aspects of the global critical minerals market, having invested in its sector for decades," she said.

King said "likeminded partners" can work together to build sustainable supply chains and hedge against such concentration.

She also acknowledged "the leadership and foresight" of the US and Japan, with both countries becoming key investors in Lynas Rare Earths, which is the only major rare earths producer outside China.

Australia's Arafura Rare Earths Ltd this week also signed a supply agreement with wind turbine maker Siemens Gamesa Renewable Energy A/S, after being granted a \$600 million loan guarantee from German credit agency Euler Hermes Aktiengesellschaft in March to develop its Nolans project.

King's comments come after the country's treasurer said last year that Australia would become "more assertive" on who it lets invest in its critical minerals space.

Australia's government in March blocked a Chinese investor from raising its stake in a rare earths mining company on the advice of the Foreign Investment Review Board.

*Reuters | April 13, 2023*



# CONSTRUCTION TO DESTRUCTION OF A “CONVEYOR DUCT” ~ A CASE STUDY

by Deepak Vidyarthi

## *Abstract*

*This paper deals with various measures adopted in protecting a conveyor duct housing a 1600 mm (63 inches) belt conveyor system in a large, heavily mechanized opencast Iron ore mine, producing about 22.5 million tonnes of Iron ore per annum. The concrete gallery named as “Conveyor Duct Two” was specially designed to withstand the impacts of heavy blasts during normal production activities in the mine. At one stage having become the main life line for the entire operation of the mine, any damage / misalignment of the duct could result in total stoppage of production bringing the industry to a grinding halt! Therefore, utmost care had to be taken while designing every blast in the vicinity of the duct, with regard to the explosive charge, the delay intervals, blast induced ground vibrations and noise levels. And, with the benches moving down, ultimately the gallery itself had to be blasted to facilitate mining of the ore around and underneath. This again warranted a special ‘blast design’ – throwing a challenge to the blasting engineers. The author was himself involved in designing the blasts. The duct served its purpose for about 25 years before being reduced to debris. An attempt is made to describe various blast designs in the journey of “Conveyor duct” from “construction to destruction”! The author was himself involved in the design, planning and execution of the demolition of the duct.*

**Key words:** Conveyor duct; life line; utmost care; blast design; explosive charge, blast vibrations, construction to destruction.

### Introduction

A large, opencast iron ore mine designed for an annual production of 22.5 million tonnes of low grade iron ore, extending in depth up to 450 m (1426 ft) had a strike length of 6.0 km (3.7 miles) and an average width of 800 m (2625 ft), with the ore body dipping at 35° - 85° due East.

Heavily mechanized with bulk mining operations, the mine was divided into three major portions; the East (SE), the Middle and the West (NW).

To meet the production demand the mine was served by three similar crushers of 4000 tonnes per hour capacity and -7” (-178 mm) discharge located strategically one each in the East, West and Middle portion of the mine. To meet the quality parameters, very rigid quality schedules with blending of ore from various locations were essential. Hourly monitoring of the quality of ore was carried out.

Therefore, although partly under-utilized, three crushers were kept in operation initially.

The crushers were so located that they could receive the entire ore production from various sections of the mine, with the least amount of up-hauling.

One crusher (Cr. A) was to serve the top benches and the SE part of the mine, second crusher (Cr. B) was centrally located while the third crusher (Cr. C) was in the NW part of the mine and 175 m (574 ft) below the level of the second crusher. (Please see Fig. 1)

It was planned to shift the East side crusher to the North-West side of the property after completing extraction of ore in the top benches concentrated on the East side. Accordingly, after about 15 years of mining and after practically exhausting the top level ore the crusher from the East side of the mine was dismantled and relocated in the Northern portion to facilitate blending of ore from the bottom benches which had come into production by that time.

Each crusher had a system of belt conveyors underneath, at a depth of about 35 m (115 ft). The width of the belt was 1600 mm (63 inches) with a carrying capacity of 4000 tonnes per hour.

### Net-work of conveyors

To evacuate the ore produced on day-to-day basis, the following net work of conveyor system was put in place -

- Conveyor duct-One (1) .. from Cr A to Transfer Tower
- Conveyor duct-Two (2) .. from Cr B to Transfer Tower
- Conveyor duct-Three (3) .. from Transfer Tower to Stock Pile
- Conveyor duct-Four (4) .. Stock Pile–Feeders–R1 / R2
- Conveyor duct-Five (5) .. Stock Pile–Feeders–R1

The conveyor system under the first crusher (top most location) was named as Conveyor duct-One running over a length of about 1000 m (3281 ft), up to the discharge point.

The first crusher (Cr. A) served for about 15 years before its removal and relocation as Cr. A’.

*Consultant (Mining) & National Council Member of MEAI*

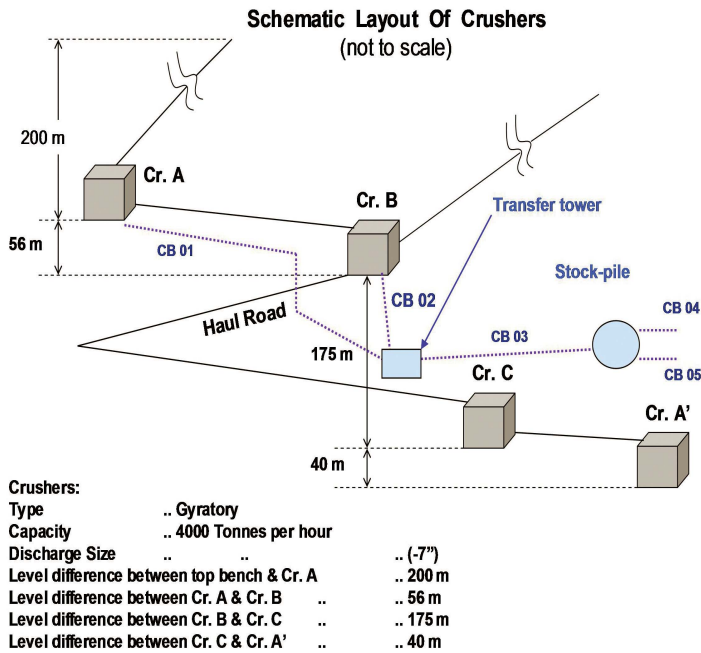


Fig 1: Schematic layout of Crushers

**Design of Conveyor Duct Two**  
**Dimensions**

- **Tunnel**
  - Internal .. 3.60 m x 4.90 m (12ft x 16ft)
  - External .. 4.50 m x 5.90 m (14.76 ft x 19.4 ft)
- **Duct**
  - Internal .. 4.85 m x 7.00 m (15.9ft x 27ft)
  - External .. 6.05 m x 8.20 m (20ft x 27ft)

Fig 2 depicts the plan and section of Conveyor Duct Two, while Fig. 3 gives a longitudinal section along the benches.

