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President's Message



MGMI has a glorious history of promoting the scientific study of mining and mineral industries of the country spanning back to around 113 years. I consider it a privilege and honour to have been elected as the President of such a noble Institute. Drawing inspiration from my predecessors my endeavour, along with the entire team of the newly elected members of the National Council, would be to carry out the ideals, values, objectives, culture and convention upon which this great Institute has been founded upon.

I express sincere appreciation to my predecessor, Dr N K Nanda and other members of the outgoing committee for the invaluable services and contribution they have rendered to the Institute during their tenure. The heights that MGMI has scaled today is the result of the commitment of all the past members who have made this body strong and vibrant. The history of their collective contribution should never be forgotten. I feel proud to be a part of that weighty legacy in carrying the flame of MGMI forward along with the newly elected team. I offer my hearty congratulations to them.

We are now living in a time of ever changing challenges, business dynamics, opportunities, disruptive technologies etc. The focus of the Institute has to be to keep abreast of the changing scenario and organize contextual, topical and tangible result oriented national and international Seminars and Workshops. Adaptability and tuning into the changing times is of foremost importance.

Let us all together carry forward the spirit of MGMI in fulfilling the expectation of the mining and mineral Industries bestowed upon the institute with the valued support from all concerned organizations. We should instill in ourselves a sense of commitment and discipline in whatever we do for the benefit of the Institute.

I convey my Best Wishes to all the fellow members of MGMI and their families a Prosperous, Peaceful, and Happy New Year 2019.

my

(Anil Kumar Jha)

In our last issue we talked about lithium and its growing demands in lithium ion batteries (LIB). Another material which comprises about 60 % of LIB is graphite. About two third by weight in a lithium-ion battery is lithium carbonate. is increasing with the Graphite demand increase in the demands of electronic devices that use of lithium ion batteries. Considering the increasing popularity of electric vehicles, demands for graphite in near future is expected to rise manifolds. You can imagine this from the fact that the fully electric five-door hatchback car, Leaf manufactured by Nishan of Japan uses 24 kWh electric batteries with 192 cells that contain 40 kg of graphite.

Earth Scientists have revealed that graphite is the second or third oldest minerals available on earth. It is one of the 12 known types of mineral that predate the Solar System. They were formed in the ejecta when supernovae exploded or low- to intermediate-sized stars expelled their outer envelopes late in their lives. In the 4th millennium BC, during the Neolithic Age in southeastern Europe, the Marița culture (Danubian Culture) used graphite in a ceramic paint for decorating pottery. Graphite is a Greek word meaning "to write". This name was given by A.G Warner in 1789 because the mineral was used for making pencils.

From the Editor's Desk



The principal types of natural graphite are Crystalline, Amorphous, Lump and Highly ordered pyrolytic. The Crystalline small flakes of graphite (or flake graphite) occurs as isolated, flat, plate-like

particles with hexagonal edges if unbroken. When broken the edges can be irregular or angular. Amorphous graphite is very fine flake graphite. Lump graphite (or vein graphite)

occurs in fissure veins or fractures and appears as massive platy intergrowths of fibrous or acicular crystalline aggregates, and is



probably hydro-thermal in origin. Highly ordered pyrolytic graphite refers to graphite with an angular spread between the graphite sheets of less than 1°.

Graphite occurs naturally in meta-morphic rocks as a result of the reduction of sedimentary carbon compounds during metamorphism. It also occurs in igneous rocks and in meteorites. Minerals associated with graphite include quartz, calcite, micas and tourmaline. China, Mexico, Canada, Brazil, and Madagascar, Sri Lanka are the main suppliers of graphite in the world.

Current world production of graphite is 1.3 million metric tonne of which 40% is flaky graphite. It is estimated that by 2020 this value

<u>"Electric Graphite Growing Demand From Electric Vehicles & Mobile Electronics"</u>(PDF). galaxycapitalcorp.com. July 20, 2011.

Boardman, John. "The Neolithic-Eneolithic Period". The Cambridge ancient history, Volume 3, Part 1 (PDF). pp. 31–32. ISBN 0521224969. Archived from <u>the original</u> (PDF) on 25 February 2013 (https://en.wikipedia.org/wiki/Graphite#cite note-Cambridge-29)

will rise to 1.9 million metric tonne. However, this estimation has not considered the demands due to batteries. Thus one can easily expect good sunshine in graphite market in near future.

The known world reserve of graphite is estimated as 800 Mte including 11 Mte amorphous graphite reserves in India. India's reported graphite reserve is distributed in states of Jammu and Kashmir, Arunachal Pradesh, Gujarat, Jharkhand, Maharashtra, Karnataka, Kerala, Tamil Nadu, Odisha, Chattisgarh and Rajasthan (Figure 1). Of the total graphite resources available in India, Arunachal Pradesh accounts for 43%; followed by Jammu & Kashmir (37%), Jharkhand (6%), Tamil Nadu (5%) and Odisha (3%). Figure 1 gives graphite map of India. However, these assets are not yet properly monetized and graphite mining and processing are limited. Total resource base of graphite is estimated as 158.02 Mte. In terms of reserves, Tamil Nadu holds the leading share of about 37%, followed by Jharkhand (30%) and Odisha (29%), as these are the only operational graphite spots (Figure 2Figure 2 numbering missing).

Table 1: India's state wise distribution ofTotal graphite resources and Operationalgraphite reserves

States	Resource	Reserve
	Distribution %	Distribution %
J&K	37	
Jharkhand	6	30
Tamil Nadu	5	37
Odisha	3	29
Arunachal Pra	adesh 43	0
Others	6	4

Source: Geological Survey of India, IM Data



Figure 1 shows reserves in different states.

Table 2: Production capacity of Indiangraphite producing companies.

