Mining Engineers' Journal



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Mining Engineers' Association of India

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Vol. 25 No. 4 MONTHLY November - 2023



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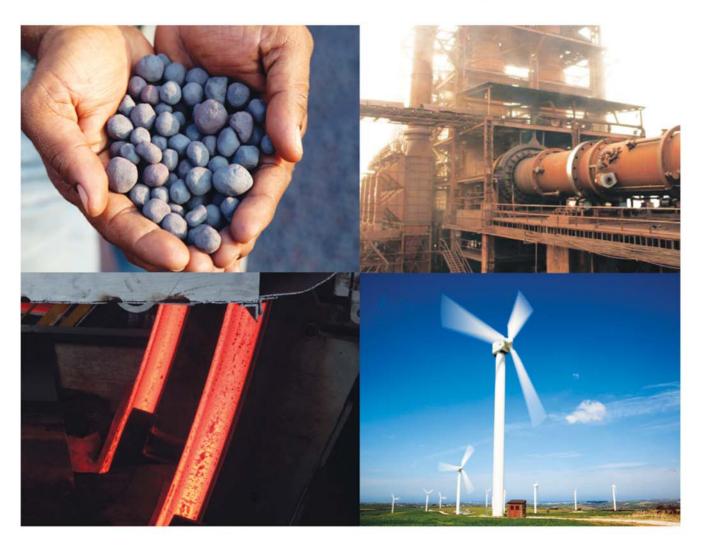
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Dear members..

Last month I talked about Women's participation in Mining. While having further discussions with the Chapters it was found that many Chapters do have Women Life Members and the number is gradually increasing with more women Mining Engineers and Geologists showing interest. Even there is encouraging response from women Environmental Professionals. With an aim to provide them more exposure and to involve them in the Association management, it is now being considered to have a women's representative in the National Council initially as a Special Invitee. In subsequent years, such a member might be chosen directly as Co-opted / Nominated Council member or even as an Elected Council member. As of now, they can involve themselves in the management of Chapters also, as an official or Committee member. Ahmedabad Chapter already has a woman Life member as its Secretary for the past over two years and she is still continuing on this post. With her sincere and hard work and the interest shown I will not be surprised if we may find her as Chairperson of the Chapter or even as an official in the National Council in the coming years. My best wishes to her. Let other women members take a clue from her.

Like women members, there is a consistent increase in the formation of Students Chapters. There are some 7-8 Students Chapters as of now, affiliated to different Chapters. Some senior members of the Association are taking abundant interest in encouraging students to join MEAI and form Students Chapters at their institutions. We are happy to note that some of the student members participated in the MEAI National Quiz 2023. The Students Chapter at AKS University, Satna is also organizing the "National Mining Day" on 1st November under the guidance of Prof. G.K. Pradhan under the aegis of Jabalpur Chapter, indeed a very pleasing and encouraging initiative. I wish the Association could organize a national Seminar or such other event "By the students and For the Students" moto later in the year at some location convenient to students

Every year we celebrate 'The Indian Mining Day' at the Association Headquarters as well as at all the Chapters. Our former President Dr. S.K. Sarangi who took up this initiative said in one of the events held at Ahmedabad, "Mining is one of the oldest professions in the world which has never been given the due recognition and honour it deserves. We have been observing various days as Valentine day, Mothers' day, Environment Day etc. to name a few. It is high time we as a Mining Community celebrate our profession once in a year." Thus, the Indian Mining Day was introduced and since then has been observed religiously on 1st November every year with a specific theme. The theme for the current year is "De-carbonization Initiative in Mining Industry", a very pertinent topic under current scenarios all over the world. On this occasion, the Headquarters is organizing "MEAI National Quiz 2023" and introducing for the first time a Gold Medal for the winner. Hope there will be healthy Competition.

Wish you and your families safe and peaceful Dussehra and Diwali celebrations!

S.N. Mathur
President



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EDITOR'S DESK



Dr. P.V. Rao Editor, MEJ

As has been communicated to our readers every year since 2019, the highlights of the four-day CRIRSCO ANNUAL MEETING-2023 held at Novotel Barra, Rio de Janeiro, Brazil on 16-19, October 2023 are presented below. Owing to non-receipt of Brazilian visa on time, the NACRI representatives viz. myself and Mr Dhananjaya G. Reddy, VP-II MEAI could not make it in person. However, on behalf of NACRI Mr S.N. Mathur, Mr K. Madhusudhana, and myself participated virtually and presented our annual report.

The first day i.e. 16th October of the Annual Meeting that was initiated by the CRIRSCO Chairperson Mr Edson Rebeiro, Brazil was restricted to CRIRSCO 'Executive' and 'Standard Definitions Working Group (SDWG)'. They deliberated on the proposed modifications to the Template Standard Definitions and concluded the final draft for further discussion and approval by the General body.

The Second day i.e. 17th October of the Annual Meeting was open to all the CRIRSCO members (28) and invited observers. At the outset, CRIRSCO Chairperson greeted the members, invited observers and presented his opening remarks and the Agenda for the Annual Meeting. The proceedings commenced with the admission ceremony of the Philippines as the 15th member of CRIRSCO, conducted by Mr Peter Stoker, Australia. Mr Edson placed the minutes

of the 2022 AGM in the meeting for ratification by the General body and enumerated the action taken report for the year 2022-23.

Mr Edson presented his vision for CRIRSCO to be recognised as the Global Benchmark System for the public reporting of Exploration Results, Mineral Resources and Mineral Reserves. He stressed that it is more than a Template and is based on Basic principles, clear Standard definitions, and four-layered Governance viz. Competent Persons (CP), Professional Associations, National Reporting Organisations, and the Committee for being fully functional. He also acknowledged a few points of concern viz. continuous professional development and awareness of all the CPs, low number of formal complaints and sanction applications, not all NROs have their codes formally recognised or adopted by their respective countries or regions - if one NRO struggles, the whole system is challenged, and financial dependence on ICMM.

Mr Thomas L. Brenner, Brazil presented the progress in launching the CRIRSCO digital website with the support of website consultants Kinsta and Geoansata, shared the provisional website link https://crirsco.launchweb.co.za, and requested the members to continuously validate it and offer their feedback. The General Body after reviewing the modified standard definitions suggested forming a working group specifically to come out with a whitepaper covering all related aspects of standard definitions before seeking approval for incorporation in the Template.

As per the succession plan, Mr Garth Kirkham, Canada will take over as the new Chairperson of CRIRSCO from 1st January 2004, initially for one year but with a provision to extend the term by one more year. Mr Lufi Irwan Rachmad, Indonesia has been named as the Secretary for one year. The next AGM of CRIRSCO will be held in Vancouver, Canada in the later part of October 2024.

The CRIRSCO budget update & forecast, funding for 2024 and beyond presented by Mr Peter Stoker was deliberated at length. Majority of the members approved enhancement of the annual fee by USD 500 every year from 2024 until it reached USD 4000 per annum, to meet the increasing costs. Also proposed that the hotel accommodation charges, henceforth, may have to be borne by the NRO representatives participating in the AGM, as the continuation of ICMM annual support of GBP 30,000 is uncertain.

The penultimate day i.e. 18th October of the Annual Meeting was open to all the CRIRSCO members, invited observers and guests. All the 15 NROs presented their annual reports while a few prospective members viz. China, Kyrgyzstan, West Africa, Saudi Arabia, Ecuador, and Peru presented their videos in support of their claim for admission to CRIRSCO. In the later part of the day, the external relationship agencies viz. ICMM, UNECE (UNFC) and ISA made their presentations.

The final day i.e. 19th October of the Annual Meeting was entirely devoted to the theme 'TECHNICAL DAY: RESOURCE CLASSIFICATION AND RISK ASSESSMENT'. Mr Scott Dunham, on 'The Parker Challenge: first lessons', Prof Roussous Dimitrakopoulos on 'Stochastic Mine Planning: past, present and future', Ms Liv Carrol on 'AI tools for risk assessment: Accenture', Dr Marcelo Godoy on 'Resource classification and the effective management of geological risks', and Ms Celeste Queiroz on 'Resource Classification: a practical example for iron ore deposits' made exceptional presentations. Mr Peter Stoker, Australia and Mr Garth Kirkham, Canada organised a round table Q&A. The AGM 2023 ended with the concluding remarks offered by Mr Edson.

- Editor

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NEWS FROM THE MINERAL WORLD

Mineral production records 10.7 percent surge in July

New Delhi: The mineral production sector in India witnessed a significant upswing in July 2023, with a remarkable 10.7 per cent increase compared to the same month in the previous year.

These findings are based on the latest data released by the Indian Bureau of Mines (IBM), indicating a positive trajectory in the country's mineral production, read the Ministry of Mines press release.

The Index of Mineral Production for the mining and quarrying sector, using the base year 2011-12 as a reference, reached a level of 111.9 in July 2023. This robust growth demonstrates the sector's resilience and ability to contribute substantially to the nation's economic development.

The cumulative growth for the April-July period in 2023 compared to the same period in the previous year stands at an impressive 7.3 per cent. This consistent performance underscores the sector's role as a vital component of India's economic landscape, read the press release.

In July 2023, production figures for several critical minerals revealed promising numbers. Coal production stood at an impressive 693 lakh tonnes, while lignite production reached 32 lakh tonnes.

Additionally, essential minerals such as bauxite, chromite, copper concentrate, gold, iron ore, lead concentrate, manganese ore, zinc concentrate, limestone, phosphorite, and magnesite all contributed positively to the sector's growth read the press release.

Chromite, with a remarkable growth rate of 45.9 per cent, led the pack of minerals showing positive trends in July 2023 compared to the same month in 2022.

It was followed closely by manganese ore (41.7 per cent), coal (14.9 per cent), limestone (12.7 per cent), iron ore (11.2 per cent), and gold (9.7 per cent). These significant increases indicate the sector's capacity for expansion and diversification.

Furthermore, the mineral sector demonstrated its resilience with notable growth in copper concentrate (9 per cent), natural gas utilization (8.9 per cent), lead concentrate (4.7 per cent), zinc concentrate (3.6 per

cent), magnesite (3.4 per cent), and crude petroleum (2.1 per cent), read the press release.

While the overall outlook is promising, some minerals showed a decline in production during July 2023. Lignite production declined marginally by -0.7 per cent, bauxite by -3.2 per cent, phosphorite by -24.7 per cent, and diamond by -27.3 per cent, read the release. These fluctuations reflect the dynamic nature of the mineral production sector, which relies on various factors, including market demand and resource availability.

The growth in mineral production is not only significant for the sector itself but also holds broader implications for India's industrial and economic development. It highlights the sector's role in contributing to the nation's self-reliance and economic growth.

ANI | Sep 28, 2023

Union Cabinet approves royalty rates for critical and strategic minerals including lithium

The Union Cabinet on Wednesday approved royalty rates for three critical and strategic minerals, Information and Broadcasting minister Anurag Thakur said. The decision on royalty rates of critical minerals comes after Mines Secretary Vivek Bharadwaj announced in September that the government will start the auction of critical mineral mines in a few weeks.

The approved royalty rates for lithium, Niobium and REE are 3 per cent, 3 per cent and one per cent, respectively. In August, there were reports of India getting prepared to start the auction process for some 100 critical mineral blocks. According to a Bloomberg report, Bharadwaj had revealed that the blocks that are being prepared for auction includes nickel, lithium, cobalt and platinum, along with rare earths. "The legal framework has been laid out and the blocks have been identified," Bloomberg had quoted Bharadwaj as saying. The tender seeking bids is expected to be out by December and auctions may start three months later, he added.

Mineral royalty is the economic rent due to the sovereign owner (government) in exchange for the right to extract mineral substances.

Mineral royalty is the economic rent due to the sovereign owner (government) in exchange for the right to extract mineral substances.

According to a Centre for Social and Economic Progress (CSEP) report, India's mineral royalty rates

are among the highest in the world, thus, impacting the competitiveness of the mining sector. "The royalty payments over and above the auction premia put a heavy burden on the mining companies. Adjusting the rates in alignment with the global best practices will facilitate investment and development in the mining sector. Lower royalty rates would encourage future exploration and production of minerals in India," it stated. India had changed its mining rules in July in a bid to boost exploration of some critical minerals like lithium by allowing private miners to search for the materials. The reforms will be key for auctioning lithium blocks recently identified in Jammu and Kashmir, and Karnataka state.

India had changed its mining rules in July in a bid to boost exploration of some critical minerals like lithium by allowing private miners to search for the materials. The reforms will be key for auctioning lithium blocks recently identified in Jammu and Kashmir, and Karnataka state. State-run enterprises have been actively scouting the globe in search of these valuable mineral resources. Meanwhile, prominent energy giants like Coal India Ltd. and NTPC Ltd. are meticulously strategizing their foray into the mining sector to tap into these essential materials. Additionally, the establishment of Khanij Bidesh India Ltd., a joint venture involving three government-owned companies, further underscores India's commitment to securing critical mineral assets on an international scale, with a primary focus on regions such as Australia and South America. In September, Reuters had reported, citing sources, that the auction for Jammu and Kashmir's lithium reserves will take place in the next few weeks.

India has been exploring ways to secure supplies of lithium, a critical raw material used to make electric vehicle batteries, in February found its first lithium deposits in Jammu and Kashmir with estimated reserves of 5.9 million tonnes. "The auction will happen soon and some overseas miners have shown interest," Reuters quoted a government official as saying. However, no official comments were made by the mines ministry on the issue.