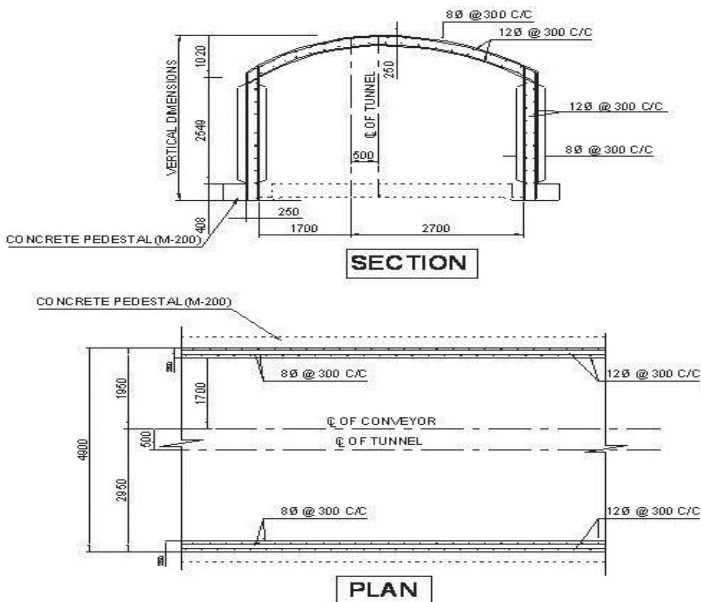


Fig 2: Plan and Section of Conveyor Duct Two

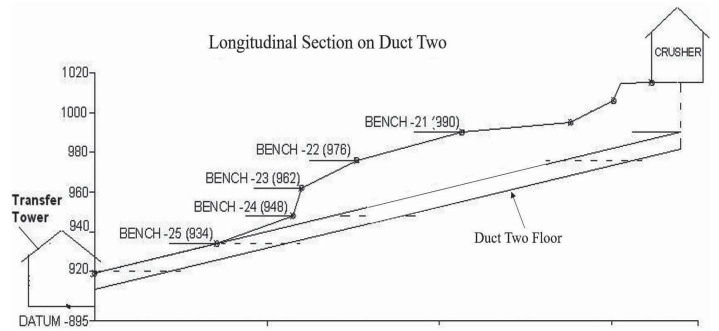


Fig 3: Longitudinal Section on Conveyor Duct Two

**Duct Two – Conveyor System**

The second crusher (Cr. B) was served by the conveyor system called CONVEYOR DUCT TWO.

Conveyor Duct Two housing the conveyor system, was 348 m (1148 ft) in length and made up of reinforced concrete in various cross sections in different segments as indicated below:

Crusher – Tunnel	..	348 m (1142 ft)
Concrete Tunnel	..	32 m (105 ft)
Tunnel (duct) – Transfer Tower	..	18 m (59 ft)

After discontinuance of Conveyor Duct One the only alternative for transporting the mined ore from the middle of the mine and a limited quantity from the East side was through the Middle Crusher ‘B’.

From the Middle Crusher to the beneficiation plant the only means for ore transportation was through Conveyor Duct Two gallery / concrete duct housing the conveyor system.

**CRITICALITY of Conveyor Duct Two**

And that is where Conveyor Duct Two gained enormous significance. The mine production from Middle and top benches was solely dependent on Duct Two conveyor. Thus, it was not affordable to cause any damage / stoppage of Conveyor Duct Two. Every operation in the mine, particularly blasting in the proximity of Conveyor Duct Two had to be undertaken with utmost care and precaution.

The tunnel had a gradient of 1 in 5 and passed through different benches from top to bottom.

The second crusher (Cr. B) served for over 20 years before it was dismantled.

The third crusher (Cr.C) was installed in the mid 90s.

**Location of Conveyor Duct Two**

Situated 35 m (115 ft) below the Crusher in the middle of the property was Conveyor Duct Two housing a 1600 mm (63 inches) belt conveyor system, electric motors, lighting etc. The duct, made up of reinforced concrete, measured 3.6 m



x 4.9 m (12 ft x 16 ft) in cross section to a length of 348 m (1142 ft).

### Construction of Conveyor Duct Two

In the initial stages of mine construction the erection / construction of Conveyor Duct Two was undertaken with the following time frame -

Tunnel Excavation	..	04 months
Concreting	..	06 months
Erection of structural equipments	..	02 months
Procurement & installation of Electrical equipments	..	11 months
Instrumentation	..	03 months

All the above activities were parallel with the installation / erection of the crusher.

### Concreting

Rock excavation	..	12150 cu.m (15892 cubic yards)
Quantity of Concrete	..	6195 cu.m (8103 cubic yards)
Steel (total)	..	907 tonnes
Total time for the conveyor system to get ready including design, procurements, installations, excavation, concreting etc.	..	03 years <i>(The activities were parallel with crusher installation)</i>

### Blasting practices followed in the mine

As the designed capacity of the mine was about 22.5 million tonnes of crude ore per annum, it called for heavy blasting, each blast yielding 600,000 – 700,000 tonnes of ore. To achieve these targets, holes with a large diameter of 315 mm (12.4 inches) were drilled to create 14 m (46 ft) high benches.

Annual consumption of bulk explosive (Site mix Slurry as well as Site mix Emulsion) was of the order of 4500 – 5000 tonnes.

### Blast Design Optimization

A software package on “blast design optimization” departmentally developed at the mine to suit the local site conditions was found to be extremely useful in designing any blast particularly in the proximity of the Conveyor duct.

The package with a sensitivity of 1 gram / tone proved to be a boon in controlling ground vibrations as well as noise levels (air blasts) caused by blasting.

### Guidelines for primary blasting in the proximity of Conveyor Duct Two:

The following guidelines were drawn for carrying out primary blasts with large diameter holes in the proximity of Conveyor Duct Two:

1. No primary blasting was carried out within a distance of 30 m (98 ft) of the gallery.
2. While blasting between 30-50 m (98-164 ft) the following precautions were taken:
  - MCD (maximum charge per delay) was within 600 kilograms (kgs)
  - Each hole was fired independently
  - Holes were loaded with “optimum powder factor” in order to keep the level of vibrations at the bare minimum
  - Non-Aluminized Explosive was used
  - As many faces as possible were created in each blast
  - Spacing and burden were optimized

### Blasts Conducted around Conveyor Duct Two:

Number of blasts had to be conducted in close proximity of Conveyor Duct Two gallery during peak production in the middle portion of the mine for about five years.

Utmost care was taken to protect the gallery from the impacts of blasting and regular monitoring of blast vibrations was carried out, besides monitoring of PPV (*D.Vidarthi, “ISEE 2007*).

### DEMOLITION of CONVEYOR DUCT TWO

With an annual production of about 22.5 million tons of ore, as the top benches moved down to the level of the middle crusher (Cr B), the crusher had to be dismantled. And, with dismantling of the crusher, the hitherto *much safeguarded* “Conveyor Duct Two” had to undergo systematic destruction; more so because about 2.20 million tonnes of good quality ore was locked up underneath the tunnel.

Conveyor Duct Two was being used for transportation of crude ore from Crusher B to the Transfer Tower. The tunnel was constructed in the excavation made through hard and solid ground. It was 348 M (1142 ft) in length and had the following sections -

- 32 m (105 ft) Duct (Crusher B - Tunnel)
- 298 m (978 ft) Tunnel
- 18 m (59 ft) Duct (Tunnel to Transfer Tower )

The tunnel had a gradient of 1 in 5 and passed through different benches, from top to bottom.