Company	State	Mining Projects	Production Capacity
Tirupati Carbons & Chemicals	Jharkhand	Rabda, Gaura, Ekta	20,000 tpa
Chotanagpur Graphite Industries	Jharkhand	Satbarwa Bishrampur	10,000 tpa
Carbon & Graphite Products	Jharkhand	Latehar, Palamu	7,000 tpa
Agrawal Graphite Industries	Odisha	Belpara, Sambalpur	10,000 tpa
Pradhan Industries	Odisha	Rayagada	12000 tpa
T.P. Minerals Pvt. Ltd.	Odisha	Dangachacha, Sargipali	8,000 tpa
G.R. Graphite Industries	Odisha	Balibandha, Sambalpur	6,000 tpa
Tamil Nadu Minerals Limited	Tamil Nadu	Sivagangai, Madurai	8,400 tpa

The principal players in graphite production contributing about 85% of India's graphite are: Tirupati Carbon & Graphite, Chotanagpur Graphite Industries, Carbon & Graphite Products, Agrawal Graphite Industries, Pradhan Industries, T.P. Minerals, G.R. Graphite and TAMIN Minerals. The production capacities of these companies are shown in Table 2

Graphite mining sector is becoming vibrant now globally. Northern Graphite Corporation (OTCQX: NGPHF) of Canada has invested at Bissett Creek graphite deposit to develop in Phase 1, a mine and plant capable of producing over 20,000 tonnes of graphite concentrate per annum at an initial capital cost of CDN\$101.5 million (US\$81.2 million). The second phase is planned for doubling the plant throughput after three years of operation and increasing production to an average of 42,000 tpy over the succeeding 10 years in order to meet the expected future growth in graphite demand.

KS Mines of India has restarted its graphite mining in its mine located in Palmu district of Jharkhand. The KS mines has 1.8Mte reserves of Flaky graphite. The future of lithium-ion, vanadiuom-redox batteries, hydrogen fuel cells, microchips and solar panel technologies, will be demanding more graphite flakes. Present technology for artificially produced alternatives of graphite flakes costs \$20000 per Mte, however, natural graphite of Srilanka and India can supply that at \$4000 per Mte

KS Mines has now developed capacity for producing 3000Mt of refined flaky graphite powder (300 mesh graphite), which is 98-99% pure carbon. Ceylon Graphite of Sri Lanka operates having mines of vein graphite, a purer and higher yield graphite found in scarce supply globally. The company reported discovery of three new, natural crystalline graphite veins over 15 cms in width between 68.93 meters and 69.53 meters downhole at its H1 site in the Hakbewa area.

The flaky graphite has a very high demand. About 59 % of graphite consumed is for refractory applications, crucibles, foundry operations, and steel making. Other applications of flaky graphite include replacing silicon wafers and the expanding market of fuel cells and Li-ion Batteries. The flaky graphite is considered as "the world's next wonder material". International customers of flaky graphites are M/S marble Corporation Japan, M/S Nisso Iwai Corporation Japan, M/s Mitshubishi Japan, M/S Naturstein Verkaufs GMBH Switzerland, M/S Magti Trading Inc. Italy and KOH-I-NOOR HARDTMUTH.

Graphite is also closely connected to the entire automobile industry due to its versatile range of uses. Every conventional car includes between 80 and 100 sintered parts containing graphite. The importance of graphite can be realized from the Figure belowPut figure number, that illustrates how modern car industry uses graphite.



Source (<u>https://www.gk-graphite.com/en/</u> featured-product/

India's domestic demand of graphite R.O.M. was estimated to touch 2,08,000 tonnes by 2016-17 at 9% growth rate by the Working Group for the 12th Plan, by the then Planning Commission of India. Of late, a few emerging & important specialized applications of exfoliated graphite have been reported especially in the manufacturing of sealings, gaskets, braids and brushes. New products of synthetic graphite, such as, graphite fibres/ropes and graphite insulation blankets have been introduced. In the world scenario there seems to be a rapid diversification in respect of potential large volume end-use for natural graphite, such as, in heat sinks, also called spreader shield, which is a graphite foil material that conducts heat only in two directions. Graphite has thermal conductivity above aluminum and almost equal to copper. These are used for dissipating heat in laptop computers, flat panel displays, wireless phones, digital video cameras, etc. Such emerging & high growth applications of graphite are certainly causing noticeable impacts on the demand and consumption patterns within the country and abroad. Global demand for natural graphite has been forecasted to increase by 37% by 2020. Demand for graphite in lithium-ion batteries for

application in electric/hybrid vehicles, laptops, smartphones, home/business applications and traditional uses for expanded graphite foils, are the potential areas that are expected to be major drivers in the market. It represents 23% of global flake graphite demand. Battery demand for graphite is forecasted to double in the next six years.

Thus India needs to initiate more R&D and application oriented demonstrative projects in graphite. Graphite mining economics and possibilities of Indian mining firms investing in graphite deposits in other countries also require critical attentions. Detailed exploration

of graphite deposits in Odisha, Jharkhand, Jammu & Kashmir and Kerala should be carried out.

Cost-effective beneficiation technologies for low-grade graphite ore need to be developed.

Khanindra Pathak Kharagpur



Graphite specimen from Kimmirut,Baffin Island, Canada

HEALTH TITBITS

Cauliflower gives cancer curry Eating vegetables such as cauliflower in a curry may help prevent and treat prostate cancer, according to new research from the US. Scientists say that the spice turmeric, which gives curry its yellow colour, reduced the development of cancers in lab mice, as did a naturally-occurring substance called phenethyl isothiocyanate. It is abundant in vegetables such as watercress, cabbage, broccoli, Brussels sprouts, kale, turnips and cauliflower.

UPCOMING EVENTS

BAUMA 2019

April 8, 2019 – April 14, 2019 Munich, Germany

Bauma is the heartbeat of the industry. It allows you to meet international market leaders and see the latest pioneering innovations from around the world. It allows trade visitors to find the right suppliers and solutions that meet their exact needs.

Bauma is a global driving force behind innovations, a success engine and a marketplace. It is the only trade fair in the world that depicts the industry for construction machinery in its entire breadth and depth. The only place to get an overview that is this comprehensive is at bauma. It is a platform that also features a number of international premieres—making your visit an unforgettable experience.

Link: https://www.bauma.de/index-2.html

MINING WORLD RUSSIA

April 23, 2019 – April 25, 2019 Krasnogorsk, Russia

The Russian mining industry is huge and those that have a flair for the Wild West can do very well in the Russian market. There is a large group of quality business partners ready to work with you to introduce new technologies to the industry. Mining world Russia is a good starting point to understand the country and its opportunities. The event includes a trade show with 240 companies and 8,000 visitors.

Link: http://www.miningworld.ru/en-GB

ASIA PACIFIC INTERNATIONAL MINING EXHIBITION (AIMEX)

August 27, 2019 – August 29, 2019 Sydney, Australia

Australia is very similar to Canada in many ways and as such is a comfortable market to enter. It however also develops its own array of technologies due to its remote position from North America. Australia typically looks north to the Asian market the same way that Canada looks to Latin America. After maturing in Latin America Canadian companies next look to the Asia Pacific region.