ET Online: Oct 11, 2023

■ Rs 82,000 cr collected under District Mineral Foundation till August: Govt

DMF is a non-profit body working for people and areas affected by mining-related activities in such manner as may be prescribed by the state government.

The mines ministry on Monday said Rs 82,370.79 crore has been collected under the District Mineral Foundation (DMF) till August this year.

DMF is a non-profit body working for people and areas affected by mining-related activities in such manner as may be prescribed by the state government.

"The total amount of funds collected under DMF comes to Rs 82,370.79 crore and the amount utilised stands at Rs 45,150.21 crore (August)," the Ministry of Mines said

As of August, DMFs have been set up in 644 districts in 23 states/Union Territories, while 17 states/UTs have DMFs in each district, the ministry said.

States and UTs that have DMFs in all district include Andhra Pradesh, Bihar, Himachal Pradesh, Kerala, Uttarakhand, Uttar Pradesh, Punjab, Haryana, Chhattisgarh, Jharkhand, and Jammu & Kashmir.

Business standard | October 14, 2023

India's shift to green power may cost 73,800 jobs at Coal India by 2050: GEM report

If plans were implemented to phase down coal to limit global warming to 1.5 degrees Celsius (2.7 degrees Fahrenheit), only 250,000 miners - less than 10 percent of the current workforce - would be required worldwide, the GEM report stated.

State-run miner Coal India Limited (CIL), which has the biggest workforce among listed government undertakings, is likely to axe 73,800 jobs by 2050 as India pledges to move from fossil fuels to green power, according to a research report released by the US-based think tank Global Energy Monitor (GEM) on October 10.

The transition to green power is likely to see over a million job-cuts around the world by 2050, the report said on the basis of the climate change pledges made by different countries. Besides India, China will be hit hardest with an estimated 241,900 layoffs by mid-century. China's coal industry, the world's biggest, employs more than 1.5 million people, GEM said.

The International Labour Organisation (ILO) coined a term 'just transition' to define greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind.

India, the world's second largest coal producer, has a workforce of about half the size of China's Shanxi province. India officially employs approximately 337,400 miners at its operating mines, though some studies suggest the local mining sector has four 'informal' employees for each direct employee.

Underlining the imperative that the governments remain involved in planning for coal worker transitions, the GEM report said Coal India is "facing the most potential layoffs" of 73,800 direct workers by 2050.

The report said nearly half a million workers (414,200) operate mines that may reach their end of operation before 2035, affecting nearly 100 workers a day in the mining sector. For the study, GEM covered 4,300 active and proposed coal mine projects around the world with a total workforce of 2.7 million.

At the UN climate talks in Glasgow in 2021, the participants agreed to phase down coal power and a phase out "inefficient" fossil fuel subsidies. These two issues were never explicitly mentioned in the decisions of the UN climate talks before, despite coal, oil and gas being the main drivers of global warming.

"The future of coal mine employment is starker at midcentury. By 2050— a timeframe within the career of an under-40-year-old coal miner working today — nearly 1 million coal mine jobs (990,200) will no longer exist at operating mines under the coal industry's foreseeable closures, potentially laying off over one-third (37 percent) of the existing workforce," read the report.

But, most of the mines likely to shut down "have no planning underway to extend the life of those operations or to manage a transition to a post-coal economy", GEM said.

Dorothy Mei, Project Manager for the Global Coal Mine Tracker, said coal mine closures are inevitable, but economic hardship and social strife for workers is not. "Viable transition planning is happening, like in Spain where the country regularly reviews the ongoing impacts of decarbonisation. The governments should draw inspiration from its success in planning their own just energy transition strategies," she said.

If plans were implemented to phase down coal to limit global warming to 1.5 degrees Celsius (2.7 degrees Fahrenheit), only 250,000 miners - less than 10 percent of the current workforce - would be required worldwide, GEM estimated.

Runa Sarkar, a professor at the Indian Institute of Management Calcutta, said the coal mining region most affected by mine closures is West Bengal. She said India, however, is yet to commit to a peaking year for coal production and, at present, coal production is on the rise, with talks of reopening some closed mines to meet the current demand.

Coal remains the largest single source of electricity worldwide, including in India, and is by far the largest source of electricity sector emissions, contributing just more than a third of power supply but responsible for nearly three-quarters of power sector CO2 emissions.

"It is important to recognise that in the normal course of things a push towards efficiency in production would lead to process automation and a concomitant loss of jobs. At the same time, in October, 2022, the government issued fresh guidelines on mine closure, taking into account its associated ecological and socioeconomic complexities," Sarkar said.

One must take into account that areas which are rich in coal are not the ones where the sun shines or wind blows in abundance, which in turn implies a widening of regional imbalances as a result of mine closures, Sarkar said.

"All this necessitates a more broad-based bottom up discussion around energy transition to ensure one which is both regionally balanced, sustainable and iust." she added.

The Paris Agreement, a legally binding international treaty on climate change adopted by 196 parties at the UN Climate Change Conference (COP21) in Paris, France in December 2015, aims to hold the increase in the global average temperature to well below 2°C above pre-industrial levels. It also accords countries to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

Each nation that ratifies the Paris Agreement pledges its own nationally determined contribution (NDC), which is to be revised on a five-year schedule, to reduce GHG emissions and to adapt to the effects of climate change.

India on its part has updated its NDC targets under which it has committed to reducing the emission intensity of its GDP by 45 percent by 2030, from the 2005 level and achieving about 50 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030.

Sweta Goswami, Money control October 10, 2023

Venezuela, Jindal Steel to sign deal on iron ore mill

Venezuela's government and Jindal Steel & Power Co. have signed an agreement for the Indian company to run the country's largest iron ore producing plant, according to a person with knowledge of the matter,

marking the first entry in years by an international firm into the South American nation's closely held companies.

Nicolas Maduro's government signed off on a deal for Jindal Steel & Power to operate CVG Ferrominera Orinoco, Venezuela's largest iron ore plant, according to a person who asked not to be identified as the information hasn't been made public. No details of the agreement, which was inked Friday, were provided.

Venezuela's information ministry and Jindal Steel & Power didn't immediately respond to requests for comment.

The deal is Venezuela's first step to open up operations in its metallurgic and mining industries to an international private company, after US sanctions hit the country in 2019. Venezuela's mining and heavy industries are all state owned.

Ferrominera has an annual installed capacity of 25,000 metric tons of iron ore and proven reserves for 4.2 million metric tons. The plants have been working below capacity due to years of mismanagement, lack of investment and a power crisis that hit the nation in 2009 and forced the company to cut production to save energy.

Jindal Steel & Power Chairman Naveen Jindal has visited the plants in Bolivar state with technicians, union leader Carlos Ramirez told local newspaper Tal Cual in August.

The government has not published information on the terms of the agreement, fueling questions over the impact on iron ore supply to local industry.

"An economic opening process to the private local and international business is needed, but in a public and transparent manner," the association said in a statement sent to *Bloomberg*.

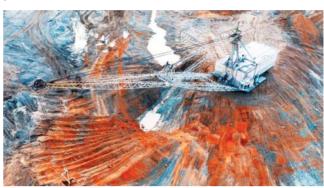
Bloomberg News | September 30, 2023

Critical minerals security: Path to greener future Security of critical minerals is now emerging as a significant strategic concern in regions, nations, and among major industry players.

Criticality of critical minerals

Critical minerals are the foundation for enabling the global transition to a greener future, by being an important element/building block in the manufacturing of renewable equipment (e.g., wind turbines), electric vehicles and underlying semiconductor chips/ digital

technologies. As the global economy aspires for a greener future/ radical energy transition, there is a multifold increase in demand for critical minerals (for example, 40X for Lithium, 25X for Graphite, 20X for Nickel and 7X for Rare Earth metals) over the transition period.



Accentuating the increased demand is also the underlying trend of increased mineral intensity. For example, an electric car requires six times more mineral inputs than a conventional car, and an onshore wind plant requires nine times more mineral inputs than a gas-fired plant.

Critical minerals' security is hence now featured as a key strategic theme across regions, countries and for leading majors.

Emerging critical minerals' landscape Production of critical minerals is highly concentrated, with the top three countries controlling over 75 per cent of global output for Lithium, Cobalt, and Rare Earth Elements. Australia contributes 50 per cent of global production for Lithium, while The Democratic Republic of the Congo and China produce 70 per cent and 60 per cent of Cobalt and Rare Earth elements, respectively.

The concentration level is even higher for mineral processing operations, where China's share of refining is around 35 per cent for Nickel, 70-80 per cent for Lithium and Cobalt, and approximately 90 per cent for Rare Earth elements. Additionally, Chinese companies have made large investments in foreign assets in Australia, Chile, the DRC and Indonesia to secure these minerals.

Given the significant strategic nature, three specific trends are emerging:

 Establishing critical minerals security, a national priority – South Korea has brought in comprehensive resource security measures, Japan has acknowledged the critical minerals amongst its strategic sectors, and Australia

- has identified a war chest to enhance its global positioning further.
- 2. Multi-country collaboration Partnerships are emerging at multilateral forums (e.g. QUAD) across countries (e.g. South Korea forging partnerships with Australia, Indonesia, and Kazakhstan).
- 3. Backward integration by consuming majors In addition to the investments by existing miners, leading consuming majors are evaluating entry into the mining of certain critical minerals like Nickel. This further illustrates the need to access critical minerals for de-risking and laying the appropriate foundation for future growth.

Resource nationalism has also emerged as a new challenge. In April 2022, Mexico nationalised its Lithium reserves, and recently, Chile, which hosts the largest lithium reserves, has announced plans to nationalize its Lithium industry. Similarly, Indonesia has banned Nickel ore exports to develop local downstream operations and extract greater value.

India's critical minerals push

For the critical mineral strategy to be successful, India needs to develop the entire value chain from mineral exploration to recycling of metals. This implies building capacity at each value chain stage (mineral exploration, mineral extractions, intermediate processing, manufacturing, and recycling).

India has already taken several steps to develop its critical minerals sector, including forming a JV company in August 2019 to secure critical minerals from overseas locations.

India has proposed high-level guiding principles for accelerating the global critical mineral value chain development required for sustainable energy transition during the G20.

In June 2023, India released a comprehensive list of 30 critical minerals necessary for economic development & national security and joined the Minerals Security Partnership, an alliance of 14 developed countries led by the USA, to ensure that critical minerals are produced, processed and recycled in a manner that supports the ability of countries to realize the full economic development benefit of their geological endowments.

In August 2023, commercial mining of six critical minerals, i.e., Lithium, Beryllium, Niobium, Tantalum, Titanium and zirconium and deep-seated minerals like Gold, Silver and Copper were allowed through an amendment to the Mines and Minerals (Development & Regulation) Act, 1957.

GoI is developing its first Critical Mineral Policy, which includes establishing a common pool of stockpiling critical minerals with friendly countries/ groupings, promoting indigenous research, utilizing trade agreements and providing fiscal incentives.

India is also embarking on its Samudrayaan Mission to conduct deep seabed mining in search of critical minerals.

Potential way forward for India to secure its critical mineral requirements

To boost the critical minerals supply chain in India, a few initiatives that the government may take into consideration:

- Onboarding battery manufacturers and automakers to invest in mineral assets abroad and process them locally, ensuring uninterrupted supply for batteries and electric vehicles.
- Encouraging JVs with foreign companies and develop a local ecosystem for refining and processing critical minerals.
- Introducing Advance Market Commitments to provide stability to demand guidance for interested players, ensuring adequate capabilities in the private sector.
- Establish a Critical Mineral Fund for geological exploration and financing early-stage critical mineral projects off the ground.
- Deep Ocean Mission ("Samudrayaan Mission")
 in the Critical Mineral Strategy can be explored.
 Exploration activities conducted by the MoES
 indicate vast resources of Copper, Nickel, Cobalt,
 and Manganese, which can help reduce India's
 reliance on imports.
- Recovery of critical metals through recycling will play a critical role from a supply chain resilience and sustainability perspective. India will have to invest in the creation of the supply chain ecosystem to make the metal recovery through the recycling of end-use products and batteries. R&D will also play an essential role in this regard.
- As clearly mentioned in the report published by the Ministry of Mines in June 2023, a national institute or centre of excellence on vital minerals may be established, following in the footsteps of CSIRO, an Australian government corporation and one of the largest mission-driven multidisciplinary science and research organisations in the world. The Centre of Excellence for Critical Minerals can focus on identifying more efficient ways for discovering next-generation critical mineral

deposits through geological knowledge, data analytics and modelling, and machine learning capability.

Overall, while India has already initiated a few key action steps in the right direction, there is a need to develop a comprehensive strategy to ensure that India can have a stronger grip on the moving parts and thus become resilient in its journey towards ensuring its critical minerals security. The government of India needs to centrally bring key stakeholders (mineral exploration agencies, miners, battery manufacturers, automakers, renewables equipment manufacturers, R&D institutions, relevant government departments and PUSs) on that strategy table and specify role expectations from each of them. This must be treated as a national program rather than individual stakeholder trying to find solutions to their individual needs.

Amit Bhargava and Bidyut Chakraborty, KPMG, India | October 5, 2023

Cabinet approves royalty rates for mining of three critical and strategic minerals- Lithium, Niobium and Rare Earth Elements (REEs)

The Union Cabinet chaired by the Prime Minister Shri Narendra Modi approved amendment of Second Schedule of the Mines and Minerals (Development and Regulation) Act, 1957 ('MMDR Act') for specifying rate of royalty in respect of 3 critical and strategic minerals, namely, Lithium, Niobium and Rare Earth Elements (REEs).