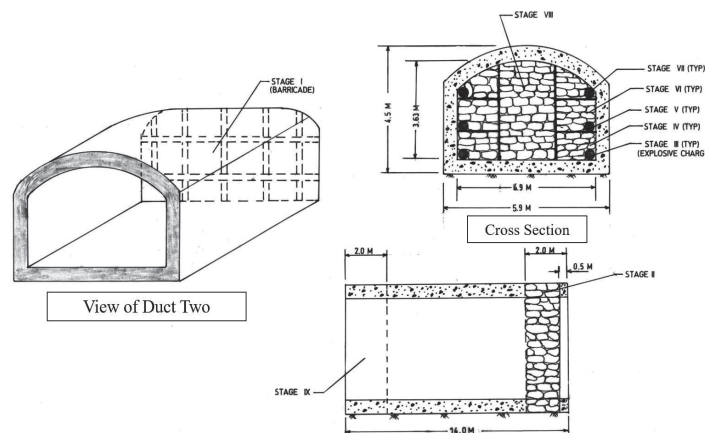
**Table – 1** gives details of typical blasts conducted around the tunnel over a period of time.

Typical blasts conducted in the proximity of Conveyor Duct Two									
Blast No	No of Holes	Explosive Quantity (Tonnes)	PPV		Location	INSTRUMENT		Firing Pattern	Remarks
			mm / sec	inch/ sec		Distance			
						m	ft		
1	23	13.18	18.99	0.75	CB-02	51	167	Serial	No damage; Hole to hole - 50 ms delay
2	123	30.77	2.37	0.10	CB-02	250	820	Trapezoidal	No damage; Each hole fired independently
3	150	86.76	2.29	0.09	CB-02	320	1050	Trapezoidal	No damage; Hole to hole - 50 ms delay
4	62	27.59	2.04	0.08	CB-02	285	935	V-Cut	No damage; 50 ms relays on alternate holes
5	72	46.59	1.33	0.05	CB-02	475	1558	V-Cut	No damage; 50 ms relays on alternate holes
6	48	28.53	1.56	0.61	CB-02	341	1119	V-Cut	No damage; Hole to hole - 50 ms delay
7	138	99.75	8.98	0.354	CB-02	111	364	V-Cut	No damage; Hole to hole - 50 ms delay
8	28	19.36	1.57	0.06	CB-02	390	1280	V-Cut	No damage
9	26	14.482	21.88	0.86	CB-02	46	151	V-Cut	No damage; Each hole fired independently

The tunnel demolition was carried out as detailed below -

1. The tunnel was to be blasted in 22 stages, each stage consisting of blasting a segment of 10-14 m (33-46 ft). Each segment was to be loaded with pipe charges of explosives along the length at four places, two in the top and two in the bottom corners and packing them with sand bags by providing wooden barricades at either end. (Please see Fig. 4).
2. Later on, the plan was revised and an easier and cost-effective method of blasting was designed which involved blasting the tunnel along with the primary holes on the existing benches housing the tunnel.
3. Tunnel length of 220.5 m (723 ft) was blasted in this fashion, whereas, 17.5 m (57 ft) of the tunnel which was exposed and located above the ground level was blasted as per the original design.
4. By the above design-modification, it was possible to execute the entire job at 65% of the cost against the original estimates.
5. Out of 298 m (978 ft) of the tunnel length, 60 m (197 ft) length from crusher building side had to be left out as it was within the ore body left below the Crusher B pillar for the purposes of slope stability.
6. In the remaining 238 m (780 ft), a tunnel length of 220.5 m (723 ft), which was below the earth's surface,

was demolished by drilling and blasting 315 mm (12.4 inches) diameter Primary holes. The primary holes were drilled parallel to the tunnel at closely spaced intervals of 5 m (16 ft). The explosive charge was distributed along the depth of the hole to take care of 1 in 5 gradients of the tunnel. Special emphasis was given on the type of blast depending on the rock mass through which the excavation was made.



**Fig 4:** Sequence of activities showing various stages of blast preparation for a segment of the tunnel Conveyor Duct Two

- 25 numbers of holes which were drilled for the purpose were loaded with high strength explosives



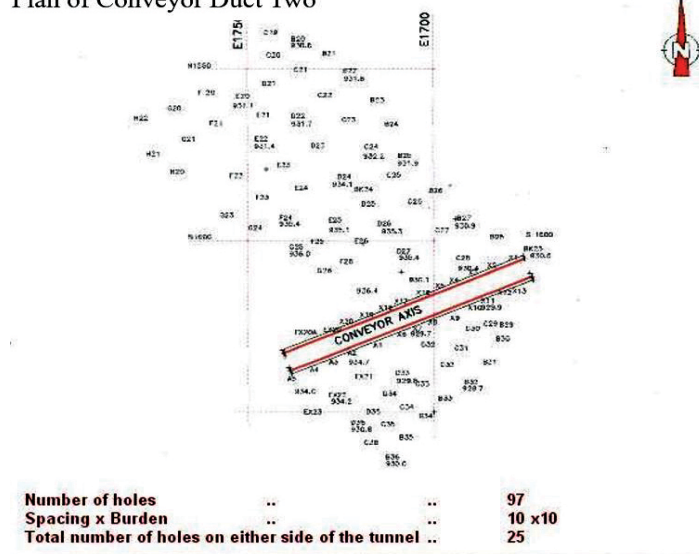
(energy level of 867 Kcal/Kg) along the depth of the drill hole, where the tunnel was passing through. Another portion of the hole was loaded with comparatively lower strength of Explosives (with energy level of 807 Kcal/Kg.) (D.Vidarthi, - ISEE 2006).

- These holes were loaded with quantities required for Conventional Blasting (to deliver more explosive energy to demolish the tunnel).
- The other 72 holes drilled on the same bench for normal blasting were loaded with Explosives of lower strength with Split-Charge.
- On blasting all the holes together, it was observed that the tunnel length in the blast block had been demolished.
- The exposed metal scrap was handled manually by gas-cutting for the purposes of shifting it to the scrap yard and the remaining portion of the debris was hauled to the dump yard with the help of 2.2 cu.m (2.88 cubic yard) Backhoe / 35 t Dumper combination.
- The remaining portion of the tunnel, which was passing through different benches, was handled in the similar fashion by conducting three more blasts.

7. Demolition of Exposed Portion of The Tunnel –

- The remaining 17.5 m (57 ft) of the tunnel, which was above the ground level was blasted by packing explosive cartridges inside the tunnel as per the original plan of design.
- 6.7 tons of high brisance, high energy, high alumina and high VOD Explosive was used for the purpose.
- Explosive Cartridges in pipe charges were placed along the length on the sides & floor of the tunnel and along the width on the roof of the tunnel. Pipe charges were kept at a predetermined distance of 1.5 m (5 ft) from each other and were connected by detonating cord.
- The remaining space inside the tunnel was packed with Sand bags to provide a good stemming effect to the Explosives. Stemming also helped in keeping the explosive charge coupled to the body of the tunnel.
- Either end of the tunnel was provided with firm wooden barricades.
- On blasting, it was observed that the tunnel was completely demolished.
- The handling of debris was carried out in the same fashion as in the previous blasts.