Link: http://www.aimex.com.au/home/

HEADQUARTERS ACTIVITIES

MINUTES OF 880thCOUNCIL MEETING

The Minutes of the 880th Council Meeting of the MGMI held at MGMI Bldg., GN-38/4, Sector – V, Salt Lake, Kolkata – 700 091 on 18th August, 2018 at 12.30 p.m. (Duly approved in the 881st Council Meeting held on 8th December, 2018).

Present: Dr N K Nanda , President in the Chair. The meeting was attended by S/Shri Jha N C, Saha R K, Sahay A N, Lochan Rajiw, Talapatra Ranajit, Prof (Dr) Khanindra Pathak, Ghosh Samir Kr, Arora V K, Chakraborti Bhaskar, Goenka J P, Prof. (Dr) Karmakar G P, Dr Moitra A K, Prof (Dr) Mukhopadhyay Subir Kumar, Roy Prasanta, Dr Sinha Amalendu, Kundu D K.

ITEM No. 0 Opening of the Meeting

0.1 Dr N K Nanda, President extended welcome to all members present, Past Presidents, Council Members and Invitees and requested the Hony. Secretary, Shri Rajiw Lochan to take-up the agenda.

> The Hony. Secretary gratefully acknowledged and informed to the Council that the President of MGMI, Dr N K Nanda has attended in the 25th World Mining Congress during June 19-22, 2018 in Astana, Kazakhstan and presented a Paper.

Condolence:

One minute silence was observed in the memory of Late Atal Behari Vajpayee, Former Prime Minister of India.

0.1.1 Leave of absence was granted to those who could not attend the Meeting.

880.1.0 To confirm the Minutes of the 879th meeting of the Council held at the MGMI Bldg. Kolkata - 700091 on 28th April, 2018 at 2.00 p.m.

> The Minutes were circulated to all Council Members. Minutes confirmed with modifications and approved. The Council then resolved that-

Resolution: The Minutes of the 879th (3rd meeting of the 112th Session) meeting of the Council held on 28th April, 2018 at the MGMI Bldg. Kolkata – 700091 be confirmed.

880.1.1 a) To consider matters arising out of the Minutes.

The Council then considered the Action Taken Report on the Minutes of the 879th Council Meeting held on 28th April, 2018 at Kolkata and noted the report.

880.1.1 b) To consider report of the Extra Ordinary General Meeting held on 21.07.18

The report of the Extra Ordinary General Meeting held on 21.07.2018 was circulated amongst the Council Members and they have noted that a Five Members Committee has been constituted to further deliberation into the matter on the following aspects – comparison with UNFC code, advantage-disadvantage of the proposed change, IMIC, Code of

Ethics and Financial implications. The members of the Committee are

- 1. Mr N C Jha Chairman
- 2. Dr Samir Kr Dasgupta
- 3. Shri Smarajit Chakrabarti
- 4. Shri Akhilesh Choudhury
- 5. Shri A K Debnath &
- 6. Shri Rajiw Lochan, Hony Secretary, MGMI, Ex-officio Member

Thereafter, the Committee invited Prof. S P Banerjee, Mr. R P Ritolia, Mr. L K Bose and Mr. Prasanta Roy as Special Invitees.

It was informed that the Committee met on 10th August 2018, and further deliberation will be continued in the second meeting which is scheduled to be held on August 28, 2018.

880.2.0 To discuss about the forthcoming events of the Institute

a) Half Day Workshop 2018

The Council noted that the National Seminar will be held on Saturday, the 29th September, 2018 at Biswa Bangla Convention Centre, Newtown. The topic of the National Seminar being of Management Excavation Stability.

b) 60th Holland Memorial Lecture

The 60th Holland Memorial Lecture also will be held in Biswa Bangla Convention Centre, Newtown, on September 29, 2018. Speakers name discussed and agreed to firm by the President / Hony Secretary on priority considering previous events.

c)

112nd Annual General Meeting

112th Annual General Meeting also will be held at the same venue and date.

880.3.0 To consider and approve the Audited Accounts for the Financial Year ended on 31st March, 2018.

> The Auditor's Report and Audited Accounts for the Financial Year ended on 31st March 2018, were placed before the Council for consideration. The Council gone through the Auditor's Report, Balance Sheet for 2017-2018 and were approved.

880.4.0 To appoint the Institute's Auditor for the Financial Year 2018 – 19 with their remuneration.

A letter has been received from our Auditors M/s. Halder and Dutta, expressing their unwillingness to continue as our Auditor from the Financial Year 2017-18 and submitted their resignation. Shri Sudhip Kr. Sen, Chattered Accountant and one of the Partners of M/s. Halder and Dutta Company gave his consent for appointment as auditor of MGMI and agreed for Rs. 12,000/- for execution of all assignments of Audit, ROC, Annual Filling, IT Returns, GST returns etc.

The Council agreed to appoint Shri Sudhip Kr Sen as Auditor of MGMI for 2017-18 & 2018-19 at remuneration of Rs. 12,000/-.

880.5.0 To consider and approve the recommendations of the Judging

Committees for various Awards and Medals for the year 2017 - 18.

The recommendations made by different Judging Committees for various Awards and Medals have been accepted by the Council. While considering the Institute's Award, it was proposed by the Committee that the award to be given to the name of the paper only and not to any individual Author, however, all the authors to be provided with Certificate for the contribution made by them. This has been approved by the Council (List of Awardees placed as Annexure I).

880.6.0 To Elect the President of the Institute for the year 2018-2019.

Shri Anil Kr Jha, Chairman, Coal India Ltd. and Vice President, MGMI was unanimously elected as the President of the Institute for the year 2018-19.

- 880.7.0 To consider applications for Membership and the Membership position.
- a) The Council approved 11 Life Membership applications
- b) The Council noted the present position of membership which is as follows:

	28.04.2018	Add	Trans	Loss	18.08.2018
Member	265	-	-	-	265
Life Member	2502	11	-	02	2511
Associate	40	-	-	-	40
Student Associa	ite 06	-	-	-	06
Life Subscriber	32	-	-	-	32
Subscriber	01	-	-	-	01
Donor	02	-	-	-	02
Patron	04	-	-	-	04
Corporate	08	-	-	-	08
	2860	11		02	2869

880.8.0 Any other matter with the permission of the Chair.

880.8.1 The Council was informed that as per requirement of becoming RPO of CRIRSCO to enable member of NACRI, a workshop was organized during May 25-26, 2018 at the Hotel Pride in association with NACRI. The Workshop was inaugurated by Shri Anjani Kumar, Coal Controller. The Workshop was conducted by Mr. Harry M Parker, the former Cochairperson, CRIRSCO, Mr. Kerry Whiteby, Dr. Abani R Samal and Dr P V Rao, Co-chairman, NCC.