Recently, the Mines and Minerals (Development and Regulation) Amendment act, 22023 was passed by the Parliament, which has come into force from 17th August, 2023. The Amendment, among other things, delisted six minerals, including Lithium and Niobium, from the list of atomic minerals, thereby allowing grant of concessions for these minerals to private sector through auction. Further, the amendment provided that mining lease and composite license of 24 critical and strategic minerals (which are listed in Part D of the First Schedule of the Act), including Lithium, Niobium and REEs (not containing Uranium and Thorium), shall be auctioned by the Central Government.

Today's approval of the Union Cabinet of specification of rate of royalty will enable the Central Government to auction blocks for Lithium, Niobium and REEs for the first time in the country.

Royalty rate on minerals is an important financial consideration for the bidders in auction of blocks.

Further, manner for calculation of Average Sale Price (ASP) of these minerals has also been prepared by the Ministry of Mines which will enable determination of bid parameters.

The Second Schedule of the MMDR Act provides royalty rates for various minerals. Item No.55 of the Second Schedule provides that royalty rate for the minerals whose royalty rate is not specifically provided therein shall be 12% of the Average Sale Price (ASP). Thus, if the royalty rate for Lithium, Niobium and REE is not specifically provided, then their default royalty rate would be 12% of ASP, which is considerably high as compared to other critical and strategic minerals.

Also, this royalty rate of 12% is not comparable with other mineral producing countries. Thus, it is decided to specify a reasonable royalty rate of Lithium, Niobium and REE as below:

- (i) Lithium 3% of London Metal Exchange price,
- (ii) Niobium –3% of Average Sale Price (both for primary and secondary sources),
- (iii) REE- 1% of Average Sale Price of Rare Earth Oxide

Critical minerals have become essential for economic development and national security in the country.

Critical minerals such as Lithium and REEs have gained significance in view of India's commitment towards energy transition and achieving net-zero emission by 2070. Lithium, Niobium and REEs have also emerged as strategic elements due their usages and geo-political scenario. Encouraging indigenous mining would lead to reduction in imports and setting up of related industries and infrastructure projects. The proposal is also expected to increase generation of employment in the mining sector.

Geological Survey of India (GSI) has recently handed over the exploration report of REE and Lithium blocks. Further, GSI and other exploration agencies are conducting exploration for critical and strategic minerals in the country. The Central Government is working to launch the first tranche of the auction of critical and strategic minerals such as Lithium, REE, Nickel, Platinum Group of Elements, Potash, Glauconite, Phosphorite, Graphite, Molybdenum, etc. shortly.

PIB Delhi I October 11, 2023

India to add 56.6 Mtpa of crude oil refining capacity by 2030

Between 2014-2023, India added a total of 38.9 Mtpa of refining capacity of which 39 per cent was greenfield and the remaining 61 per cent was brownfield

India, the world's fourth largest refiner, will add as much as 56.6 million tonnes per annum (mtpa) of crude oil refining capacity in the next seven years of which 84 per cent will be through brownfield expansion.

At present, the world's third largest crude oil consumer has a cumulative refining capacity of almost 254 Mtpa, or a little over five million barrels per day (Mb/d).

According to the Ministry of Petroleum and Natural Gas (MoPNG), India will add nine mtpa of refining capacity through greenfield expansion.

Between 2014-2023, India added a total of 38.9 Mtpa of refining capacity, of which 39 per cent was greenfield and the remaining 61 per cent was brownfield, while during 2010-14, it added 29.7 Mtpa capacity through brownfield expansion.

As per the Centre for High Technology (CHT), a technical wing of MoPNG, the refining capacity of Indian refineries is projected to increase by about 56 Mtpa by 2028.

In FY23, Indian refineries processed 5.13 Mb/d of crude oil, or 255.2 Mt, against 4.85 Mb/d or 241.7 Mt. In August 2023, the crude pressed stood at 5.28 Mb/d or 21.9 Mt (provisional), while during April-August in FY24, the crude processed stood at 5.25 Mb/d or 109.5 Mt.

As of September 2023, India had a total crude oil transportation pipeline of 10,938 km with a capacity of 153.1 Mtpa. The refined products transportation pipeline is 22,973 km with a capacity of 149.3 Mtpa.

Refining push

The government's refining push is on account of India's rising consumption of crude oil as its industrial, construction and manufacturing sectors expand. Besides, after the Russia-Ukraine war, Indian refiners have emerged as one of the key refining destinations.

CareEdge Ratings said that FY23 marked an exceptional period for Indian refiners. They achieved exceptionally high gross refinery margins (GRMs), primarily attributed to disruptions in the demand-supply dynamics resulting from the outbreak of the Russia-Ukraine war in February 2022.

Rishi Ranian Kala, Business line | October 14, 2023

As the Future of India's Coal Is Decided, Life in a Mining District Hangs in the Balance

Before mining came to Chhattisgarh, a landlocked

state in central India, Hasdeo Arand was a remote forest with a dozen tribal hamlets. Spanning more than 650 square miles, the forest is often called the "lungs of central India" and is home to endangered elephants, sloth bears, and leopards, as well as valuable water reserves. Many of the local villagers are Adivasis, or "original inhabitants" hailing from the Gond tribe, who cultivate crops in their backyards and sell woven grass baskets at the market. For them, this land is sacred.

This is how Umeshwar Singh Armo remembers growing up in Jampani, a small hamlet crowned with guava trees. This is where his ancestors were buried, and where he hopes future generations of his tribe will thrive. Today, the 43-year-old is the village chief of the local district of Paturiadand, home to around 900 villagers.

The area's nearly 250 plant and bird species aren't the forest's only resources. Armo remembers when, as a schoolboy, he learned about another one: a shiny substance called "coal." But it wasn't until 2007 that surveyors sent by the state government began roaming the forest, using satellite cameras and laser scans to look for the stuff.

"We would all gather around to watch them survey the land. We were curious, even excited, about what it all meant," Armo recalls. "But we could not imagine they would dig the ground out like this."

What the surveyors found was a miner's jackpot: more than 5 billion tons of coal sitting under the pristine forest. In 2013, Chhattisgarh's government marked out coal blocks, or designated areas for mining, and gave approval to Rajasthan, another state government, to extract the fuel. The Rajasthan government contracted the mining operations to Adani Power, India's largest private operator and developer of coal mines and coal-fired power plants. Shortly after, a chunk of the forest roughly the size of five football fields was torn out to establish the Parsa-East Kanta Basan (PEKB) mine, named after two hamlets that once stood on the land. Today, what remains are large black craters.

Of course, the problems with coal don't end with extraction. As a major consumer of it, India is also the third-largest emitter of greenhouse gasses (though its per capita emissions are around seven times lower than that of the U.S.). Most developed nations are winding down coal capacity to meet climate targets, but India and China continue to account for about 80% of all active coal projects. And while the U.S. and the E.U.

(Continued on Page 22)



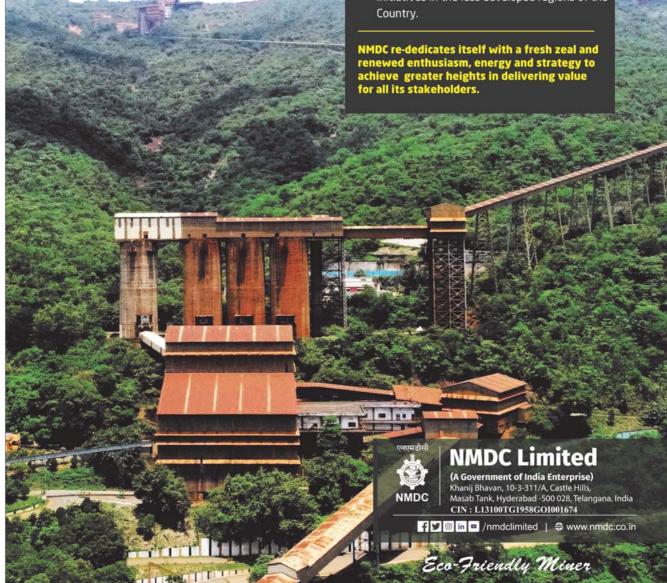
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METICULOUS MINING IN MANGANESE DEPOSITS OF KEONJHAR & SUNDERGARH DISTRICT, ODISHA

KL Janghel¹ and Dr. MD Patel²

Abstract

The Manganese deposits in Bonai-Sundergarh-Keonjhar region of Odisha belong to the Iron Ore series of Precambrean era. Stratigraphic layers contain Lower shale formation -> Middle banded BHQ and /or BHJà. The Manganese ore lensoids and lateritoid are associated with Upper ferruginous shale formation. Characterized by origin, the iron content in the major portion of ore bodies occur in the range of 10.5%-63.4%. Occurrence of High Grade and Battery grade Manganese in pockets is, thus, a rare phenomenon. This problem, while most of the deposits are on the declining side of mining, gives rise to many challenges to upkeep the economy of Manganese mining in this area. It is obvious from the figures in the article that although Odisha is having largest ore reserve, the state ranks third in the Manganese production arena. So, the authors suggest that while productivity through selective mining is the only way left out obviously with engagement of small machinery, the contamination is unavoidable. So, simultaneously processing of ore is also required with latest technologies so that qualitative products result to enable the Mine operators to sustain economically.

Key words: Manganese Mining

1.0 Introduction

Odisha is the richest state to have more than 50% of Manganese deposits reserve of India @406 Million tonnes whereas it produces only about 25% of the counties total production @2.4 Mtpa. The major belt, predominantly holding the deposit, is spread over Bonai-Sundergarh-Keonjhar area. In this range, detrital type of manganese ore bodies, formed in the Precambrian Iron Ore Group of rocks occur besides stratiform (bedded type) and stratabound-replacement types of deposits. These ores appear in the form of large boulders within laterized overlying cover at various depths, often reaching beyond 30 m from the surface enabling the operation through opencast mining unlike the deposits being worked with underground mining in Madhya Pradesh & Maharashtra. Above brief narration of origin of Manganese deposit in the area implies that the Ore body is of extremely irregular nature with respect to its shape & quality, both. During the early nineties, the most common problem faced while mining the deposit was sudden vanishing of deposit whereas there is no presence of significant cause such as major fault in the area indicating geological disturbance for such incidents.

The present situation is most of the deposits are on the halfway of depletion; some of them have become permanently extinct. Most of the areas have become devoid of core mineral zones leaving behind the trailing reserve having meagre low grade, that too ferruginous ores with extreme risk of being contaminated with impurities around while mining. Additionally, these days mining is more constrained by clamping rules of Forest Conservation Act & Rules posing serious problems to availability of better grade of Ore for mining & waste material dumping area. Above all, the stiff competition in world market has added another feasibility dimension to carry on with the mining activities apart from technical issues. Under these circumstances, it is imperative to have a fresh review to be made for methods of mining in totality coupled with requirement of improved processing techniques of Manganese Ore.

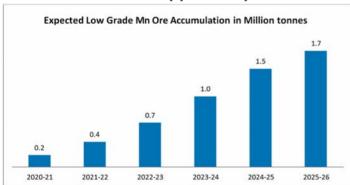
2.0 The implications of the latest challenges

- 2.1 Irregular Deposit Quality & Shape wise. This prohibits large scale blasting coupled with difficulties in bulk loading from blasted faces directly by mechanized loading as it could lead to undesirable contamination.
- 2.2 Quality of ore produced is maintained by manual sorting at mining face as a result, Productivity cannot be improved as because mechanized sorting of Ore is impossible at Mining Face presently due to pocket nature of deposit.
- 2.3 Ore is ferruginous in quality, which poses problems in producing purely battery grade ore (High-grade ore & Chemical grade ore, which are having better demand in market).

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Favorable points are:

- (i) High Grade lump is sorted manually & ore containing Fe up to 15% (as per IS: 4763-2006) is directly saleable as ferro- grade Manganese ore.
- (ii) Most of the area is having exposed ore bodies due to being old mining area. Thus, not much of exploratory work is required implying substantial cost savings on this front of mining.
- 2.4 Inter-lease boundary of the same owner (Company/ organization) is blocking a major portion of the ore body because on either side, a Green barrier of 7.5m +7.5m=15m is to be developed as per statute.
- 2.5 Disposal of Waste material_@ the average stripping ratio of 12 and presently at the projected level of production requirement of 1 Mtpa from the area needs space for 1.2 Million m^3 waste x Swelling factor @ 1.4 = 1.68 Million m^3 every year . Considering 3 % of this volume only can be filled in mined out area, @ maximum height of waste dump not exceeding 25 m in 5- steps , waste disposal will need about 16 hectares area every year on hilly terrain.



2.7 Classification of Manganese Ore

(IS: 11895-2006)

		,					
SI.	Туре	Consituents (%)					
No.		Mn	Fe	SiO ₂	MnO ₂	Fe+ Mn	
1.	Manganese ore	35 & above	-	-	-	-	
2.	Ferruginous manganese ore	Below 35 and upto 25	Below 23 and upto 13	-	-	48 (min)	
3.	Siliceous manganese ore	Below 30 and upto 20	-	-	-	-	
4.	Manganifer- ous iron ore	Below 25 and upto 10	Below 48 and upto 30	-	-	55 (min)	
5.	Manganese ore (Chemi- cal grade)	-	5 (max)	-	Above 78	-	

Source: Bureau of Indian Standards, (BIS)

2.6 Stock of Low Grade Mn Ore is increasing day by day because of its percentage occurrence is high @40% in the deposit combined with lesser demand in the market . It is likely to soar up to 1.7 Million tonnes by FY 2025. It is a dead Working capital unless enriched through roasting up to Mn 46 % or by Coal reduction & subsequent enrichment to Chemical Grade Ore by electromagnetic separation to enhance its salability.