Plan of Conveyor Duct Two



Longitudinal section

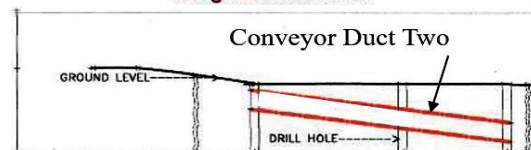


Fig 5: Pattern of primary drill holes around and either side of 'Conveyor Duct Two for breaking the tunnel

Fig. 5 shows the plan and section of the Bench where, the primary holes were drilled parallel to the axis of the tunnel on either side at an interval of 5 m (16 ft). The holes were drilled 1 meter (3.3 ft) away from either side of the tunnel.

- 8. With the demolition of the tunnel the complete excavation of the ore beneath was estimated to return a cost benefit of 92.9 million Indian Rupees (over US \$ 2.0 million) at the time of execution.

**Conclusion**

It was an excellent engineering feat and a result of meticulous planning that a robust structure was originally designed to take the beating during the production phase for almost 25 years and then systematically demolished – to yield maximum production including the locked-up reserves underneath and maximize profits to the company.

**References**

- D.Vidarthi, "Explosive Energy in Blast design Optimization" (International Society of Explosive Engineers 2006)
- D.Vidarthi, "Monitoring and Predictions Of Blast Vibrations-A Case Study" (International Society of Explosive Engineers 2007)-2860



## FIRST AID TRAINING AT HYDERABAD

Mining Engineers Association of India has been granted approval for Imparting training on **First Aid and to issue Certificate by DGMS Vide Letter no. DGMS/OH/First Aid/02/2023/02/04 dated 23-02-2023.**

Mining Engineers Association of India - **2<sup>nd</sup> Batch First Aid Training classes from 15-05-2023 to 25-05-2023** at Flat no.608&609, Raghava Ratna Towers, Chirag Ali Lane, Abids, Hyderabad 500001. After 10 days of Theory and Practical Training, Candidates will be issued First Aid Certificate.

Candidates interested in obtaining **FIRST AID VOUCHRE**, Certificate may apply.

Each Batch of 30 Candidates will be considered for Imparting Training on First Come First Service Basis. In case of more candidates next batch will be started shortly after completing 2<sup>nd</sup> Batch.

Application form is provided below and also available on our website [www.meai.org](http://www.meai.org). Please fill in the relevant details and submit.

Link for application form -  
<https://forms.gle/VKhmdAzLvBstZk448>

For further details please contact:

**MEAI office / Landline:** 7780117320 - 040-23200510

**M Narsaiah** - Secretary General: 7382087618

Sd/-

**SECRETARY GENERAL**

MINING ENGINEERS' ASSOCIATION OF INDIA.



## MEAI SENIOR CITIZENS' WELFARE SCHEME

“Mining Engineers’ Association of India (MEAI)” is a society established under the Societies Registration Act, 1860 and is functioning since 1957, inter-alia achieving the following objects:

- To protect the interests of mining engineers, geologists and allied professionals connected with mining and mineral industries in India and to improve their social and intellectual position / status in their profession.
- To raise and collect funds for general purposes or any specified objectives and to invest and disburse the same in a manner conducive to the attainment of objectives referred to in the objects of the Association or for which the fund was specially created.
- To accept any request, gift, donation, endowment or subscription or to accumulate and provide any fund or endowment to invest the same and apply the income arising there from or to resort to the capital thereof for any of the objectives of the Association.

### Eligibility

MEAI Life members / Fellow members / Honorary members who are of the age of above 65 years and not in active employment / service and are living in total neglect and in penury are eligible to opt for the Scheme. The beneficiaries of the ‘Scheme’ should have been Life members / Fellow members / Honorary members for a minimum period of 10 (ten years) to become eligible for the ‘Scheme’. The President & the Committee shall from time to time may modify the eligibility criteria depending on the situation prevailing at a given time.

For other details please visit our website [meai.org](http://meai.org) in which complete bylaws governing the scheme is posted.



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### Mine Planning Services:

All aspects of Statutory Mine Plan preparation, Life Of Mine Study & Detailed Project Report (DPR)



### Quality Assurance:

Grade Reconciliation, Washability Studies, Quality monitoring plan preparation for Mines & Beneficiation plant



### Laboratory Services:

Chemical & Physical Analysis, Physico-Mechanical studies of rock samples

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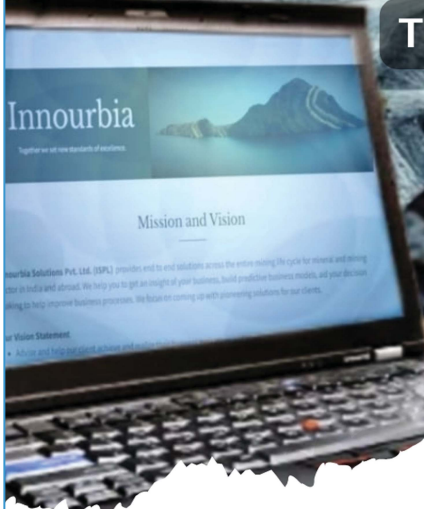
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Kolkata, WB, India



## MEAI NEWS

### MEAI HEADQUARTERS

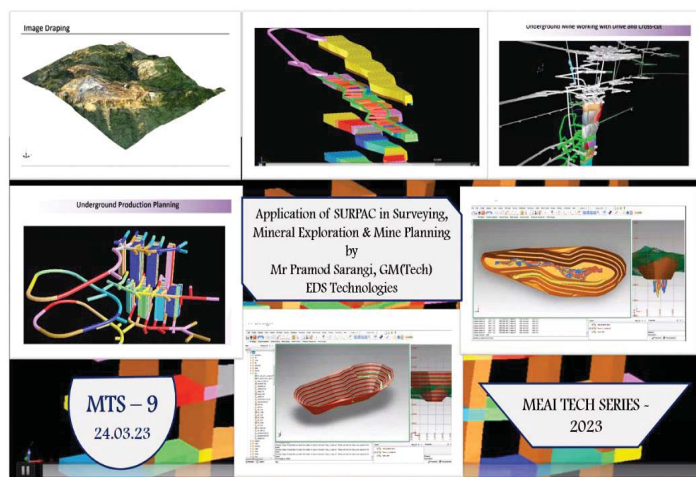
#### MEAI TECH SERIES – March 2023 (MTS–9)

MEAI presented the 9<sup>th</sup> disquisition in the Tech Series for the mining professionals on 24<sup>th</sup> March 2023 (Friday) at 6:30 pm, on WebEx platform.

Mr Deepak Vidyarthi, Chairman TDPC extended a warm welcome to the participants as the President, MEAI Mr K. Madhusudhana in his opening remarks appreciated the continuity of MEAI TECH SERIES and invited the speaker Mr. Pramod Sarangi, GM (Tech) EDS Technologies to share his views and experience on “Application of Surpac in Surveying, Mineral Exploration & Mine Planning” and wished the presentation a grand success.