> It is being informed by NACRI vide their letter dated 12th July 2018 and confirmed that the President of MGMI has been co - opted as Cochairperson of NACRI in India as recognized as Member of CRIRSCO.

- **880.8.2** A letter has been written by Shri Akhilesh Choudhury who is one of the contestants for the Council Election of MGMI 2018-21 regarding provision of 38 (d) of Memorandum and Article of Association of MGMI and requested for necessary action in this regard. The Council deliberated / discussed, verified and noted that the suggestions were made by Shri J P Goenka for consideration by the Council at the 111th Annual General Meeting of MGMI that
 - i) Letters should be sent by ordinary post and not through Speed Post.

ii) Gap between the despatch and

receiving of the Ballot Papers should be two months.

- iii) To find out the ways and means that members should be more involved and those members who are not having email would be requested to arrange for the same.
- iv) MGMI may explore the possibility of Electronic Voting.

This was discussed in the Council Meeting vide no. 877th dated 16.12.2017 and advised that the Scrutinizing Committee for the forthcoming Council Election would look into the matter and take necessary measure accordingly.

The Scrutinising Committee deliberated the matter and unanimously agreed to send the Ballot Papers to eligible members through ordinary post and prepared the date schedule of Council Election for 2018-21. Accordingly, Ballot Papers were issued to Members on 24.07.2018 by ordinary post and the last date of receiving the ballot papers decided to be on 25.09.2018 alongwith 02 months' time which was long desired of most of the members to provide better opportunities to caste the vote. It was discussed and deliberated in the Council Meeting for ratification of the action /decision taken by the Board of Scrutineers Committee to conduct the Election of Council members of MGMI from 2018-21 onwards. The Council debated the matter at length and found that the election process was in order and iustified for the enhancement of time gap between despatch and receiving of the ballot papers and advised that the gap between the despatch and receiving of the ballot papers should be of 02 months. So, the election process will be continued as notified. It was also advised that it should be incorporated at the appropriate place of the Memorandum and Article of MGMI and should also be intimated to Registrar of the Company (ROC).

880.8.3 The service of Shri Gouranga Ghatak, Executive Secretary, has been extended upto March 2019 and the service of Shri Joy Chakraborty has also been extended upto March 2019 on similar terms and conditions.

> President expressed his gratitude to all Senior Members of Council and Past Presidents for extending their whole hearted support during his tenure as President of MGMI from 2016 to 2018.

> The meeting ended with Vote of thanks to the Chair at 17.00 hrs.

Report on Training Programme on "Technologies for Safety Enhancement in Mines"

Jointly organised by MGMI, Kolkata and CSIR- CIMFR, Dhanbad 3-8 December 2018

A short term course was organised by The Mining, Geological & Metallurgical Institute of India, Kolkata, in collaboration with CSIR-CIMFR. Dhanbad with the objective to address the relevant issues, share the R&D knowledge gained at CSIR-CIMFR, a National Institution and recent advancement globally pertaining to the above mentioned subject areas. Also it aims at collection of information which is encountered in actual field conditions to workout future R&D road map for this vital area. The course broadly covered basic guidelines, procedures and innovative techniques used to evaluate and implement best practices for improving health and safety standard of miners and protection of machineries.

In the Inaugural Function Shri P S Bhattacharayya, Former Chairman, CIL, was the Chief Guest. Shri J P Goenka, Vice President, MGMI, Dr Amalendu Sinha, Former Director, CSIR-CIMFR and Coordinator of the programme, Shri Rajiw Lochan, Hony Secretary, MGMI, Dr I Ahmed, HOS, HRD, CSIS-CIMFR and Shri Prasanta Roy, Immediate Past Hony Secretary and Joint Coordinator of the programme were on the dais. Shri R P Ritolia, Shri R K Saha, Past Presidents, MGMI and other guests were present. 34 Executives from different subsidiaries of CIL, SCCL & TISCO and non-coal companies attended the programme.

Shri Prasanta Roy conducted the programme. At the outset Shri Rajiw Lochan welcomed Shri P S Bhattacharyya, Former Chairman, CIL, and the Chief Guest of the function by presenting Flower bouquet. While welcoming all the distinguished guests, speakers and participants he expressed his gratitude to the distinguished invitees for attending the session and to the companies for sending good number of participants and said that many such training programmes are being planned to be organized for the benefit of the industries.

Dr I Ahmed in his remarks mentioned that CIMFR has considerable expertise and practical experience of R&D in different discipline of mining and on the other hand MGMI has galaxy of mining stalwarts, senior academicians from reputed Institutions as their members. Participants will definitely get benefit of their experience vis-a-vis we will get feedback from the industry about the real problems encountered in present day practices which will help in planning our future R&D activities. He also stated that MGMI and CSIR-CIMFR can also jointly organize customized course as per the requirement of the mining companies.

Dr Amalendu Sinha said that the training programme has been specially structured to share with the participants about the latest developments in the area of mine safety and requested the participants to freely interact with the speakers.

Shri J P Goenka, expressed his happiness about large participation and said about importance of monitoring in assessing mine safety.

The Participants were then requested to give self-introduction.

Shri P S Bhattacharyya, the Chief Guest of the function in his Inaugural address congratulated MGMI and CSIR-CIMFR for the good initiative taken and expressed the need for many more such programmes in future too. He shared his experience of different sectors mining and non-mining both. He disclosed a few incidences encountered in his service life to covey that how one can motivate the entire team in the industry to achieve big targets. Shri Bhattacharyya also shared few success stories with participants from TISCO and SCCL.

Shri Prasanta Roy, Immediate Past Hony Secretary and Joint Coordinator of the programme conducted the entire proceedings and concluded the session with vote of thanks.

Glimpses of the Inaugural session are shown in few photographs of the occasion in PHOTO GALLERY Section.

On 4th December 2018, Dr. Pradeep K Singh, Director, CSIR-CIMFR interacted with the participants and apprised them about the major projects being undertaken at CSIR-CIMFR. He also invited suggestions and feedback from the participants on the upcoming areas of research in the field of mine safety, so that the Institute can accordingly focus on its thrust areas.