2.8 Commercial Classification of Manganese Ore

SI. No.	Grade of Ore	Chemical Composition	Specifications
1	Battery / Chemical	MnO2 by Mass	72% Min.
	Grade	Cu, Pb, Cr & Ni	Trace
		Mn	> 44 %
2	High Grade	Mn: Fe Ratio	7 min. i.e. Fe => 6 %
	Ferromanganese Grade	Mn	> 38%
3		Mn: Fe Ratio	2.5:1 Min. i.e. Fe =>15%
		Р	0.1 % Max
	Blast furnace Grade	Mn	25-35%
		Р	0.2% Max
4		Al2O3	7.5 % Max
		SiO2	13 % Max
5	Medium Grade	Mn	35 to 38 %

3.0 Enhancing confirmation level of Exploration Data

In view of the previously mentioned mounting problems, following steps are suggested:

- $3.1\,\mathrm{As}$ there is more demand of High Grade ore, the financial risk can be taken by having more exploratory drilling at closure grid of 50m x 50m, 25m x 25m or even 12.5m x 12.5m grid wherever required so that closure interpolation of data may be made to enhance degree of confirmation of the deposit for mine planning & its meticulous implementation. This is a helpful step to increase the quantity of viable deposits.
- 3.2 Most of the portions of deposits were exposed by development & consequent mining operations in the past. Thus it provides platform for more detailed exploration work to be done at lesser cost as:-
- (a) Some of the data are as such available from exposed faces.
- (b) Depth of future exploratory borehole drilling may be reduced as we can locate new boreholes at lower levels of bottom benches nearer to the expected location of ore bodies. Thus, it will give leverage in cost of exploration so that extension of depth to be covered by exploration for even Core drilling can become economical.

- (c) Instead of core drilling, we may also opt for usual non-core holes drilling which can also be drilled with usual production drills (of lesser diameter model say, 35-45mm) extendable up to 30-60 meters measured further from existing working floor levels. Sample results analyzed from such holes up to additional depth will enhance the viability level of the deposit with least additional cost.
- (d) Some of the ongoing blasthole can be used as exploratory holes for getting in-depth information by extending these upto another 30-60 m drilling if required at interval of 25 m x 25 m grid or even closure grid of 12.5m x 12.5m pattern as required and mentioned in point No. (iii) above.
- 3.3 These days, advanced software versions e.g. SURPAC 6 & MINEX are already available for accurate Ore body modeling and subsequent assessment. So, additional data obtained through methods adopted above can be put together TO HAVE MORE CONFIRMATORY IMPACT TO ASCERTAIN INSITU AVAILABILITY OF LUMP:FINES RATIO IN THE IRREGULAR DEPOSIT AS CITED w.r.t. the area under speculation.

Thus, there will be data that are more accurate available as guidelines from above exercises, which will help in meticulous planning to mine the deposit in most economical way.

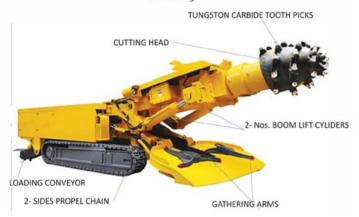
4.0 Enhancing Mining Face Productivity

- A. Reduction of bench height from 6-8m presently to 3m to mine extremely irregular portion of pocket deposits,
- B. To have increased productivity, we have to replace manual sorting by mechanized sorting, loading & transportation. This can be brought about by:
- (i) Use of smaller machines e.g., Bobcat loader/ small bucket capacity backhoe shovels fitted with the drain making bucket (about 300 mm wide), Auger / Alpine Miner may be also considered to engage on the blasted face
- (ii) Desired quality material, taken away from mining face, can be kept at small height (say up to 3 m high) heaped in row near the face for onward loading by bigger loaders (2.5-3 m³ bucket capacity) onto existing dumpers of 18 t capacity for hauling up to Crusher plant.
- (iii) Step (ii) needs more no. of faces under operation preparedness in advance so that every day at least sufficient face length is in readiness to lift the ore to meet the daily requirement of ROM. This can be had if we reduce the bench height as suggested in step (A) above within a given area for unchanged level of production.
- (iv) Mechanized sorting by small loading machines and collection of materials for preparing heaps in front of

- working bench can be divided in 3 categories by having speculative judgment backed up by Slice plan data:
- (a) Chemical / Battery Grade Manganese (say Mn > 72% & Fe < 5%) to be sorted manually.
- (b) Ferruginous Manganese Ore mixed with laterite (say 38%< Mn<54% and 15%>Fe> 5 %) as ROM excavated and transported by mediocre capacity loader/ shovel with dumper combination to Processing Plant.
- (c) Sub Grade Material having Mn < 10%.
- (v) Some recent ideas of engaging MB Crusher fitted with backhoe to screen out fines at the floor of the face only, so that preliminary crushing is done at the floor of the face only, is ruled out form following points of view:
- a) CAPEX required to engage large number of such machines at individual large nos. of faces will be more to handle 1 MTPA scale of Mn. Production after sorting.
- b) The onus of crushing, instead, should lie upon Main Crushing & Processing Plant.
- Opting for a bigger size of such shovel fitted with crusher on bucket will contradict the suggestion in Point No.(2) (B)-(i) above suggesting for meticulous quality control engaging small loading machines.
- d) If required, the material dumped at mining face and heaped up by small machines can be chain crushed by running dozer over the material and it can be further screened out at Mining face on larger size of inclined screens in place of present practice of face workers doing this job on smaller screens. Thus, output will be increased too.
- C. Medium charged hole blasting can be practiced to just dislodge the mining face so that finer particle generation is reduced and selective mining by small excavators is possible increasing the effectiveness while sorting, segregating and removing the ore away from the bench takes place.
- (i) Use of Hydraulic Rock splitter can be one of the most effective alternatives to blasting in irregular portion of deposit only (i.e. not to apply it everywhere as it is slow process) encountered in mining. The advantage of technology is controlled breaking of rock tracking the quality exactly required.
- (ii) The crushing job can be shifted to Crushing & Processing Plant separately installed as we have to handle/process 1.22 MTPA of ROM to produce 1 MTPA of Mn. Ore. The Plant has to be located at centralized place of Manganese Group where-
- a. Water is available for wet processing.
- b. Area for slime disposal is available at least for 10 yrs.@ 18% solid rejection.
- c. Dispatch of processed Ore is easy by road & rail.

- (iii) Thus, the above combination of machineries will definitely help in reducing workforce, which will have advantage on cost control through reducing overhead cost.
- (iv) Bench Floor width, however, is to be maintained at 2.1 m x 3 = 6.3 + 5m = say 11.3 m to enable loader operation & running of 18 T Dumpers. Thus the working Pit slope with 4m high bench will be around 20 degrees.
- D. The mechanized face sorting, loading & bulk transportation will definitely implicate the problem of perfect sorting. Therefore, we have to be determined to improve the processing of ROM to have a saleable high fetching quality product of manganese ore as per Market demand.

Alpine Miner (Yields high Productivity as a Continuous Miner)



Auger Mining (It is used in Indonesia very commonly)



As discussed above, this is going to be most important step for VALUE ADDITION to the ore produced from the mining

faces, which might not be of quality up to the mark of earlier handpicked ore because the latter has been replaced by bulk handling with the help of small machinery. Moreover, manganese ore deposit of Keonjhar–Sundergarh Districts of Orissa pertaining to Iron Ore Formation of Singhbhum (Jharkhand)-Keonjhar series, unlike that of central & western part of India, is ferruginous in character. Therefore, we have to divide enrichment process in 2 parts:

- Physical separation of impurities & free Fe-oxide particles from the mixed ore.
 The Manganese ore enriched through this process may be suitable for Ferro-manganese production but for battery grade high quality saleable ore, second
- stage enrichment is required e.g.

 Chemical separation of Fe Oxides & Manganese Oxides from ferruginous Mn. rich particles in 2- stages: Here, the first stage is required by treating Medium & Low Grade Ore with Carbon / Coal for REDUCTION OF

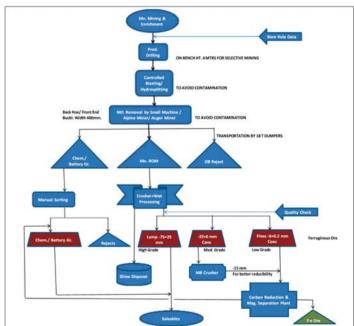
Fe2O3 to Fe3O4 followed by MAGNETIC SEPARATION

as the pioneer Company like Tata Steel is already

5.0 Process Flow Diagram

Method of Mining to be adopted can be precisely shown in Production Process Flow Diagram as below.

experimenting for this purpose in Joda area.



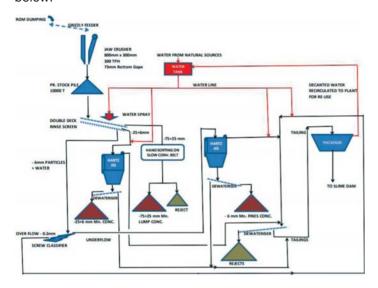
6.0 Ore Enrichment Process - Possible improvement in Processing

WET CIRCUIT PROCESSING, in particular, with jigging in processing plant as being practiced in Manganese Ore India Ltd. Similar wet process can be adopted, of course, by overcoming the legal problems in resourcing water from natural stream and rivers by sorting out the matter with the

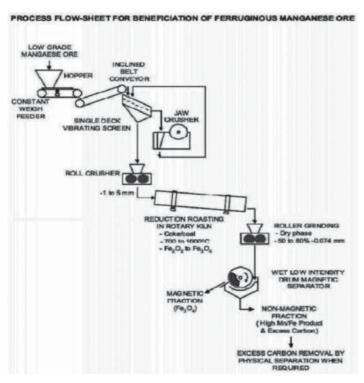
Water pollution Control Board of state. The liaising process can be made easy by justifying the matter on following grounds:

- (i) Ensuring less burdening of the natural area by arranging slime disposal necessarily in depleted pits.
- (ii) Envisaging Recycling of decanted water from the Processing plant, which can reduce the dependency on natural water by 30 %.

A suitable Wet circuit Process Flow Diagram of Manganese Ore is suggested for Keonjhar – Bonai region ore is shown below:



9.2 Removal of Iron Oxide from Mn Ore



7.0 Present vs Future Scenario

Use of Present technology to improve productivity has been already discussed previously.

Thus, only improvement in Mining method alone cannot solve the problem of Mn. deposit in Keonjhar –Sunergarh-Bonai Region of Odisha, but also a futuristic approach to the problem is required through latest Processing Technology to upgrade the ore up to the saleable level. One of the ambitious approach can be:

- Use of RADOS XRF Sorter for lump ore -50+10mm Size for Mn. 30-46%. This will completely enable it to replace the workforce engaged on Lump ore sorting as shown in Wet Processing. However, technology is having its inherent limitations presently. We have to explore any new version if available in market from OEMs.
- Ore size range of -10mm+0.2 mm to be processed through Carbon reduction & Magnetic separation (by converting Fe2O3 to Fe3O4). It is a successful technique & can be used with properly studied economic viability.
- Wet circuit Process to be only used in case of subgrade available now in deposit and rejects in Slime dam. This is an ambitious plan as its economic viability is yet to be proved.

8.0 Conclusions

 Permission for getting water for wet processing to be obtained from legal authorities. Even if underground water is required to be used, such permissions are required from Environment Control Department & Water Pollution Control Board of state etc.

Favorable:

- a. Water recirculation in Processing Plant saves natural water by 30%, which should be given an utmost importance.
- b. Major Manganese producers in the area & other leading Ferro Manganese Plants in Odisha can create industrial thrust on the situation to overcome the Pollution & Forest Problems.
- c. Manganese steel is a Strategic requirement for Defense.
- 2) Mechanization & resultant expansion (adding Processing Plant & Slime dam) need lot many legal hurdles to be crossed over. The most sensitive problem is Public hearing to be tackled.

Favorable:

 Use of old excavated areas for slime dams can be opted always.

- b. Any ongoing R & D for use of subgrade Mn. Ore including the rejection in Slime Dam shall be encouraged. Use of flocculent & decanted water from such dams to Agricultural fields is most acceptable trend in these areas.
- 3) Implication of Manpower retrenchment after mechanization to be tackled amicably through Voluntary Retirement Scheme/ Early Separation Scheme etc.
- 4) Overall Cost of Production & IRR aspects need to be thoroughly studied including CAPEX etc. while mechanizing and expanding the capacity.
- 5) Inter boundary locking of Ore body to be sorted out with an effective approach made to the Govt. Authorities in the interest of the Conservation of minerals, particularly when adjacent leases belong to the same Owner as this is most common situation in the area.

9.0 Acknowledgement

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In addition, my sincere thanks go to Dr. PV Rao, Editor of the prestigious MINING Journal and the management of the Mining Engineers' Association of India for publishing this paper.

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(Continued from Page 15)

have set goals of reaching net zero emissions by 2050, India says it will get there by 2070—another decade behind China's goal of 2060.

In light of the most recent IPCC report's stark findings, U.N. Secretary-General António Guterres stressed that all countries need to move faster to reach those targets. India, which previously argued that phasing out coal would be too detrimental to its economy, may be succumbing to global pressure. In May, during a committee meeting as part of this year's G-20 Summit,

India's secretary for coal, Amrit Lal Meena, announced that the country will close around 30 coal mines over the next three to four years.