Mr Pramod Sarangi made an excellent presentation on Application of Surpac in Surveying, Mineral Exploration & Mine Planning. He explained about the Mine planning solutions, Modelling of opencast mining process, Dump design, Image draping, Creation of Lithological Cross Sections, Underground design process, Stope optimization in Underground mines, Underground production planning, Pit design etc

With a very interactive session, the presentation concluded with a Vote of Thanks proposed by Mr T.R. Rajasekar, Consultant to the speaker for the wonderful disquisition for having taken pains for its preparation and to all the participants.



### AHMEDABAD CHAPTER

#### Knowledge sharing session by Kutch Local Center

A Knowledge sharing session, on “Digitization in Mining Industry” was organized by Kutch Local Centre, Ahmadabad Chapter at GMDC Limited, Calcine Bauxite project Gadhsisa, on 4<sup>th</sup> March 2023. The session was conducted in hybrid mode. Around 60 members participated in the session.

The session was inaugurated with welcoming of Guests on to the Dais. Shri S R Rathore I/c General Manager (Project), Group of Bauxite Mine Gadhsisa presented the welcome address and briefed about the importance of the subject.

The members of Kutch Local center presented six papers in the session. Various topics covered by the speakers are:

1. Digitization in Mining Production Department: Shri S D Dangar & Shri D A Bhimani
2. Digitalization in Environment Sector in India: Shri S.K. Choudhary
3. Digitization in Mining Safety: Ms. Jalpa Patel
4. Digitization in KML plan Drone survey: Shri Anjil G Patel
5. Digitalization in the Mining & Metals Industry: Shri Vishnu Nahak
6. Digitization in Mining Production and safety: Shri N S Rathore

The theme of the session was well deliberated. Digitization has not only derived profitability but has improved a lot in terms of safety, productivity and efficiency through automation. The session turned out to be very interactive. The speakers were felicitated with Mementoes.

The session ended with vote of thanks presented by Shri SJ Matariya, AM Mines, CB Project, GMDC Gadhsisa and the entire session was conducted by Ms. R DEY (Geologist), CB Project, GMDC Gadhsisa. The event was sponsored by M/s Rock Tech Engineers.



L-R: Shri A.B. Dani, Shri M. Choubey, Shri S.R. Rathore, Shri D.B. Bhayal, Shri N.S Prajapati



Welcome Speech by Shri SR Rathore, I/c GM GMDC Gadhsisa



Shri DB Bhayal, GM(P), GMDC Matano-Madh welcomed by Shri SR Rathore



Welcoming Shri Mukesh Choubey, GM-Shanghi Cement



A view of Audience



Shri AG Patel, Jr. Surveyor GMDC Gadhsisa making his presentation



Shri SD Dangar, AM (Mine) GMDC Matano Madh making his presentation



Shri SK Chaudhary Manager(Env), GMDC Umarsar making his presentation



Shri N S Rathore AGM-UTCL making his presentation



Shri Vishnu Nahak, Mining Engineer, Sanghi Cement making his presentation



Ms Jalpa Patel, Geologist, GMDC Gadhsisa making her presentation





## NOMINATIONS FOR MEAI AWARDS 2023

The Mining Engineers' Association of India presents awards sponsored by the Industry/individuals during Annual General Meeting in July - August every year. Nominations for the following Awards are invited in the prescribed form, so as to reach the Secretary General by **31<sup>st</sup> of May 2023**. Nomination can be made by one member for one award only.

- 1. MEAI - Sitaram Rungta Memorial Award** for the best paper on Mining related issues during the year 2022.

### **AWARD Bylaws:**

- The award is known as MEAI – Sitaram Rungta Memorial Award, instituted by M/s Rungta Group of Mines.*
- The award is presented to a Mining Engineer/ Geologist or any other qualified person involved with Mining Industry, who presented a paper on mining related issues during the previous calendar year/ financial year.*
- The papers presented in any of the paper meetings, seminars or workshops organized by the Association/ Chapter during the calendar year are eligible for the award, provided*
  - The paper was not published in any journal/ magazine in India or abroad*
  - The author did not deliver lecture/ talk related to this paper on any other forum.*

- 2. MEAI NMDC Award** for significant contribution to Iron Ore Industry during the year 2022.

### **Award Bylaws:**

- The award is known as MEAI-NMDC Award instituted by M/s NMDC Ltd.*
- The award is presented to a Mining Engineer/ Geologist or a qualified person involved in Mining Industry for the meritorious services rendered by him/ her to the Iron ore Industry.*

- 3. MEAI Simminds Award** for significant contribution to limestone industry during the year 2022.

### **AWARD Bylaws:**

- The award is known as MEAI – SIMMINDS award instituted by M/s SOUTH INDIAN MINES AND MINERALS INDUSTRIES Ltd.,*
- The award is presented to a Mining Engineer/ Geologist or a qualified person involved in Mining Industry for his/ her significant services rendered to the Limestone industry.*

- 4. MEAI Smt. Bala Tandon Memorial Award** in recognition of contribution to Mining Industry for improving ecology, environment and a forestation during the year 2022.

### **AWARD Bylaws:**

- The award is known as MEAI - Smt. Bala Tandon Memorial Award instituted by Padmabhushan G.L. Tandon in memory of his late wife.*
- The award is presented to a Mining Engineer/ Geologist or a qualified person associated with the Mining Industry, in recognition of his/ her meritorious services for improving ecology, environment and afforestation in mining and mineral industries.*

- 5. MEAI Abheraj Baldota Memorial Gold Medal Award** (Mining Engineer of the year 2022) in recognition of significant contribution to Mining Industry by a Mining Engineer with 20 years of experience in the Industry.

### **Award Bylaws:**

- The award is known as MEAI – Abheraj Baldota Memorial Gold Medal Award (Mining Engineer of the year) instituted by M/s MSPL Ltd., in memory of its founder late Abheraj Baldota.*
- The award is presented to a Mining Engineer with a Degree or Diploma in Mining Engineering and Mine Manager's Certificate of Competency with 20 years of experience in mining and allied disciplines as on the date the nomination is forwarded and the nominee should have completed 45 years of age and contributed substantially to the mining and mineral industries in the areas of management performance, production, mining technology, human resource development, protection of environment, mineral conservation, beneficiation etc.*

- 6. MEAI Abheraj Baldota Memorial Gold Medal Award** (Young Mining Engineer of the year 2022) in recognition of significant service to Mining Industry by an Young Mining Engineer who has not completed 35 years of age as on 2021.

### **Award Bylaws:**

- The award is known as MEAI – Abheraj Baldota Memorial Gold Medal Award (Young Mining Engineer of the year) instituted by M/s MSPL Ltd., in memory of its founder late Abheraj Baldota.*
- The award is presented to an Young Mining Engineer with a Degree or Diploma in Mining Engineering or a Manger's*

*Certificate of Competency with five years' experience in mining industry and the nominee should not have completed 35 years of age as on the date of filing his nomination for the award.*

- 7. MEAI-SRG Informational Technology Award** for the year 2022, In recognition of significant contribution to Mining Industry adopting Information Technology during the year 2022.