The participants then visited the factories of M/s Nanda Millar Co Ltd and M/s Mine Line Pvt Ltd The working of mine safety related instruments being manufactured, were demonstrated to the participants.

On 5th December 2018 the participants visited the CBM site of ESSAR at Durgapur and to see the exploration site. Subsequently, the team visited CSIR-CMERI, Durgapur and interacted with the Prof Harish Hirani, Director, CSIR-CMERI. The further course was organised at CSIR-CIMFR, Dhanbad from 6th to 8th December 2018. In total 14 lectures were delivered by the experts dealing on different aspects of Mine safety. Topics discussed in the Training Programme

- Safety Enhancement by Ensuring Stability in Stops and opening in deep hard Rock Mines
- Whole-body vibration exposure and ergonomic issues of heavy earth moving machine operators in surface mines: A major health concern
- Brain storming with doyens of mining/mineral industries
- Sustainable opencast coal mining practices
- Safety issues of underground mining in hard rock
- A discussion on the notified occupational diseases in mining industry
- Importance of Rock Properties and Stresses in Mine Safety Engineering
- □ Subsidence Control for Eco-friendly Mining
- Methane Drainage Practices to Reduce Explosion Risk in Underground Coal Mines
- Application of Safety Management in Mines
- □ Application of Numerical Modelling
- Role of Ventilation Survey and Advanced Fire Control Techniques for Safety in Mines
- Ground Stability Evaluation and Stabilisation of Underground Excavations
- Mine Safety Legislations
- □ Safe Blasting Practices
- Safety in Explosive Handling and Charging in Field
- Rock Mass Failure and Slope Stability Criteria
- Instrumentation, Slope and Strata Monitoring Techniques
- Mine Closure Plan

PHOTO GALLERY OF MGMI HEADQUARTERS ACTIVITIES Training Programme on "Technologies for Safety Enhancement in Mines"

Jointly organised by MGMI, Kolkata and CSIR- CIMFR, Dhanbad 3 - 8 December 2018



Shri Rajiw Lochan, Hony Secretary, MGMI felicitating the Chief Guest Shri P S Bhattacharyya, Former Chairman, CIL with flower bouquet



Dignitaries on the dais during Inauguration of the Programme (L to R): Dr I Ahmed, HOS, HRD, CSIS-CIMFR, Shri Rajiw Lochan, Hony Secretary, MGMI, Shri J P Goenka, Vice President, MGMI, Shri P S Bhattacharyya, Former Chairman, CIL, Dr Amalendu Sinha, Former Director, CSIR-CIMFR, Shri Prasanta Roy, Immediate Past Hony Secretary



Chief Guest Shri P S Bhattacharyya, Former Chairman, CIL delivering the Inaugural Address



Dr Amalendu Sinha, Former Director, CSIR-CIMFR & Programme Coordinator addressing to the participants, speakers, guests and others.



View of the dignitaries, invitees speakers & participants





Industrial Visit to Nanda Millar Company





Industrial Visit to Mine Line Pvt Ltd



Visit to CSIR-CMERI



Journey to Dhanbad

CHAPTER ACTIVITIES

Singrauli Chapter

MGMI Singrauli Chapter organized a General Body meeting on December 13, 2018 where in the General Body constituted a Governing Body of the Singrauli Chapter with Shri P K Sinha, CMD, NCL as Chairman, Shri M K Prasad, GM, NCL, Honorary Secretary, Shri Suman Saurabh, CM (M), Hony Joint Secretary, Shri Manish Kumar, Senior Manager (M), NCL, Hony. Joint Secretary, Shri Bhartendu Kumar, CM(X), Hony Treasurer, Shri R B Sindhur, Senior Manager (M), Member, Shri A K Nath CM (C), Member, Shri A N Malviya, Senior Manager (M), Member and Shri Binod Kumar, Senior Manager (M), Member.

BOOK REVIEW

A Handbook on SURFACE MINING TECHNOLOGY

(Revised Third Enlarged Edition)

By Prof (Dr) Samir Kumar Das

Professor of the Department of Mining Engineering, IIT Kharagpur 721302 Price Rs1000.00

The present work (a handbook on Surface Mining Technology, written by Prof Dr Samir Kumar Das) is another valuable addition to the very small number of standard books written on this subject by the Indian authors. This book covers the modern approaches and thoughts on surface mining designs as well as on surface mining technology. The text is presented avoiding unnecessary reviews and details so that the readers get straightway to the core of the various issues dealt in the book.

In this edition, the contents provide sufficient elaborations, case studies to make them easy to understand. The chapters are arranged to make it a student's friendly text book. It will also serve the interested readers and mining personals as comprehensive reference for basic surface mining. Undergraduate, Postgraduate and Research studies of mining and allied subjects will be highly benefitted. Practicing engineers in the Mining and allied industries will find this book useful for their knowledge cum skill enhancement in delivering their duties. This book will help the mining personnel to prepare for the competitive professional examinations.

Available at: Mrs Rumi Das Sagar Deep Prakashan Hijli Co-operative Society Near Big (Durga Mandir) Ghagra Bridge Infront of 3 Bakul Trees Prem Bazar-721306, Kharagpur (W.B.) Mob. : +919064314840, +919775885953 Email.:mrsrumidas@gmail.com

New Members

(As approved in Council Meeting on 08.12. 2018)

AS LIFE MEMBER

10794-LM, Shri Samudra Mitra,

M Sc (Tech), Appl Geophysics, Director, Geos Mining Consultant

'KOJAGORI', Charupalli, Jamboni, P.O. Bolpur, Dist. Birbhum (WB)-731204,Ph: 9822922167/ 8918416474/ 03463-252292, E-mail: samudramitra@rediffmail.com

10795-LM, Shri Manoj Upadhyaya,

B E (Mech), PGDBM Chief Manager (MM),Coal India Limited,4A, D-Type, Rohini Housing Complex, P- 225, CIT Scheme, VII-M, Block – R, Ultadanga, Kolkata –700 054, Ph: 89024-97631 Mail: mupadhyaya.cil@coalindia.in

10796-LM, Shri Bikas Maity,

B Tech (Civil), M Tech (Struc), AMIE (Civil), Managing Director, Pioneer Surveyors & Pioneer Geometrics Engineering Pvt. Ltd., Pioneer Tower, Premises No. 20-85, AB-109, AA-1, Opp. Water Tank No. 2, Newtown Kolkata – 700156., Ph: 9038002783(O), Mobile: 831035977/9433002750, Mail: maity.bikas@gmail.com