But as the experience of Hasdeo's residents shows, even efforts to prevent the damage coal does in the long term can have surprising—and damaging—effects in the short run.



Reuters reported that India also plans to stop building new coal-fired power plants—apart from those already in the pipeline. Not making any new commitments to coal is good news, says Tim Buckley, the director of the think thank Climate Energy Finance, but there's a downside for those affected by existing operations: "No new coal' means you rush to complete all the mines that are already there," he said.

"If you're a villager in that coal mine, you're screwed," he added.

Interviews conducted over three months in 2022 with more than 40 people—including locals who oppose the mine as well as those who support it; Adani workers at the PEKB mine; and teachers, police, and activists in the area—revealed how life in the forest has been transformed by the presence of a mining giant. For many, the transformation won't end there.

"If we look far ahead, we all know that coal mining will only last 30 years," Armo says. "But after that, our land will be destroyed. Then what? We have nowhere else to go."

Astha Rajvanshi / Chhattisgarh, India | Oct16, 2023

R&D IN COMMERCIAL COLUMN FLOTATION MODIFICATIONS, AND REGRIND BALL MILL FLOW SHEET DESIGN MODIFICATIONS. AN INNOVATIVE WAY TO REDUCE CARBON FOOTPRINT.

Sivarao Kshirasagara

Abstract

The Chanderia Lead and Zinc Smelter in Chanderia village, Rajasthan, India, faced significant challenges with the rejection of zinc concentrate due to elevated levels of Insoluble Silica Material (ISM). This issue not only diminished smelting capacity but also resulted in quality control complications in the production of zinc metal within the Imperial Smelting Operation.

To address these issues, a dedicated team of engineers embarked on a global quest to discover cutting-edge technologies. The Government of India generously provided funding to initiate a transformative project aimed at retrofitting the existing beneficiation plant located in the Rajpura Dariba Mines, situated in the village of Dariba, Rajasthan. This ambitious endeavor targeted the production of lead zinc concentrates in a 3000 tonnes ore per day plant. Plant is split into two streams of flotation circuits of 1500 tpd each.

The design expertise of CISA France played a pivotal role in crafting an innovative flow sheet, featuring the integration of Column Flotation equipment to replace the conventional cleaner flotation cells within the existing circuit. However, the initial results fell short of the anticipated outcomes. In response, the HZL R&D team rigorously monitored and audited all relevant parameters, leading to essential modifications.

Significant progress was achieved through a series of strategic replacements and adjustments to the design, resulting in improved performance. Moreover, a regrind ball mill circuit was introduced to meet the stringent smelter requirements for lower ISM content, further enhancing the process.

Subsequent advancements included the development of a novel flow sheet for the regrind ball mill, specifically engineered to produce high-quality products with reduced Insoluble Silica Material. Notably, this adapted flow sheet design holds promising potential for application across various minerals, thereby making a substantial contribution to the field of flotation technology in the mining industry.

Result: ISM in zinc concentrate was reduced from 8% to 3%. Grade improved from 45%Zn to 52%. Tailing losses reduced from 0.5% to 0.3% Zn. Improved yield%.

Key words: Grinding, flotation, Column flotation, Thickener, Cyclone, Regrind ball mill, Slimes, Insoluble silica (ISM), Grade, Recovery.

1.0 Introduction

In the realm of zinc mineral processing, optimizing the quality of zinc concentrate stands as a paramount objective. This case study zeroes in on a multifaceted approach to achieve this goal: reducing insoluble materials (ISM) from 8% to 3% and elevating the zinc concentrate grade from 45% to 52%. The pivotal components of this journey involve harnessing the potential of column flotation technology, implementing flowsheet modifications, and integrating a regrind ball mill into the process.

Column Flotation Technology: A groundbreaking development in mineral separation, column flotation

technology was initially introduced as a promising means to enhance zinc beneficiation. This advanced technique offers increased selectivity and efficiency, primarily by providing a larger surface area for bubble-particle interaction. However, the initial application of column flotation did not yield the expected results, prompting further investigation and modification.

Flowsheet Modification: The heart of the transformation lies in the deliberate reconfiguration of the processing flowsheet. This innovative approach included bypassing the thickener and adopting cyclone-based dewatering for the column flotation tails. The rationale behind this change was twofold:

first, to improve overall process efficiency by reducing water content in the tails, and second, to concurrently elevate the zinc concentrate grade and reduce ISM levels.

Regrind Ball Mill: The introduction of a regrind ball mill marked a pivotal shift in the zinc beneficiation process. This specialized equipment played a critical role in the modification of flow streams, primarily aimed at mitigating the production of slimes during grinding. Controlling slime content is a pivotal factor in achieving the desired zinc concentrate specifications, as excessive slime can impede downstream processes.

This case study serves as an exploration of these three key elements—column flotation technology, flowsheet modification, and regrind ball mill integration. It delves into the rationale behind these strategic decisions, the challenges encountered along the way, and the remarkable results achieved. Ultimately, this investigation offers valuable insights into the dynamic and evolving landscape of mineral processing, emphasizing how innovation and adaptability in these specific areas can be transformative in optimizing zinc concentrate production.

2.0 Location

Commercial beneficiation plant in India, Rajasthan state, Dariba village, Rajpura Dariba mine run by Govt of India as PSU (public sector undertaking).

2.1 Project Brief

This project has a capacity of 3000 tpd lead and zinc ore, grinding and flotation process plant. Two streams in operation, 1500 tpd each, flotation circuits.

Run of mine boulders are size reduced in primary, secondary, and tertiary crusher and screened to produce 12 mm ore, which is stockpiled for down line process.

12mm ore is ground in a ball mill with water. Ball mill discharge is pumped to cyclones for size separation. Cyclone overflow, having 80% of 75 micron particles, is fed to the lead floatation circuit. The zinc circuit receives lead tail and zinc is extracted through the traditional flotation method. The final tail has pyrite and dolomite and 0.5% zinc. Zinc concentrate is cleaned in cleaner cells to remove iron. The column flotation process was implemented later on in place of zinc cleaner cells to reduce ISM.

3.1. Case 1

3.1.1 Issue

Smelter rejected Zinc concentrate produced as it contained, 45% Zn, and > 8% ISM. It was not economically viable to feed the smelter at Chittorgarh Imperial smelter, Rajasthan. It was decided to investigate probable technologies in the

world to reduce silica in Zinc concentrate. Target of 52% Zinc and 3-4% ISM was not achieved through the initial Column flotation process

3.1.2 Supplemental Details

3.1.2.1. Commercial Grinding Circuit

Mineral beneficiation plant includes Crushing, Grinding, Lead flotation, Zinc flotation, Filtration, and Tailing disposal. Capacity 3000 tpd, with two streams.

Run of mine ore is crushed to get 12mm to feed to the Primary grinding Ball mill. Ball mill discharge is the size separated in Hydro cyclone to feed to flotation cells. The optimum size for flotation is 80% 200# i.e. 75-micron particles.

In the grinding circuit for grinding 12mm ore, we have a ball mill in a closed circuit with a Hydro cyclone as a size separator. During grinding few particles of minerals are not liberated, or found interlocked with Pyrite and Zinc.

3.1.2.2. Flotation Fig 1 & Fig 2A

Cyclone overflow having 80% 200# i.e. 75 microns is fed to flotation cells. Using different chemicals Galena is floated, and Sphalerite and Pyrite are depressed. The tailing of the lead circuit is sent to the Zinc circuit to produce zinc concentrate by depressing Pyrite. Pyrite mineral is rejected as waste along with dolomite.

The Concentrate is recovered in stages from flotation cells as, rougher concentrate, and Scavenger concentrate. Rougher concentrate is cleaned in stages to get clean concentrate. Scavenger concentrate and the cleaner tail is sent to rougher after Regrinding. Regrinding is in closed circuit with a hydro cyclone. A conventional flotation flow sheet is used as shown in Fig. 1 and Fig 2A.

3.1.2.3. Thickener Fig 2B

Thickener is used for dewatering the column tail. It was operated manually without any instruments to monitor it. Serious problems were faced in operating thickeners, with breakdowns of pumps, jamming pipelines, etc. Manpower was deployed but problems could not be solved.

3.1.2.4 Column Floatation

Column flotation in zinc mineral processing involves a tall cylindrical tank with a bottom air sparger, generating 1-2 mm air bubbles. Diluted slurry enters from the top, and a counter-current flow of bubbles and slurry ensues. A onemeter bubble bed is showered from above with wash water, effectively removing entrapped insoluble materials (ISM) between air bubbles. This process carries zinc particles to the column's top, resulting in a high-grade concentrate. The dilute tailing at the column's bottom is discharged and later processed through a thickener to eliminate excess water before entering the Zinc rougher stage.

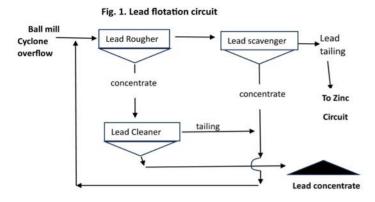


Fig 2A. Zinc floatation circuit

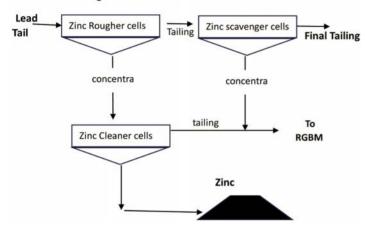
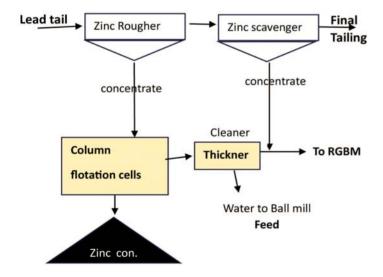


Fig 2B. Zinc floatation circuit



3.1.3 Methodology/Innovation

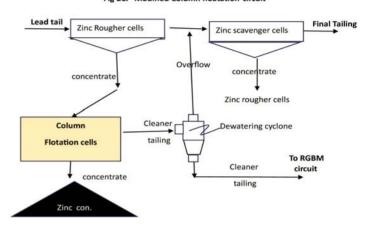
3.1.3.1 Flowsheet Redesign

The optimization of the zinc mineral processing flowsheet encompassed three distinct stages, each contributing to the enhanced efficiency and quality of the process. The collaborative efforts of the Research and Development (R&D) team played a pivotal role in these modifications. (Stage 3 is discussed in detail as case 2).

3.1.3.2 Hydro Cyclone (Thickener Replacement): Fig 2C In the first stage of the flowsheet redesign, the conventional thickener was substituted with a hydro cyclone for the purpose of dewatering the column tail. This strategic replacement aimed to streamline the process and improve

Fig 2C. Modified Column floatation circuit

water management within the plant.



Hydro Cyclone Installation: The thickener was replaced with a hydro cyclone, which was strategically incorporated into the system to effectively dewater the column tail. This hydro cyclone played a central role in the separation process, efficiently removing excess water from the tailings.

Gravity-Driven Feed to Zinc Rougher Cells: One hydro cyclone unit was strategically positioned above the zinc rougher cells. This arrangement allowed for the gravity-driven transfer of the hydro cyclone's underflow to the zinc rougher cells, ensuring a seamless and efficient integration of the dewatered material into the subsequent stages of processing.

Overflow to Zinc Scavenger Cells: The overflow from the hydro cyclone was directed toward the zinc scavenger cells. This allocation of resources ensured that the waterrich portion of the column tail was effectively utilized in downstream processing steps.

3.1.3.3 Wash water system, Sparger tip, Froth bed level controller

The second stage of the flowsheet redesign focused on refining smaller machinery components critical to the efficiency of the column flotation process. This stage encompassed several key improvements in the froth bed level controller, wash water system, and sparger tip,

Froth Bed Level Controller Enhancement: The default configuration of the froth bed level controller was further refined and optimized to ensure precise control and management of froth levels during the flotation process. This enhancement contributed to improved concentrate quality and reduced variations in froth behavior.

Installation of Fabricated Water System: A comprehensive water system was introduced, featuring the installation of a water filter and the redesign of water spray mechanisms. This system served to enhance water quality and distribution within the flotation cells, thus promoting more efficient mineral separation.

Water Tank Float Valve Leveler Refabrication: To facilitate improved control over water levels, the water tank float valve leveler underwent a refabrication process. This included modifications to both its length and diameter, ensuring precise and reliable water level management throughout the processing cycle.

Sparger Tip Replacement: The existing sparger tip was replaced with a redesigned version, enhancing the efficiency of air dispersion within the flotation cells. This modification contributed to more effective bubble-particle interaction and, consequently, improved mineral recovery.

3.1.4 Result and Discussions

3.1.4.1 Hydro Cyclone

Results: The replacement of the thickener with a hydro cyclone yielded significant results, including a drastic reduction in column flotation downtime. Additionally, this replacement led to a reduction in slime and water concentration in the cyclone underflow.

Discussion: The frequent breakdown of the thickener had previously resulted in operational interruptions, including jams in underflow, pump inefficiencies, pipeline clogs, and intermittent flow issues. Replacing the thickener with a hydro cyclone addressed these challenges and significantly reduced column flotation shutdowns. This reduction was primarily attributed to the decreased reliance on two pumps, which were now consolidated into a single pump. Moreover, the lengthy pipelines required for the thickener were no longer necessary with the cyclone installation. Importantly, the introduction of the hydro-cyclone also reduced the workforce required for maintenance and supervision, as it eliminated the need for constant thickener monitoring. Furthermore, the overflow from the hydro-cyclone, which contained a higher concentration of water and slimes, was redirected to the zinc scavenger cells, ensuring efficient utilization of these materials in downstream processes.