**AWARD Bylaws:**

- a. *The award is known as S.R.G. Award for Information Technology, instituted by M/s S.R.G. Consulting Mining Engineers (P) Ltd. in memory of late Sriram Srinivasan and late Pradeep Kumar Bhattacharya both founder directors who lost their lives in Train (Rajdhani Express) accident in the year 2002.*
- b. *The award is presented to a qualified Mining Engineer/ Geologist/ a qualified person for his significant contribution in Information Technology to Mining and Mineral Industries and the nominee should be a Life Member of the MEAI.*

- 8. MEAI-Smt. Gullapalli Saraladevi Memorial Award** (Lifetime Achievement by a Mining Engineer) during the year 2022.

**Award Bylaws:**

- a. *The award is known as MEAI – Smt. Gullapalli Sarala Devi Memorial Award for Life time achievement by a Mining Engineer, instituted by Shri G. Jagdeesh in memory of his late wife.*
- b. *The award is presented to a Mining Engineer with a Degree or Diploma in Mining Engineering or a Manger's certificate of competency with at least 30 years' experience in mining industry.*
- c. *The award is presented for the Life Time Achievement of the mining engineer in the areas of production, quality control, processing/ beneficiation and trading besides overall management of mines, mining projects related to Public and Private Sectors during his service period.*

- 9. MEAI Master Tanay Chadha Memorial Geologist Award** for the year 2022 in recognition of significant contribution by a geologist in the field of Mineral Exploration, quality control and production, mine planning etc. during the year.

**Award Bylaws:**

- a. *The award is known as MEAI – Master Tanay Chadha Memorial Geologist Award instituted by Shri G.L.Tandon (Padma Bhushan) in the name of his late grandson (S/o Smt. Sunita Chadha and Shri Sudhanshu Chadha). The award is presented to a geologist with a Master's Degree in Geology/ Applied Geology/ Geophysics with at least*

*five years' experience in Mining and Mineral Industry who had contributed significantly in the areas of mineral exploration, quality control and production, mine planning, etc.*

- 10. MEAI- Smt Veena Roonwal Memorial Award** for the year 2022 to a Mining Engineer/Geologist/a qualified person involved with Mining Industry with 10 years' experience for presenting a paper during the year in a seminar/ symposium workshop organized by MEAI on "Water Management in and around a working mine" or "Implementation of New/Latest Technology in Mining and allied subjects.

**Award Bylaws:**

- a. *The award is known as Smt. Veena Roonwal Memorial Award instituted by Prof. G.S. Roonwal in memory of his late wife and is presented to a qualified Mining Engineer/ Geologist/ a qualified person involved with Mining Industry with 10 years' experience, for presenting a paper during the year in a seminar/ symposium/ work shop/ technical paper meeting organized by MEAI/ MEAI Chapter on "Water Management in and around a working mine or implementation of New/ Latest Technology in mining.*

- 11. MEAI- Smt Kiran Devi Singhal Memorial Award** for the year 2022 only to a person (MEAI Member/Non-member- need not necessarily be from mining discipline) for his/her contribution in the field of "Development and Conversation of Minerals and Environment" in and around Metalliferous mines (excluding Coal and oil) during the year 2022.

**Award Bylaws:**

- a. *The award is known as MEAI - Smt. Kiran Devi Singhal Memorial Award instituted by Dr. Suresh C. Singhal in memory of his late mother.*
- b. *The award is presented to a person (MEAI member or non-member and he need not necessarily be from mining discipline) for his/ her out-standing contribution in the field of "Development and Conservation of Minerals and Environment in and around metalliferous mines (mines excluding those of Coal and Oil).*
- c. *The award consists of a Medal and a Certificate.*

- 12. MEAI Award to a best paper in Mining article published in the Mining Engineers' Journal in the financial year 2022** - Instituted by Dr. M.L. Jhanwar.

**Award Bylaws:**

- a. *The Award will be known as Eco-friendly Mining Award.*
- b. *The Award will be for the financial year.*
- c. *The Award will be given to a person for contributing the best paper on Eco-friendly Mining in Mining Engineers' Journal published by MEAI.*



- d. *The Awardee may be member of MEAI or non-member.*
- e. *The paper should not have been published in any of the journals in Magazines India/ Abroad.*
- f. *Whoever contributes paper in MEJ on Eco-friendly Mining should become eligible to be considered for the award.*

**13. MEAI-SCCL Coal Award** for the year 2022 to a Mining Engineer, a Geologist, a Mechanical Engineer and a Foreman/Over man for meritorious contribution to the Coal Industry.

**Award Bylaws:**

- a. *The awards are known as MEAI- SCCL Coal Awards instituted by M/s SCCL Ltd.*
- b. *The awards are presented to a Mining Engineer, Geologist, Mechanical Engineer, Overman/ Foreman or a qualified person involved in Mining Industry for the meritorious services rendered by him/ her to the coal industry.*

❖ For detailed guide lines please visit website [www.meai.org](http://www.meai.org) and memorandum of association and rules and regulations (as on 01.03.2018)

**Applications and Guide Lines**

Application must be supported by at least two council members and shall be sent to MEAI NHQ in Prescribed Format (Copy Enclosed) at Hyderabad before 30<sup>th</sup> April 2023. (MEAI NHQ Address: Mining Engineers' Association of India, F-608&609, VI Floor, Raghava Ratna Towers 'A' Block, Chirag Ali Lane, Abids, Hyderabad – 500001. Mob – 7780117320).

Applications are to be sent along with enclosed soft copies in (PDF format) with subject.

**MEAI Awards 2023 to email - [meai1957@gmail.com](mailto:meai1957@gmail.com)**



## MEAI AWARD FORMAT

1. Name:
2. Date of Birth:
3. Academic Qualification:
4. Professional Qualification:
5. Whether a Member/ Life Member of MEAI:
6. Applying for which award:
7. Specific details of the award applied:  
for as per requirement of bylaws  
(Enclose relevant documents)

Date:

Certified that I know Mr/ Ms. \_\_\_\_\_ personally and his/ her application is forwarded for consideration.

Chairman, MEAI Chapter \_\_\_\_\_ (or) Council Member, MEAI  
Enclosed copies of documents on experience and achievements.

- i.
- ii.
- iii.

## Inaugural Function held on 24-4-2023



Dignitaries on the Dais in Inaugural function on 24-4-2023



Address by Mr K Madhusudhana, President MEAI



Address by the Chief Guest Mr B Surender Mohan



Address by Dr PV Rao, NACRI Co-Chair



Felicitations to Chief Guest Mr B Surender Mohan, Former CMD, NCL Limited



Felicitations to Mr K Madhusudhana, President MEAI



Felicitations to Dr PV Rao, Co-Chair NACRI



Felicitations to Mr Shameek Chattopadhyay, Guest





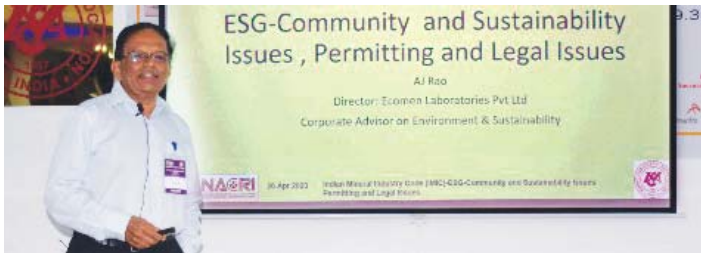
Felicitations to Mr M Narsaiah, SG MEAI, Guest