10797-LM, Shri Arghya Majumder,

B Met E, M Met. E, Asstt General Manager, RINL-157-D, Sector – 1, Ukkunagaram,Visakhapatnam – 530032, A P, Ph: (0891) 2887120 — 9440977597 Mail: arghya@vizagsteel.com

10798-LM, Dr. Bijaya Kumar Rath,

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10799-LM, Shri R N Sachdev,

B Tech (Hons) Mining, Chief General Manager (Retd.),Central Coalfields Limited, C-10, Greater Kailash Enclave – II, New Delhi – 110048, Ph: 9958289076 /011-43013700, Mail: ravi_sachdev65@yahoo.com

10800-LM, Shri Ramakant Tiwari,

B Tech (Min),FCC (Coal), PGDBA (Mgt.),Promoter Director, C-1/1671, Vasant Kunj, New Delhi – 110070, Ph: 9575302731, Mail: ramakantsandhya@gmail.com

ACHIEVEMENT OF MEMBERS

Congratulations and Best wishes



Shri Arun Kumar Shukla Director (Operations), HCL

Shri Arun Kumar Shukla is a Graduate Mining Engineer of 1985 batch from Indian School of Mines, Dhanbad. He has done his M Tech. in Environmental Engg. and also obtained degree of Law (LLB). He possesses First Class Mines Managers' Certificate under the Mines Act, 1952. Presently, Shri Shukla is Director (Operations) in Hindustan Copper Ltd (A CPSU under Ministry of Mines, G O I).

Shri Shukla is having a vast experience of Indian Mining Industry. He has started his carrier from Central Coalfields Ltd. and worked there for more than 21 years, then joined NMDC Ltd. in October, 2006. On deputation from NMDC, he served as Managing Director of Jharkhand State Mineral Development Corporation Ltd. (A State PSU) for about 2 years. He was also holding the charge of CEO of the two newly formed Joint Venture Companies of NMDC viz. NMDC-CMDC Ltd. and JNMDC Ltd to start new mines in the state of Chhattisgarh and Jharkhand respectively. Prior to join Hindustan Copper Ltd., Shri Shukla was working as Executive Director in NMDC Ltd and was heading one of its major units namely Bailadila Iron Ore Mines, Bacheli Complex in Bastar, Chattisgarh. Shri Shukla is also in the Board of Chhattisgarh Copper Company Ltd., a newly formed joint venture company of HCL & CMDC Ltd.

Shri Shukla is an active member of various professional bodies such as Institution of Engineers (India), MGMI, MEAI, ISTD. He has visited various countries like Australia, Europe, USA, Canada, North America and Africa as a member of technical delegations of the Government of India.

ACHIEVEMENT OF MEMBERS

Congratulations and Best wishes



Shri Narendra Kumar Tripathi Director (Technical), P&P of BCCL

MGMI is also proud of its member **Narendra Kumar Tripathi** who has joined as the Director (Technical), P&P of BCCL, a wholly owned subsidiary of Coal India Ltd. He is a mining engineering graduate from IIT (ISM), Dhanbad (1984).

He possesses vast and varied experiences in different subsidiary companies of CIL. Besides successfully working at different mining areas at senior positions, he worked as General Manager of Dankuni Coal Complex also the only coal carbonisation plant of this country.

Shri Tripathi holds a PG Diploma in Personnel & Industrial Relations also. He has further

completed Advanced Management courses at Frankfurt School of Finance & Management, Germany: University of St Galen, Switzerland and ESSEC Business School, France.

Shri Tripathi is credited with unparalleled performance giving all time high physical and financial performances, while working as General Manager at Dankuni Coal Complex of SECL, at Kajora Area and at Sonepur Bazari Area of ECL.

Shri Tripathi has worked at different senior levels in underground as well as open cast mines of MCL and SECL also.

NEWS ABOUT MEMBERS

Shri Rakesh Prasaed (9621-LM) MMGI

is now at Plot No 19, Swami Swaroopnand Co-op Hsg., Society, Narendra Nagar, Nagpur, Maharastra 440015, Email: rakeshprasade72@yahoo.com (M) 7741871594

Shri V K Gupta (9539-LM)MMGI

is now GM(Min), WCL, 302, Shivrani Heights, Gokul Housing Society, Gorewada Road, Nagpur, Maharastra 440 013 Email vkgmarch1963@gmail.com (M) 9423077723

Shri Amitabh Singh (9528-LM) MMGI

is now RTd. Chief Manager(Min), WCL, 202, A Wing, Hitesh Tower, Nara Ring Road, Nr. Sai Temple, Jaripatka, Nagpur 440 014 (M) 9112247311

Shri E Karthikeyan (10023-LM) MMGI is now at BDF 4W MIG Flats, St No 159, Newtown Kolkata 700 156 (M) 9433007153, 7077218158 Email: kartik@presidency.com

Shri Ashok Kumar Panda (8195-LM) MMGI

is now Dy Manager(Mining) Ananta OCP, Jagannath Area, MCL, at Ananta Vihar Colony, PO Dera Colliery (Talcher), Dist. Angul (Odisha) 759103 Email : ashokkrpanda1969@gmail.com (M) 9430786740 Shri Sunil Kumar Roy 8521-LM) MMGI is now at Flat No 102, A Block, Oriental Garden Residency, Kusumvihar Phase 2, PO Koyla Bhawan, Dhanbad 826 005, Jharkhand Email: skroy1965@gmail.com

Shri G Vageesan (6306-LM) MMGI is now at 16, Sterling Avenue, Sakthi Nagar, Porup 600 116

Shri Prabir Kumar Bagchi (9853-LM)MMGI is now Sr Manager (Systems) T6/F8/E4, Eastern High, Newtown, Kolkata 700 156 Email bagchi.pk@gmail.com

Shri Viswanathan Sulur (6315) MMGI is now at 1606/A, 1st Floor, 28th MN BSK 2nd Stage, Bangalore 560070 Email: sulurvis@gmial.com

Shri Bhartendu Kumar (8415-LM) MMGI is now at D 34, Nigahi, PO Nigahi, Dist Singrauli, MP 486 889 Email bhartendu100@gmail.com

NEWS UPDATE

News from India and Abroad

Coal Mine Accidents in Meghalaya

Illegal rat-hole mining is continuing in Meghalaya because of economic and vested interests of a range of persons involved and market demands. These mines are not under the jurisdiction of DGMS and go on practicing unsafe hazardous operations deploying even child and illegal migrant labors.