3.1.4.2 Wash water system, Sparger tip, Froth bed level controller

Result: The comprehensive redesign of the froth bed level controller and the enhancements made to the wash water system, sparger tip, and float valve system yielded substantial improvements in the overall process.

Discussion: Prior to these modifications, the control of pulp level had been challenging, with instrument readings providing inaccurate information. The redesign of the

froth bed level controller successfully stabilized pulp level readings, contributing to a more controlled and predictable process.

The wash water system, previously inadequate in thoroughly washing the froth, resulted in elevated ISM levels. The identification and fabrication of key spare parts, including the water filter, water spray system, and tank float valve system, addressed this issue. The introduction of the water filter removed small contaminants, enabling continuous and effective water spray. The redesigned water spray system improved water droplet size and distribution, resulting in 100% of froth washing, which, in turn, facilitated the removal of entrapped ISM between the bubbles.

Furthermore, the refabrication of the float valve system increased its robustness, reducing the frequency of valve failures.

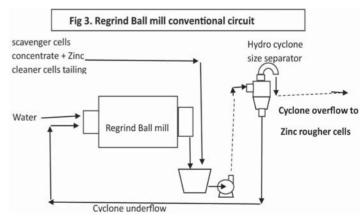
In combination, these modifications resulted in a substantial improvement in zinc concentrate quality, elevating it from 45% to 50%, while concurrently reducing ISM levels from 8% to 5%.

3.2 Case 2: Fig 3 & 4

3.2.1 Issue

Based on the flowsheet and process modification improvement was seen in zinc concentrate and ISM concentrate but the target concentration of 52% zinc and 3% ISM was not achieved.

Mineral processing, a critical facet of resource extraction, relies on efficient grinding to liberate valuable minerals from interlocked particles. Optimal liberation is essential for maximum mineral recovery. This section delves into a specific challenge encountered in the Zinc circuit operations in India where interlocked Sphalerite and Pyrite particles hindered liberation. The failure to liberate these minerals resulted in elevated iron content in the concentrate, increased tailing losses and high ISM, necessitating the use of a Regrind Ball Mill (RGBM). Fig.3



3.2.2 Supplemental Details

3.2.2.1 Sphalerite and Pyrite

In commercial mineral production, valuable Galena and Sphalerite concentrates are obtained, while Pyrite and dolomite are discarded as waste materials.

From the table below it is seen while comparing sphalerite to pyrite, sphalerite is softer and pyrite is harder and thus sphalerite particle size is finer after grinding. Primary grinding aims for optimum liberation, crucial for efficient flotation. However, some minerals remain partially unliberated. A particle size of 200# or 75 microns, accounting for 80% liberation, is considered economically suitable for primary grinding of both Pyrite and Sphalerite.

S.No.	Mineral	Mohs Hardness	Color	Sp. Gr	Composition
1	Sphalerite	3.5 4	Brown	4.8	ZnS
2	Pyrite	6 6.5	Gold	5.95	FeS2
3	Dolomite	3.5 4	Gray	2.84	CaMg(CO3)2

3.2.2.2 Regrind Ball Mill (RGBM):

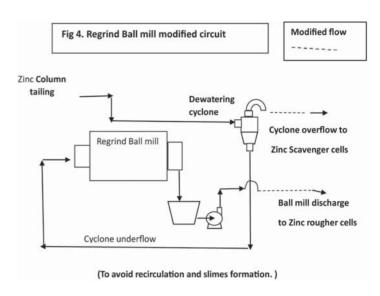
Traditionally, a conventional grinding circuit (Fig. 3) was adopted to address the interlocked Sphalerite and Pyrite challenge. The scavenger concentrates and cleaner tailings were sent to the RGBM for liberation of interlocked Pyrite and Zinc particles.

Within the RGBM circuit, a cyclone served as a size separator. Middling from the Zinc cleaner tail, combined with scavenger concentrate and RGBM discharge, were introduced into the cyclone. The cyclone's underflow was recycled back to the RGBM for further grinding, while the overflow was directed to Zinc rougher cells. However, a few percent of liberated particles remained in the underflow, generating slimes due to repeated grinding. RGBM circuit at this project was idle for reasons not known.

3.2.3 Methodology

To address the above challenges, a comprehensive solution was devised, focusing on revamping of RGBM and operating, with a modified flow sheet, which involves pumping of ground slurry to Zinc rougher cells. Notably, the RGBM discharge was no longer recirculated through the cyclone underflow. Instead, it was directly sent to Zinc rougher cells. Fig 4.

Some unground interlocked Pyrite-Zinc particles (from the primary grinding circuit) and RGBM discharge were floated in Zinc rougher cells, and then sent to cleaner cells. Pyrite & middling were depressed as Column cleaner tail and returned to the RGBM for further grinding and liberation.



3.2.4. Result and Discussion

The implementation of the innovative flow sheet (Fig. 4) led to significant improvements in process efficiency and Zinc concentrate quality. By preventing slime generation in the RGBM, the operation achieved higher liberation levels, meeting smelter requirements, and reducing Insoluble Silica Material (ISM) content.

All above modifications lead to improvement in column flotation to reduce ISM and improve Zinc concentrate grade as per smelter requirement. Zinc concentrate grade jumped from 50 to 52%. ISM reduced from 5 to 3%.

Thus, we could avoid slime formation. RGBM discharge size separated through flotation. Concentrate as fines. Middling as coarse, returned back to RGBM, Innovative flow sheet.

4.0 Conclusion

- Column flotation and Regrind ball mill modification project was successful and economically profitable in reducing silica in concentrates. Improved concentrate grade & yield. Continued operation since 2004 till date 2023.
- 2.* Same circuit can be adopted in lead circuit to reduce misplacements in Zinc concentrate and tailing losses. (* Few plants don't do lead regrinding. You can reduce ball load to avoid over grinding.)
- 3. Carbon footprint could be reduced due to
- Reduced power consumption
- Enhancing smelter capacity
- Reduced transportation loads.

In conclusion, this case study exemplifies the significance of adapting technologies to tackle precise grinding and liberation challenges within mineral processing. The implemented flow sheet modification serves as a striking illustration of innovative problem-solving in the mineral

processing industry. These alterations have indisputably optimized the zinc mineral processing process, rendering it more efficient and profitable.

These methods can also be applied to various other mineral ores like Sulfide minerals, Coal, Iron ore, Rock phosphate, Uranium, Lithium, any flotation process adopted to extract minerals.

5. Suggestions

To enhance operational efficiency and stay at the forefront of mineral processing technology, the following recommendations are proposed:

- Regular Technical Auditing: Implement annual technical audits carried out by a dedicated team of engineers.
 Document and incorporate audit findings into monthly reports. To compare, whenever there is disturbance or change in grade, recovery etc.
- Metallurgical Reporting: Include metallurgical results concerning operating variables in monthly reports to facilitate data-driven decision-making.
- Embrace Innovation and R&D: Foster a culture of continuous innovation and research and development.
 Stay updated on global technological advancements through international mining magazines. Embracing new technologies not only boosts profits but also reduces carbon footprints.
- Upgrade Outdated Technologies: Promptly phase out obsolete technologies to increase profitability and minimize environmental impact. Stringent government regulations, demand to reduce carbon emissions and support for eco-friendly equipment.
- How to know the problems and solutions: Consult experienced Engineers or consultants.

6.0 Acknowledgement

Acknowledgement is due to M/S Hindustan Zinc Limited, a Government of India Public Sector Undertaking (PSU), for affording the opportunity to conduct industrial research and development. Unlike many commercial plants that overlook laboratory research conducted by various agencies, Hindustan Zinc Limited has demonstrated a commitment to research-driven improvements. This collaboration has resulted in the successful retrofitting of column flotation technology, the modification of the RGBM flow sheet design, and numerous other advancements across various units within HZL. We express our gratitude for their support in striving for greater profitability and sustainable practices.

7.0 Other activities

We carried out R&D work in the projects, quality control, enhanced production, pollution control etc. And also gave suggestions for Improvement and development. Few such projects are given below.



MEAI TECH SERIES (MTS-15):

Application of Various Geophysical Techniques in Mining for Safety and Augmentation by Dr P.C. Jha, online at WebEx platform on 27th October 2023.



- **7.1 Fomento Goa**: Iron ore processing. Achieving plant capacity from 1.6 million tons to 2.4 million tons, with several modifications and inclusions of new equipment. Tailings were processed in HGMS to improve yield, with 50% Fe (China & Japan Market)
- **7.2 Panduronga Timblo Industrias Goa**: Iron ore processing. 100 tph. Project to recover Iron ore 50%Fe from tailing of 35%Fe, using HGMS. (China and Japan Exports)
- **7.3 KEJ Minerals Hospet**: To recover Manganese from tailing containing 25% Mn. 100tph. Lab tested and project completed.
- **7.4 Suggestions in the pipeline**: Reduce 40% power consumption in grinding circuits. Useful for making feed to pellet plants, Cement feed preparation, Clinker grinding, Mineral Grinding, etc.

My Mentors in Iron ore processing: Sri YS Reddy, Sri CS Dhave, Goa. Sri Adibhatla Shantaram, USA. For Lead and Zinc ore: Sri RK Gaur Rajasthna. Manganese: Sri Sanjay Jainarayan Nagpur.

We have good contacts with a team of mineral processing engineers, geologists, and instrumentation Engineers. Till date we have never failed in our targets given. Most of the time projects fail due to insufficient knowledge about technology, process control, and minute details of the project operation and operating parameters.

MEAI NEWS

BELLARY-HOSPET CHAPTER

Executive Committee Meeting

The Executive committee meeting of the Chapter was held on 17th October 2023 at JSW Mines Office, Vidyanagar at 6:30 pm. The Office bearers, Ex-Officio and Council members, Executive committee members, Development committee members and special invitees attended the meeting.



Sri SHM Mallikarjuna, Chairman welcomed all the members present. Before discussing the agenda points, he requested the dignitaries to address the gathering.

Sri K Madhusudhana congratulated Sri K Prabhakar Reddy, Sri G Laxminarayana and Sri Sunil Kumar Singh for being elected as the National Council members and congratulated the new team of the BH Chapter for the term 2023-25. He appreciated the efforts of MEAI BH Chapter and First-Aid Committee for providing the First Aid training to more than 400 members. He reiterated that so many people during the examination time got benefitted from the First-aid training Programme.

He shared with the gathering that more than 450 professionals got enrolled as Life members of MEAI during his term and emphasized the need for increasing the membership of MEAI. He requested the new team to take additional steps to increase the membership of MEAI.

Sri K Prabhakar Reddy congratulated the new team and BH Chapter for receiving the Best Chapter award uninterruptedly for 3 times. He felt and urged everyone to take responsibility for the BH Chapter development. He conveyed that the First Aid efforts to be continued. He also pointed out that self-sustainability would certainly help the Chapter self-reliant and we need to find the ways for it.

Sri Sunil Kumar Singh thanked everyone for electing him as a Council member of the MEAI. He thanked the past president Sri K Madhusudhana as well for his support. He wished to drive forward the development of the Chapter for further improvement. For the continuous development he

opined that brain storming is a best tool and communication within the chapter to be open.

Sri G Laxminarayana thanked former president Sri Madhusudhana for his support and thanked everyone of the BH Chapter. He congratulated BH Chapter for receiving Best Chapter Award and Best Plantation Award in the recent Awards function. He opined that we all worked together and continue the same efforts to make the BH Chapter in the forefront in all activities.

Sri SHM Mallikarjuna, Chairman started discussing agenda points and all the members present in the meeting discussed previous meeting minutes and approved unanimously.

All the members discussed and decided to conduct cricket tournament i.e. MEAI Premier League on 29.10.2023 (Sunday) at Sandur. Members requested SMIORE Limited to arrange the cricket ground for cricket tournament. Sri Bharat Kumar and Sri MM Rakesh are nominated as coordinators for the cricket tournament. It was also decided to give opportunity to two student chapter members in each team. Coordinators will circulate a google form in the group to enroll the players.

Indian Mining Day celebrations

All the members opined that MGVTC, Sandur is the convenient place for everyone to conduct Indian Mining Day Celebrations. Hence MGVTC, Sandur fixed as venue for Indian Mining Day Celebrations.

As part of the celebration it was decided to organize a Blood donation camp with Indian Red Cross Society, Bellary. Sri Yogananda TL, HOD Mining and Metallurgy was nominated as coordinator for organizing Blood Donation Camp.

Quiz, Essay Writing and Posters competition: On the occasion of the Indian mining Day Celebrations, It was decided in the meeting to conduct various competitions like Quiz, Essay Writing, Posters and Debate among the students and online Quiz competition to employees and their family members above the rank of Mines Foreman.

Sri Yogananda TL for Students and Sri K Krishnudu for Employees were nominated as Coordinators for conducting these competitions. Hence, it was requested all the Mines HOD's and Senior officers to submit company wise list of employees for this competition.

Special Prizes for Students: It was discussed and a resolution has been passed in the meeting to encourage students and Student Chapter members on behalf of MEAI BH Chapter. Details of Resolution are given below:

- Every year on 1st November on the occasion of Indian Mining Day Celebrations MEAI BH Chapter will give special prize award to two students who have passed out previous year and secured class 1st rank.
- One student will be from Mining discipline, TMAES Polytechnic.
- Another Student will be from Mineral Processing, Nandihalli P.G. Centre.
- Merit students will be felicitated with Shawl, Certificate from BH Chapter, Memento and cash prize of Rs.5000/-

Plantation Programme: All the members agreed to arrange plantation programme and scheduled the next plantation drive. M/S RBSSN will arrange the plantation programme in next July or August near National School, Hospet. In Sandur also location and host will be identified in next meetings.