Felicitations to Mr TR Rajasekar, Guest



Presentation by Mr Manish Tomar, Faculty



Presentation by Mr AJ Rao, Faculty



Felicitations to Dr AK Sarangi, Faculty



Felicitations to Mr Pankaj Satija, Faculty



Felicitations to Dr TM Babu, Faculty



Felicitations to Mr AJ Rao, Faculty



Felicitations to Mr TR Rajasekar, Faculty





Felicitation to Mr AR Vijay Singh, Faculty



Felicitation to Mr R Karthikeyan, Faculty

**Valedictory Function 28-4-2023**



Dignitaries on the Dais in the Valedictory Function



Address by the Chief Guest Mr VS Rao, Former President MEAI



Chief Guest presenting Training Certificate to Ms Yamini Singh, Delegate



Delegates participating in the evaluation test on 28-4-2023



Delegates participating in the evaluation test on 28-4-2023



Delegates photographing with Faculties

## MEJ RIDDLES

Dear Readers of MEJ,

In order to increase the readership of MEJ, which has been felt essential in the interest of our ardent members, the mineral industry professionals as well as the mining sector, the Editorial Board of MEJ has decided to hold a monthly QUIZ. The monthly QUIZ will be designed and printed in MEJ based on the content published in the previous month's MEJ. The MEJ readers will be given five objective questions with multiple choices to choose; and expect them to respond with their correct answer by email to the Editor at [editormejmeai@gmail.com](mailto:editormejmeai@gmail.com) by 20<sup>th</sup> of the current month. If more than three members responded with the correct answers, then the three winners will be decided by draw. Each winner will be issued a certificate of merit and a nominal cash prize of Rs 500.

Encourage the EMJ readers to participate in the QUIZ in large numbers and benefit from the enhanced knowledge by reading the Journal from the first to last page.

### Questions based on MEJ April 2023 issue

- 1. Which Company is in the business of Mining, Pellet, DRI, Steel and Power?**  
(a) Minera (b) NMDC Limited  
(c) Baldota (d) MOIL
- 2. Which Indian State Governor did Rajasthan Chapter-Udaipur felicitate in February 2023?**  
(a) Bihar (b) Andhra Pradesh  
(c) Uttar Pradesh (d) Assam
- 3. Which Chapter organized knowledge sharing session on "The Current trends of demand for the rare earths & critical minerals and India's position"?**  
(a) Bangalore (b) Dhanbad  
(c) Ahmedabad (d) Himalayan
- 4. Which Indian State produced highest value of mineral production in 2020-21?**  
(a) Odisha (b) Rajasthan  
(c) Chhattisgarh (d) Karnataka
- 5. By 2026-27, what percent contribution of the mining sector to GDP proposed by the Union Minister of Mines?**  
(a) 2.0% (b) 2.5%  
(c) 2.3% (d) 2.1%

## WINNERS OF RIDDLES PUBLISHED IN THE MEJ APRIL 2023 ISSUE

*Congratulations to proud winners*

**Mr Darshan B.U**

Jr. Manager - Geology & QC, John Mine of R.Praveen Chandra, Chitradurga  
E-mail: [darshan@ermgroup.in](mailto:darshan@ermgroup.in)

**Mr Sanjeev Soni**

ACC Limited, Lakheri Cement Works, Lakheri  
E-mail: [sanjeevkumar.soni@acclimited.com](mailto:sanjeevkumar.soni@acclimited.com)

**Mr Satish Kumar Agrawal**

Mining Engineer, E-mail: [satish.ag47@gmail.com](mailto:satish.ag47@gmail.com)

To receive the cash prize of Rs 500, the winners may please contact the Secretary General, MEAI on email at [meai1957@gmail.com](mailto:meai1957@gmail.com) or Mob. 9177045204.



# CONFERENCES, SEMINARS, WORKSHOPS ETC.

## INDIA

**15-18 May 2023: Mineral Resource Estimation and Applied Geostatistics.** A refresher Course by Dr Abani Samal offered LIVE on CISCO Webex platform. Total 4 sessions of 4 hours each, 8 am to 12 noon (IST). Contact Dr Suman Mandal regarding registration at [suman@cgcl.in](mailto:suman@cgcl.in) and Dr Abani Samal for Course related matters at [arsamal@geoglobal.co](mailto:arsamal@geoglobal.co).

**14-15 Jul 2023: International Seminar on Food and Energy Security through Minerals.** Location: Jaipur. For details, Contact – Mr Anil Mathur on Mob 9414119227, E-mail: [chairman.jaipur@meai.org](mailto:chairman.jaipur@meai.org) & [meaijpr2010@gmail.com](mailto:meaijpr2010@gmail.com)

**25-27 Aug 2023: International Seminar on Vision – Mining 2047.** Location: Ahmedabad. For details, contact Email - [meaiahmedabad@gmail.com](mailto:meaiahmedabad@gmail.com)

**6-9 Nov 2023: International Mining, Equipment & Minerals Exhibition (IME 2023).** Eco Park, Rajarhat, Kolkata, India. Organised by The Mining, Geological & Metallurgical Institute of India (MGMI). Contact Email ID: [miningexpo@tafcon.in](mailto:miningexpo@tafcon.in)

## ABROAD

**4-5 Mar 2023: International Conference on Mining and Refining of Metals ICMRM.** Rome, Italy. Website URL: <https://waset.org/mining-and-refining-of-metals-conference-in-march-2023-in-rome>

**4-5 Mar 2023: International Conference on Mining Intelligence (ICMI 2023).** Rio de Janeiro, Brazil. Website URL: <https://waset.org/mining-intelligence-conference-in-march-2023-in-rio-de-janeiro>; Contact URL: <https://waset.org>

**5-8 Mar 2023: PDAC 2023.** The annual PDAC 2023 Convention – the world's premier mineral exploration and mining convention. Metro Toronto Convention Centre, 222 Bremner Blvd., Toronto, Ontario, M5V 3M9, Canada

**22-23 Apr 2023: International Conference on Recent Developments in Mining Technologies ICRDMT.** London, United Kingdom. Website URL: <https://waset.org/recent-developments-in-mining-technologies-conference-in-april-2023-in-london>

**22-23 Apr 2023: International Conference on Mining and Mineral Technologies (ICMMT 2023),** Tokyo, Japan. Website URL: <https://waset.org/mining-and-mineral-technologies-conference-in-april-2023-in-tokyo>; Contact URL: <https://waset.org>

**3-4 May 2023: International Conference on Mining Technologies and Sustainable Systems ICMTSS.** Rome, Italy. Website URL: <https://waset.org/mining-technologies-and-sustainable-systems-conference-in-may-2023-in-rome>

**4-5 May 2023: 17 International Conference on Mining Technology and Exploration (ICMTE 2023).** Amsterdam,

Netherlands. Web: <https://waset.org/mining-technology-and-exploration-conference>

**29-31 May 2023: MetPlant Conference 2023.** Perth, Australia and online. Contact AusIMM. T: 1800 657 985 or +61 3 9658 6100 (if overseas)