Rat hole mines of Meghalaya

On December 13, 2018 such a rat hole mine got inundated as it got connected to another water filled rat hole mine and it is feared that number of people have lost their lives. The real number is not known as such mines do not keep proper records. Reuter reported on 14 December that thirteen miners were trapped. On a humanitarian move, NECL of CIL sent their rescue teams to help the rescue operations. However, the lone survivor Sayeb Ali said to NDTV reporter that 17 persons have lost their lives.

Such illegal mining allures poor unemployed youth and exploit them and it is continuing for a long time as there is apathy and lack of Governance to curb such activities.

Reuter reports that it was caused by a flash flood from a nearby river on Thursday raced through the mine, which is located near a dense forest, however, no technical investigation report is available.



Accommodation of miners, the 'Bihari Line' in Ladrymbai.(Chinai, 2006)



Auctioning of 105 mineral blocks to private miners in current FY

Considering the parliamentary election, AJOY K DAS, correspondent of Creamer Media in the Mining Weekly expresses doubt that the Ministry of Mines , Govt of India has informed the parliament that there could be auction of 105 mineral blocks before the end of the current financial year. According to the Mines Ministry, various state governments have completed the auction of 18 mineral blocks over the past nine months, which includes 7 iron ore blocks in Karnataka and five in MP.

GSI is expected to submit geological reports of 18 mineral blocks by February 2019 to the respective state governments to enable them to put these up for bidding by private miners.

India has only 82 exploration agencies, compared to Australia which has about 300 exploration firms. Thus it is a challenge to properly monetize the natural assets.

It is also a concern that only 62% of the corpus fund of about Rs 10.48-billion (as on July 2018) of the <u>National Mineral Exploration Trust</u> (NMET) has been utilized in <u>exploration</u> <u>projects</u>. This trust had been created by making it mandatory for every mineral leaseholder to contribute amount equaling to 2% of royalty payable for each mineral produced by the leaseholder.

Though there is money, getting the tasks completed in this financial year is doubtful as there is general election next year.

India likely to allow power plants to swap imported and domestic coal

Ministry of Coal, Government of India is further rationalizing the coal supply linkage to thermal power plants by allowing swapping of imported coal. An inter-ministerial task force is working on developing the model. At present, there are some thermal some power plants located away from the coastal area are based on imported coal and incur additional transportation costs. Similarly there are thermal power plants along, or near, the coast linked with domestic coal supply. It is expected that developing a proper economic model for swapping of fuel supply between such plants would reduce the fuel costs for both the consuming plants

Ministry is attempting to laydown guidelines for such linkage arrangements to avoid risks of disputes between thermal power plants that might arise from quality, grade and delivery issues.

GLOBAL MINING NEWS

Coal mining trend

International Energy Agency (IEA) has reported that demands for coal in China and India has again in the increasing trend despite the pressures from environmentalists. The study report of this Paris-based agency claims that coal consumption will rise by an average of 0.2% a year from 5,355 million tonnes of coal equivalent (Mtce) in 2017 to 5,418 Mtce in 2023. This is because falling demand in Western Europe and North America, which is likely to be offset by increased demand in a host of Asian countries, including China, India, Indonesia and Vietnam.







Source: IEA — Coal 2018 Report.

http://www.mining.com/coal-demand-seensteady-through-2023-thanks-to-india-chinaiea/

However, the long term demand is uncertain as the local oppositions and policies aimed at combating climate change will assist in growth of disruptive technology and alternative energy sources.

Adani's Australian mine plans face further delay

Adani Mining's Australian venture at Carmichael coal mine has not yet kicked off as environmental clearance is yet to be obtained.

The Carmichael coal mine is a proposed thermal coal mine in the north of the Galilee Basin in Central Queensland, Australia. Mining is planned to be conducted by both open-cast and underground methods. The mine is proposed by Adani Mining, a wholly owned subsidiary of Adani Group.

Queensland's environmental groups are opposing this venture pointing out the past records of Adani as well as questioning the need of Australia to have such mines. The approvals are pending for waiting on scientific reviews of Adani's plans to protect the endangered black-throated finch and to manage groundwater levels at the nearby Doongmabulla Springs.

Copper supply crunch earlier than predicted

The following information excerpt is prepared by **Prof (Dr) Subir Kumar Mukhopahhyay** from the reports, published in public domain in e-version of Copper News Digest of **Mining Weekly** (April 10, 2018) and Mining.com (13 **December 2018),** with due acknowledgement to the reporter/ author Cecilia Jamasmie, for the purpose of dissemination of information and knowledge. He emphasizes on the massive exploration programs in order to replenish world's fast depleting copper resource base

April, 10, 2018

Global copper scenario

Copper demand will surpass supply earlier than expected, opine experts attending the 17th World's Copper Conference, at Santiago, Chile. According to Arnaud Soirat, chief executive for copper and diamonds at Rio Tinto, increased consumption from new technologies, including electric vehicles, will drive demand for the metal and its by-products. He said, "We anticipate global market supply and demand will keep close to balance in 2019 and 2020"..... "after that the deficit will become increasingly evident".

The above observation is widely shared by other experts, including CRU analyst Hamish Sampson. According to him, unless new investments arise, existing mine production will drop from 20 million tonnes to below 12 million tonnes by 2034, leading to a supply shortfall of more than 15 million tonnes. The situation looks even worse when considering that over 200 copper mines currently in operations will reach the end of their productive life before 2035. Only if every single copper project currently in development or being studied for feasibility is brought online before then, including most discoveries that have not yet reached the evaluation stage, the market could meet projected demand.

Colin Hamilton, MD of commodities research at BMO Capital Markets, fully agrees with Sampson. Delivery to exchanges, however, does weigh on prices because of data-driven investors, which adds to the fact that shareholders are still somewhat opposed to companies investing in new projects and exploration. "They just want returns," Hamilton said.

He believes the expected copper supply crunch will become "much more real", due to the lack of mega-projects coming on stream before the mid-2020s and as global production will peak by the second half of the next year.

BHP unveils world-class copper found near Olympic Dam in South Australia

13 December 2018

BHP, (ASX, LON, NYSE: BHP) the world's number one mine operator, made a rare public disclosure, which is already being called by some experts "the thickest high-grade copper intersection seen in years." The announcement is based on drilling results from a very earlystage exploration program in South Australia. The mining giant declared that it has identified an iron oxide, copper, gold (IOCG) mineralized system located 65 km southeast of Australia's largest reserve of copper and uranium ore, its Olympic Dam operations.