Nature Walk Programme: All the members in the meeting discussed and opined that refreshment and get together activities should be there in the group to improve connectivity among the group members. Hence, it was decided to organize a nature walk every quarter at Hospet and Sandur areas. Sri YVR Krishna Reddy and Sri J Srikanth were nominated as Coordinators for Nature walk programme for Hospet and Sandur areas respectively.

New Year Diary distribution to all the Chapter members: Sri K Prabhakar Reddy opined that since we have sufficient time to print dairies, it is better to keep useful information in the diary for the benefit of the members. All the members appreciated and nominated Sri K Prabhakar Reddy and Sri K Krishnudu as coordinators for printing the New Year diary.

Organizing Seminars, training programme and workshops: It was decided in the meeting after due deliberation that All India Surveyor's meet, that was planned last year, is going to be conducted in the month of February or March-24. It will be a one-day workshop. It was decided to organize a National Seminar at Hospet in the month of November or December 2024 like MEGECON. It was also discussed in the meeting to conduct a monthly technical talk for a duration of 2 to 3 hours.

Membership Programme: It was discussed in the meeting to increase the membership of the BH Chapter. Organizations like NMDC, JSW, KSMCL, SMIORE, ZTC, MSPL etc. along with TMAES polytechnic need to come forward to increase the membership of the Chapter.

Communication in the group: All the members felt that recent updates, guidelines, circulars, news on Mining etc., to be shared in the group for knowledge sharing among the group. Members did also feel that, occasions like birthdays,

Anniversaries etc., only one message in the group with their contact number would be enough and interested members may send their wishes personally. Members also felt that our First Aid training programme advertisement should to be circulated in different groups.

Financial status as on date: Sri J Srikanth presented the financial report of the Chapter and all members approved the same. He also informed that 8 Original Fixed Deposit bonds of BH Chapter worth Rs. 57,26,945 (Rupees Fifty Seven Lakh Twenty Six Thousand Nine Hundred and Forty Five only) are kept with Sri K Prabhakar Reddy. It was also decided in the meeting to search for suitable land or Flat for MEAI BH Chapter at Hospet by the committee formed for MSAK.

Sponsorship for Indian Mining Day Celebrations: All the members agreed to celebrate Indian Mining Day every year on 1st November. It was discussed and decided in the meeting to collect Rs.25,000 (Rupees Twenty Five Thousand only) from every organization to support the Indian Mining Day celebrations event as there are so many activities in the entire programme. Apart from this, depending on the requirement the companies they may sponsor specific events like T-shirts for Players, Tea, Breakfast and Lunch for Cricket Tournament.

Other matters: Issuing ID cards to Life members with all the required details was discussed in the meeting and decided to postpone the decision to the next meeting.

Sri. P Venkateswara Rao, Secretary BH Chapter has proposed vote of thanks to the members present and thanked JSW for arranging the meeting at its premises.

Swachhata Programme under Swachhata Hi Seva campaign.

Date: 1st October 2023

Location: NC Colony, Near Baldota Park, Hospet

On Gandhi Jayanthi, the BH Chapter conducted Swachhata Programme under Swachhata Hi Seva campaign on 01.10.2023 at NC Colony, near Baldota Park, Hospet.



Sri Mallikarjuna SHM, Chairman, Sri P Venkateswara Rao Secretary, Sri L Prabhakara Reddy former Chairman of the Chapter graced the occasion. More than 50 members of BH Chapter attended and performed Shramdaan for Swachhata programme and made the program a grand success.





HYDERABAD CHAPTER

Annual General meeting

The Annual General Body Meeting of the Hyderabad Chapter was held in the conference Hall of NMDC Ltd, Hyderabad on 16-10-2023. The General body unanimously elected the following New Executive Committee of the Hyderabad Chapter for the term 2023-2025.

The New Office Bearers of the Chapter:

- 1. Shri. Vinay Kumar- Chairman (Director Technical, NMDC)
- 2. Dr. M S. Venkataramayya Vice Chairman (Prof. OU)
- 3. Shri. L. Krishna Secretary (Asst. Prof, ESCI)
- Shri. Shri. V. Balakotireddy Joint Secretary (COO, BGR)
- 5. Dr. Sanjeev Kumar Sinha Treasurer (DGM, NMDC)



L to R – Shri. Vinay Kumar- Director Technical, NMDC, Shri. V. Suresh- Director Commercial, Shri. Dilip Kumar Mohanty- Director Production, Shri. Amitava Mukherjee- CMD, NMDC, Shri. Md. Fasihuddin- Past President MEAI, Shri. V. D. Rajagopal- Past President MEAI and Shri. M. Narsaiah- Secretary General MEAI



Executive Committee of Hyderabad Chapter with the dignitaries



Dignitaries on the dais during AGM



View of audience attending the AGM on 16-10-2023

JABALPUR CHAPTER

Student Chapter

Madhya Pradesh's first mining Student Chapter under the Jabalpur Chapter was inaugurated in AKS on 17-08-2023. It takes time to open the rusty doors of luck, said Pukhraj Nainiwal, Regional Controller of Mines, Indian Bureau of Mines and Chairman of MEAI, Jabalpur Chapter.



Soul of India Award 2023 in British Parliament Honoured by House of Lords and ranked 25th among India's Best Private Universities in Outlook Survey 2022, AKS University and the country's largest professional organization Mining Engineers Association of India opened its seventh Student Chapter in Satna. The Student Chapters of mining students have been opened in major educational institutions of India. In this context, the Student Chapter was opened in AKS University of Satna.



Inaugurating it, Mr. Pukhraj Nainiwal, Chairman of Jabalpur Chapter and Regional Controller of Mines, Indian Bureau of Mines, started his lecture with the poem of Saint Ji and said that keep a little patience, keep pushing a little more, It takes time to open the rusty doors of luck. On this occasion he said that the new engineers will have to break the preconceived notions of the mining sector, maximum use of advanced technology and multi-skilled manpower is the need of the future. He said that collective vision will take us forward in this direction. While wishing all the people present on the 77th Independence Day, he gave a detailed account on all the aspects of the Student Chapter and also discussed its objectives in detail. At the end, he said to do the work in such a way that it becomes famous or do the name in such a way that Let it reduce. He openly praised the glorious work done by AKS University in the field of academics.

He has also interacted with the students. While interacting, he said that this chapter will increase interest in mining engineering among the students and will provide information about new technology. AKS Pro chancellor Mr. Anant Kumar Soni, while welcoming the guests from the dais, discussed in detail about sustainable development and said that the number of girls in the field of mining should increase. For this, a 50 percent discount in fees is provided to girl students in the Mining Faculty at AKS University. Along with this, he also outlined the work of the mining faculty of the university in a phased manner. He said that if we want to save the earth, we will have to take care of sustainability. The earth will be safe for the future generations only when we are technologically strong and work according to nature. For safe and productive mining it is important that we use technology properly. Welcoming the guests at the program, he said that when professionals get a chance to discuss with the students, they also get to know the ways of development. Establishment of the Student Chapter was made possible only with the encouragement of Engineering Dean Dr. G.K. Pradhan. More than 150 mining students have become its members.

Engineering Dean Professor G.K. Pradhan said that AKS University, Satna incorporates advanced works in mining

afresh. So that all the former students and current students can benefit.

Ashish Kumar Chaturvedi, B.Tech Fifth Semester Mining Faculty of AKS University has been elected President in the Student Chapter elections. Along with him, the Secretary and all the elected representatives were administered the oath of office. The winners of the quiz and poster presentation held in the program were called on the stage and were given first, second and third prizes by the guests. Their faces lit up while receiving the award. Vice Chancellor of AKS University, Professor Mr.B.A. Chopade said that Dr. Ambedkar has done many works for all sections of mining. With the opening of the Student Chapter, many opportunities for internship, placement and work will be provided to the students in the field of mining and the credit for all this goes to the Dean of Engineering, Dr. G.K. Pradhan, whose efforts enabled the establishment of the Student Chapter in AKS University.

Dr. GK Pradhan provided complete information about the subject matter of the Student Chapter to the people present. Through a PPT presentation, students of the Mining Faculty gave a presentation about Hutti Gold Mines Limited, which was highly appreciated. In the program, the University's Pro Chancellor Ananth Kumar Soni welcomed Chairman Mr. Pukhraj Nainiwal and Secretary Mr Pratyendra Upadhyay by presenting them shawls. While giving the welcome speech, Dr. B.K. Mishra shared information on the academic excellence and other arrangements of the university. The welcome address and information about Mining Engineer Association of India was presented by Mr. Pratyendra Upadhyay, Secretary, Jabalpur Chapter. In his address, Joint Secretary Mr. Rajesh Choubey of Satna Cement, Birla Corporation talked about the Student Chapter. Faculty Pragya Srivastava successfully conducted the program. Prominent mining officers, engineers, mining honours and students of the area participated in this program. At the end of the program, the university anthem was presented. The program ended with the national anthem. At the end of the program, Mr. P.K.Palit thanked all the guests while proposing a formal vote of thanks.

TAMILNADU CHAPTER

Student Chapter Inauguration Report

The TN Chapter's Student Chapter inauguration was held on 23rd September, 2023 at Annamalai University, Chidambaram. The inauguration of the Student Chapter was started with Tamizhthai Vazhthu. The Students Chapter Mentor Dr. G. R. Senthil Kumar, Professor & Head of Earth Sciences, Annamalai University, Chidambaram formally welcomed the gathering.

The inaugural address was delivered by Prof. Dr. T. Subramani, Chairman TN Chapter & Head of the Departments of Geology & Mining Engineering, Anna University, Chennai.

He highlighted the efforts of TN Chapter, particularly with regard to disseminating knowledge through seminars, symposia, colloquiums, workshops, training programs etc. He emphasized the importance and role of the Student Chapter. In addition, he motivated the students to actively participate in the workshops, seminars, webinars and other technical events organised by the MEAI.

The function was presided over by Prof. Dr. C. G. Saravanan, Director, Mining Engineering, Annamalai University. During his address, he briefed about the activities of Diploma in Mining Engineering programme and the support provided by Neyveli Lignite Corporation of India Limited (NLCIL). The Chief Guest, Mr. S. Nagamani, EIA Coordinator, Geo-Exploration and Mining Solutions (GEMS), Salem, addressed the gathering. In his speech, he briefed about the challenges in the mining industry with reference to present context.

He wished for the success of this Student Chapter. The MEAI Student Chapter Office Bearers Mr. K. Arunbharath (Vice-Chairman), Ms. K. Sandhya (Secretary) and Ms. X. J. Janne (Joint Secretary) briefed about the MEAI Student Chapter and its functions. Finally, Dr. E. Kumar, Executive Committee Member and Teaching Fellow, Department of Mining Engineering, Anna University, Chennai proposed vote of thanks.

Over 100 students participated in the programme. The student participants were from Annamalai University and Anna University who are pursuing M.Sc. degree in Geology, B.E degree in Mining Engineering and Diploma in Mining Engineering. After the inaugural session, the Technical Session started at 11.00 a.m. In the first session, Prof. Dr. T. Subramani delivered a lecture on "Major Mineral Deposits in Tamil Nadu" followed by Mr. S. Nagamani, on the topic "Environmental Impacts due to Mining and Effective Mitigation Measures". The third and final session about "Sustainable Mining Practices" was conducted by Dr. E. Kumar.

The programme concluded at 02.00 p.m. Lunch was served at 02.00 pm to all the participants and guests. Stone Quarry, Crusher and Lorry Owner's Association, Tamil Nadu sponsored the complete programme.





A view of participants attending the Inauguration of Tamilnadu Student Chapter

REPORT OF EDUCATION WEBINAR

Opportunities for Higher Education and Research in Mining Engineering & Interdisciplinary Areas.

The meeting was convened through zoom call on 04.10.2023 at 7:00PM.

- The Chairman Prof. Dr. T. Subramani has formally greeted the speaker and other special invitees.
- Speaker, special invitees and all faculty members present introduced themselves to the gathering.
- After the formal self- introduction of the invitees, the Chairman Prof. Dr. T. Subramani & Dr. P. Balamadeswaran gave a welcome address.
- And then the session was taken over by the speaker Prof. Rajive Ganguli.
- In this webinar, various aspects of pursuing mining engineering in United States were discussed.
- His talk highlighted the educational requirements, financial requirements, job opportunities available in United States in the fields of mining and geology.
- The webinar also acknowledged some challenges, including the cyclical nature of the mining industry, which can affect job prospects if one fails to upgrade oneself in the field.
- On a whole, the webinar emphasized the potential for rewarding careers, research opportunities, and industry collaboration while acknowledging some of the challenges and considerations associated with this field of study.
- After the talk ended by 8:00 pm, the interactive session began.
- All the special invitees and the faculty members shared their insights with the gathering.
- Finally, a vote of thanks was proposed by Ms. K. Sandhya, Secretary, TN Student Chapter.

SPEAKER: Prof. RAJIVE GANGULI, Associate Dean, College of Mines and Earth Sciences and Malcolm Mckinnon Professor of Mining Engineering, University of Utah, USA &

Overseas Professor, Department of Mining Engineering, Anna University, Chennai, Tamil Nadu, India.