**15-16 Jun 2023: International Conference on Mining and Metallurgical Technologies (ICMMT 2023).** Toronto, Canada. Website URL: <https://waset.org/mining-and-metallurgical-technologies-conference-in-june-2023-in-toronto>; Contact URL: <https://waset.org>

**26-29 Jun 2023: 26<sup>th</sup> World Mining Congress.** Resourcing Tomorrow-Creating Value for Society. Brisbane, Queensland, Australia. Contact: Kristina Liska, Event and Registration Coordinator at [registration@wmc2023.org](mailto:registration@wmc2023.org)

**16-17 Aug 2023: International Conference on Mine Mechanization and Mining Policies (ICMMMP 2023).** Tokyo, Japan. Website URL: <https://waset.org/mine-mechanization-and-mining-policies-conference-in-august-2023-in-tokyo>; Contact URL: <https://waset.org>

**25 - 28 Oct 2023: China Coal & Mining Expo 2023.** China's 20<sup>th</sup> International Technology Exchange & Equipment Exhibition on coal and mining is the largest international coal and mining exhibition in Asia. New China International Exhibition Center (NCIEC), 88 Yuxiang Road, Tianzhu Airport Industrial Zone, Shun Yi District, Beijing, China

**28-29 Oct 2023: International Conference on Mining Technology and Exploration (ICMTE 2023).** Paris, France. Web: <https://waset.org/mining-technology-and-exploration-conference-in-october-2023-in-paris>

**31 Oct - 2 Nov 2023: International Mining and Resources Conference (IMARC).** Sydney, Australia. Contact: [connect@imarcglobal.com](mailto:connect@imarcglobal.com). Phone: Australia: +61 (0) 3 9008 5946

**8-9 Nov 2023: International Conference on Underground Mining Methods and Technologies ICUMMT 2023.** Istanbul, Turkey. Website URL: <https://waset.org/underground-mining-methods-and-technologies-conference-in-november-2023-in-istanbul>

**15-16 Nov 2023: International Conference on Design Methods in Underground Mining ICDMUM 2023.** Jeddah, Saudi Arabia. Website URL: <https://waset.org/design-methods-in-underground-mining-conference-in-november-2023-in-jeddah>

**01-02 Dec 2023: International Conference on Design Methods in Underground Mining ICDMUM.** Auckland, New Zealand. Website URL: <https://waset.org/design-methods-in-underground-mining-conference-in-december-2023-in-auckland>.

Printed and Published by M. Narsaiah, Secretary General, Mining Engineers' Association of India,

on behalf of Mining Engineers' Association of India and printed at Deepu Printers, Raghava Ratna Towers, Chirag Ali Lane, Nampally, Hyderabad - 500 001.

and published at F-608 & 609, 'A' Block, VI Floor, Raghavaratna Towers, Chirag Ali Lane, Abids, Hyderabad - 500 001. **Editor: Dr. P.V. Rao**

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Our founder Abheraj Baldota's core operating principle was 'I am not the owner of wealth, but a privileged trustee to serve the community with it'. Thus it is no surprise that ESG practices are ingrained in our corporate ethos, business strategy and operations since our birth in 1961.

We were the first Indian unlisted company to publish a GRI compliant sustainability report way back in 2006. We are a large producer of renewable power in India. We were also the first mining company in India to get certified for OHSAS 18001:1999 and ISO 14001:2004. Across the years, we have invested more than ₹820 Crore in ESG. From building blood banks to adopting villages and combating climate change, we have been practicing ESG long before it became a buzzword.



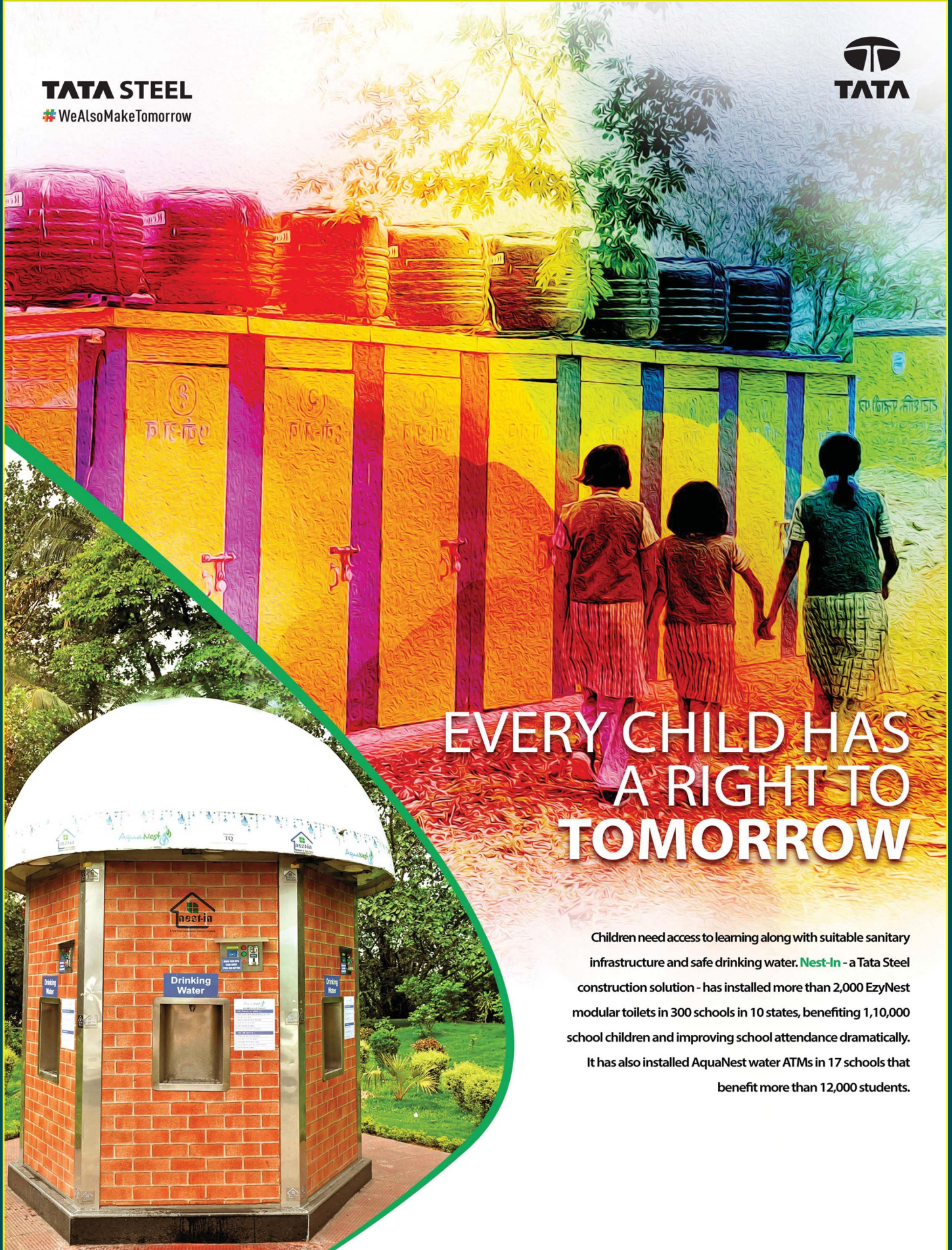
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