SPECIAL INVITEES: Dr. E. Ganesan, TAMIN, Mr. V. S. Sambasivam, Ramco Cements, Prof. Dr. G.R. Senthil Kumar, Annamalai University

MEMBERS PRESENT: Prof. Dr. T. Subramani, Chairman -MEAI-TN Head of Department of Geology and Mining Engg. Anna University, Chennai; Dr. P. Balamadeswaran, Assistant Professor, Department of Mining Engineering, Anna University, Chennai; Mr. S. Venugopal, Department of Mining Engineering, Anna University, Chennai; Dr. E. Kumar, Executive Member – MEAI-TN Department of Mining Engineering, Anna University, Chennai; Students of B.E Mining Engineering, Anna University; Students of M. Sc Applied Geology, Anna University.



RAJASTHAN CHAPTER-UDAIPUR

7th Executive Committee Meeting

The Seventh Executive Committee Meeting of Rajasthan Chapter, Udaipur was held on 7.10.2023 in the office of MEAI, Udaipur. Shri MS Paliwal, Chairman of the Chapter chaired the meeting and the following members were present.

- 1. Shri MS Paliwal In Chair
- 2. Shri RP Gupta Former President, MEAI 3. Shri AK Kothari Former President, MEAI
- Secretary 4. Shri Asif M Ansari --
- 5. Dr SK Vashisth
- 6. Shri YC Gupta
- 7. Shri Hitanshu Kaushal
- 8. Shri DD Shripath
- 9. Shri NK Kavdia
- 10. Shri RP Mali

Council Member

& Joint Secretary

Ex-Chairman

Executive Member

Permanent Invitee

Member

Member

At the outset Shri MS Paliwal welcomed all the members present in the meeting. Thereafter the agenda items were discussed and following decisions were taken.

Confirmation of Minutes of Last Meeting held on 01st July, 2023: - The Minutes of the last meeting held on 1.7.2023 were confirmed and no comments were received from the members on the decisions taken and circulated among executive members.

- 2. Action Taken Report on the decisions of executive committee: The Sixth Executive Committee Meeting was held on 1.7.2023 and action taken report was discussed by Shri Asif Ansari, Secretary of the chapter.
- 3. Organising technical talk: One technical talk by Prof Bhavesh Sarkar, ISM IIT Dhanbad will be organized on 27.10.2023. Another talk will be planned soon on hydrogeological modelling by Shri Hitanshu Kaushal and his team. Membership Certificate to new members will be presented during the above talks.
- 4. **Plantation** Programme: This year plantation programme was conducted at KBC Mine on 08.07.2023 and 28.08.2023, and at Agariya on 01.09.2023. Next Plantation will be planned at Deogarh, Rajsamand.
- Land allotment for the Chapter: As per direction 5. of UIT, new application in attached formats is yet to be submitted. Secretary was authorized to sign the application and submit it soon in UIT.
- Student Chapter: MEAI HQ requested to open a Student Chapter at Udaipur. We sent request letter to HOD Mining Engineering Department, CTAE Udaipur and Sangam University regarding the opening of the Student Chapter. Soon, Chapter will be formed. Shri AK Nandwana and Shri Hitanshu Kaushal will be the mentors from MEAI Executive committee for Sangam University and CTAE Udaipur respectively. The University to nominate two students as convener and Co-Convener and one professor as Coordinator.
- 7. Outstanding amount of Sponsors/Advertisement of Silver Jubilee Celebrations function: Representative of HZL assured an early payment of dues of Normat, Vaman and HZL.
- Training of Mining Mate & Blaster: Next training program for "Mining Mate & Blaster" will be planned by the concerned committee as per new online examination pattern and executed soon.
- Celebration of Indian Mining Day: It was decided 9. that this year's "Indian Mining Day" (on 1st November, 2023) will be celebrated at RK Marble Raisamand on the theme "Decarbonisation Initiatives in the mining industry". The Chairman and Secretary will decide the key speaker for this Programme. Essay writing and poster making completion will also be organized. Shri RP Mali will be the coordinator for it. Certificate of membership of new members may be presented in this programme.
- 10. Launching of MEAI "Rajasthan Udaipur Chapter Website": Shri Hitanshu Kaushal said that the website is ready and as soon as the domain name is received from Delhi it will be launched.
- 11. The travelling expenses of office staff: Equivalent to one month of their allowances, for services for working

in Silver Jubilee Celebration on 05.07.2023 was approved. Shri Satya Narayan Joshi, Office Assistant, MEAI-Udaipur & Shri Chunni Lal Bhoi will receive Rs. 15,000 & 5,000 respectively.

- 12. Recommendation for VP-III from North Zone: President MEAI requested to recommend a suitable
 person from our Chapter for consideration. He preferred
 to recommend young blood in the age group of 40s or
 50s who, if appointed can serve his/her tenure in the
 post of President before attaining retirement age. So, it
 has been decided to recommend Shri Asif Mohammed
 Ansari as a candidate for VP III.
- 13. Women member as a special invitee in the National Council: - President MEAI requested to recommend a suitable woman mining engineer as Nation Council Invitee. The House approved Ms Sakshi Guta from HZL for this position.
- 14. **Newsletter publication:** Since the last quarter newsletter couldn't be issued, we issued a joint newsletter this time. House appreciated Shri NK Kavdia for this good work.
- 15. Training programme on Datamine Software: House discussed and given the task to Shri Hitanshu Kaushal to assess the possibility of this training to be organized free of cost to upgrade professional knowledge of our members.

The meeting ended with the vote of thanks proposed by Dr S.K. Vashisth.





OBITUARY

Mr. K. S. Parameswaraiah (08-06-1942 to 01-10-2023) LM. no. 1488 Bangalore Chapter

Mr.K.S. Parameswaraiah, 81 yearas, passed away peacefully on the 1st of October 2023 in Bengaluru. He was born on 8th June 1942 in Tumkur. In the year 1964 he graduated from the



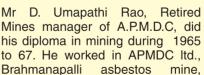
University of Mysore with an M. Sc. in Geology and worked as a Geologist for more than three decades. He retired in 2001 as a Senior Mining Geologist from the Indian Bureau of Mines, Govt. of India.

Mr. Parameswaraiah was an accomplished athlete and a basketball player and a coach. He had played for his University and Karnataka State. He had represented India in the 1984 Asian Games in the athletics veteran's category. He was also the founding father of basketball in Vidarbha having started the Apollo Basketball Club in Nagpur. A man of many talents, post-retirement, he focussed on coaching the younger generation in both basketball and athletics in Bengaluru. He was a Life Member of MEAI and had served as a member on the Executive Committee of Bangalore Chapter. In 2022, on Indian Mining Day, the Chapter felicitated him in recognition of his valuable contribution to the activities of the Chapter. He was known for his dedication, hard work, honesty, sportsmanship, and friendly and sociable nature. He is survived by his wife and three children and their spouses, and four grandchildren.

The members of MEAI condole his sad demise and conveys condolences to the bereaved family.

OBITUARY

Mr D. Umapathi Rao (09-10-1944 to 25-09-2023) LM. no – 1816 Hyderabad Chapter





Warangal black granite mine, Mangampet barytes mine and ball clay mines of dwakatirumala, as a Mine foreman, General foreman and Second class Mines Manager.

Mr D Umapathi Rao is survived by his wife, son and two daughters and whole family. MEAI members pray the almighty to grant eternal peace to the departed soul and express their profound condolences to the bereaved family.



Rajmeny MinCare Consultants

RMC: The Consulting Group of Practicing Engineers

Comprising of Geotech Experts backed up with first hand experience (40 years) of Slope Management of world class operations. It includes Slope Monitoring using two radars, 220 prisms, predicting and dealing with a dozen of slope failures. Can establish Control Blast techniques -Presplitting, Pre-stressed cable bolting, Depressurization and developing TARP, etc., for your mine slopes & dumps.



RMC has association with Govt & NABL accredited Labs & offers



Slope designing by Scientific study complying DGMS Tech circular # 3 of 2020,



Regular slope monitoring complying DGMS Tech circular # 2 of 2020,



Current & Global slope stability Assessment along with their remediation, &







https://rajmenyconsultants.com pramodrajmeny@gmail.com; Mb: 9001294921

WINNERS OF RIDDLES PUBLISHED IN THE MEJ OCTOBER 2023 ISSUE

Congratulations to proud winners

Mr Satish Kumar Agrawal

Mining Engineer, Laxmi Marble & Granite Pvt. Ltd E-mail: satish.ag47@gmail.com

Prof. D.P. Tripathy

National Institute of Technology, Rourkela E-mail: debi_tripathy@yahoo.co.in

Dr. Ashok Kumar, Assistant Professor

Department of Mining Engineering, IIT(ISM), Dhanbad E-mail: ashok.bhu.min09@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** or Mob. 9177045204.

PLEASE NOTE

The purpose of conducting this monthly Quiz competition for more than 2 years has been largely fulfilled. Hence, this monthly Quiz competition has been kept on hold from this month until further notice. The Editorial Board of MEJ thanks all those MEJ readers and Quiz participants for their patronage and continued cooperation.

The readers may share their views and suggestions with the Editor on this initiative. - Editor

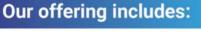




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CONFERENCES, SEMINARS, WORKSHOPS ETC.

INDIA

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

18-20 Jan 2024: ICGEID 2024. 2nd International Conference on Geotechnical Issues in energy, infrastructure, and disaster management. Venue: Auditorium complex, IIT Patna. Organized by Department of civil and environmental engineering. For details contact: Dr Amit kumar verma at infoicgeid24@iitp.ac.in or +91 7781012407

ABROAD

- **6-9 Nov 2023: Flotation '23**. The Vineyard Hotel Colinton Rd, Newlands, Cape own, 7700, South Africa. Contact details: 15 South Street, Farnham, Surrey, GU9 7QU, United Kingdom, Tel: +44 (0)1252 718 999, Email: enquiries@globalminingreview.com
- **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
- 21-23 Nov 2023: Critical Minerals Conference 2023. Perth Convention & Exhibition Centre, Perth, Australia. For details contact conference@ausimm.com
- **28-30 Nov 2023: Resourcing Tomorrow 2023.** Business Design Centre 52 Upper Street, London, N1 0QH, United Kingdom. Contact details: 15 South Street, Farnham, Surrey, GU9 7QU, United Kingdom, Tel: +44 (0)1252 718 999, Email: enquiries@globalminingreview.com
- **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.
- **10-11 Jan 2024: Future Minerals Forum (FMF 24)- Conference and Exhibition.** VENUE KING ABDULAZIZ INTERNATIONAL CONFERENCE, CENTER, RIYADH, SAUDI ARABIA. For Speaking Enquiries speaker@futuremineralsforum.com.
- 11-12 Jan 2024: International Conference on Mineral Processing and Mining ICMPM 2024. Singapore. Organised by World Academy of Science, Engineering and Technology. Website URL: https://waset.org/mineral-processing-and-mining-conference-in-january-2024-in-singapore

- 8-9 Feb 2024: International Conference on Web Mining, Information and Knowledge Extraction (ICWMIKE 2024). Lisbon, Portugal. Website URL: https://waset.org/web-mining-information-and-knowledge-extraction-conference-in-february-2024-in-lisbon; Contact URL: https://waset.org
- **18-19 Feb 2024: International Conference on Bauxite Mining and Alumina Refining ICBMAR 2024.** Jeddah, Saudi Arabia. Website URL: https://waset.org/bauxite-mining-and-alumina-refining-conference-in-february-2024-in-jeddah
- **4-5 Mar 2024: International Conference on Mining Intelligence ICMI 2024.** Rio de Janeiro, Brazil. Website URL: https://waset.org/mining-intelligence-conference-in-march-2024-in-rio-de-janeiro
- **4-8 Mar 2024: The 17th ACM International Conference on Web Search and Data Mining (WSDM).** Event Location: Mérida, Yucatán. Contact wsdm-2024-general-chairs@googlegroups.com
- 10-13 Mar 2024: EnviroTech Lisbon, 2024 cement conference. Hotel Cascai Miragem Health & Spa, Av. Marginal 8554, 2754-536 Cascais, Lisbon, Portugal. Contact details: 15 South Street, Farnham, Surrey, GU9 7QU, United Kingdom, Tel: +44 (0)1252 718 999, Email: enquiries@globalminingreview.com
- 22-23 Apr 2024: International Conference on Recent Developments in Mining Technologies ICRDMT 2024. London, United Kingdom. Website URL: https://waset.org/recent-developments-in-mining-technologies-conference-in-april-2024-in-london
- 23-25 Apr 2024: Exhibition Mining World Russia. 28th exhibition of machines and equipment for mining, processing and transportation of minerals. Moscow, Crocus Expo, pavilion For details contact: Ms. Natalia Medvedeva, Portfolio Director, ITE Group, Email: natalia.medvedeva@ite.group. Web link: https://miningworld.ru/en/media/news/2023/august/17/equipment-for-mining-industry-in-russia.
- **7-8 May 2024: International Mining Geology Conference 2024 (IMG 2024).** Perth Convention and Exhibition Centre, Perth, Australia. For details contact conference@ausimm.com
- **17-18 May 2024: International Conference on Surface Mining and Land Reclamation ICSMLR 2024.** Sydney, Australia. Website URL: https://waset.org/surface-mining-and-land-reclamation-conference-in-may-2024-in-sydney
- **17-19 Jun 2024**: **Molten 2024**. Brisbane, Australia and Online. Contact AusIMM. T: 1800 657 985 or +61 3 9658 6100 (if overseas)

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