As part of the company's ongoing copper exploration program, four diamond drill holes, totaling 5,346 m, intersected graded 3.04% copper, 0.59 grams per tonne gold, 346 parts per million uranium and 6.03g/t silver. Within the 425.7 metre-intersection BHP detected a higher-grade 180m interval comprising 6.07% copper, 0.92g/t gold and 401ppm and 12.77g/t silver. Other significant results were 406m at 0.66% copper, 0.35g/t gold, 266ppm uranium and 2.09g/t silver, and 124.5m at 0.52% copper, 0.48g/t gold, 85ppm uranium and 3.37g/t silver.





Graph courtesy of Hamish Sampson, Analyst at CRU's Copper Team

Unlike most miners, which slashed exploration budgets during the downturn that ended in 2016, BHP kept its copper exploration budget steady at an average of \$60 million annually over the last four-to-five years, out of its overall budget for exploration of around \$1 billion. The idea behind the push for copper exploration and expansions is to be ready to meet electric vehicles sector's rising demand for the metal, which is forecast to be undersupplied by 2019. Copper is a key component of the motors used in electric vehicles, in the power inverters and in the charging infrastructure needed to keep the vehicles running.

Colin Hamilton, managing director of commodities research at BMO Capital Markets told MINING.com earlier this year that the supply deficit will be partly caused by deteriorating ore grades in major producing countries, lack of new significant discoveries, low investment in exploration, the lack of mega-projects coming on stream before the mid-2020s, and by global production peaking in the second half of next year.

Stepping up the search to find new copper deposits

BHP, the world's second-biggest listed copper mining comany, has taken steps towards increasing its footprints in the market. Last year. the company said it would spend \$2.5 billion to extend the life of its Spence mine in northern Chile by more than 50 years. BHP Billiton's Spence copper cathode project is located 1,700m above sea level in the Atacama Desert in northern Chile, close to the mining town of Sierra Gorda, 50km south west of Calama and 150km north east of Antofagasta. That announcement followed the mining giant's decision last year to raise its annual exploration spending by 29%, allocating nearly all of its \$900 million budget to finding new copper deposits to add to a portfolio that includes Escondida in Chile, the world's biggest copper mine, and the Olympic Dam.

In October, BHP nearly doubled its stake in SolGold (LON, TSX: SOLG), which is developing the Cascabel copper-gold project in Ecuador, 180 km north of the capital Quito, the capital city of Ecuador, and at an elevation of 2,850 metres above sea level, it is the secondhighest official capital city in the world.

BHP has also targeted tier-one copper deposits in Canada, Peru and the south west of the United States. "Copper and oil are the main focus of BHP's exploration programs in order to replenish our resource base and enhance our portfolio," the company said in a statement. The miner said it planned its next drilling program in the Olympic Dam area early next year to unlock the massive discovery just unveiled.

German Company Makes Joint Venture in Bolivia for Lithium

On 12 December 2018, the Bolivian stateowned company Yacimientos de Litio Bolivianos (YLB) and the German company ACI Systems Alemania GmbH (ACISA) founded the joint venture YLB-ACISA. The aim of the joint venture is the sustainable extraction and industrialization of lithium, as well as other raw materials from Salar de Uyuni, the world's largest salt lake. The deposits at Salar de Uyuni are estimated at 10 million tons of high-quality lithium. The start of production is scheduled for the second half of 2021. Initial investments amount to approx. EUR 300 million.

After more than three years of intensive preparation, the launching of the joint venture YLB-ACISA on 12 December 2018 in Berlin lavs the foundation stone for implementing a long-term Bolivian-German energy and mobility initiative. As part of this joint venture, lithium hydroxide is to be extracted from so-called residual brine. The residual brine comes from existing evaporation basins, which were constructed for the production of potassium chloride and lithium carbonate. With previous technologies, the residual brine could not be used for anything else and therefore had to be discarded. Thanks to ACISA's innovative process, it can now be utilized to produce lithium hydroxide profitably with a high lithium yield that is suitable for use in batteries. In the coming years, there is a plan to establish a further joint venture to manufacture cathode material and battery systems in Bolivia and Germany.

Riotinto's innovative mining Autonomous haulage systems (AHS):

We are the world's largest owner and operator of autonomous haulage system trucks. We have more than 80 autonomous trucks in operation at our Pilbara sites, with plans in place to increase this to more than 140 by the end of 2019, each moving high arade ore. Implementing autonomous haulage means more material can be moved efficiently and safely, creating a direct increase in productivity. Autonomous haul trucks are operated by a supervisory system and a central controller. rather than a driver. They use pre-defined GPS courses to automatically navigate haul roads and intersections and to know actual locations, speeds and directions of other vehicles at all times.

Automated drilling system (ADS): The first successful test proving the feasibility of an Autonomous Drilling System was conducted at the West Angeles mine in 2008. In 2018, the 11 ADS-enabled drills have now drilled more than 5,000 kilometres – that's further than the distance from Perth to Queenstown, New Zealand. The automated blast-hole drill system enables an operator using a single console at a location remote from the machinery to operate multiple drill rigs from multiple manufacturers.

AutoHaul®: AutoHaul® is focused on automating the trains that are essential to transporting the iron ore to our port facilities. Trains started running in autonomous mode in the first quarter of 2017, and already, more than 60 per cent of all train kilometres are now completed in autonomous mode with a driver on board for supervision. Once fully operational, AutoHaul® will unlock significant safety and productivity benefits as a result of reduced variability and increased speed across the network, helping to reduce average cycle times.

This project is the worlds' first automated, long distance, heavy haul rail network and is a key component of the <u>Rio Tinto Iron</u> <u>Ore Rail Capacity Enhancement Project</u> (<u>RCE</u>).

The delivery of AutoHaul® will enable an increase in shipped iron ore tonnages to 360 million tonnes per annum (Mtpa) through reducing iron ore delivery cycle times as well as improving the safety and efficiency of rail operations on the mailine. This is achieved through an optimised driving stategy, which is computed by a powerful on-board, predictive, and dynamic train simulation.

Over three million kilometres have already been travelled in 2017 and 2018 by autonomous attended trains which are driven by the AutoHaul system and supervised by drivers on-board the trains, partially realising the safety and efficiency benefits of the AutoHaul® system. Calibre has worked as the Engineer and Design Authority since the beginning of the project and has commissioned a comprehensive wayside communications network and implemented lean engineering principles to accelerate fit-out of <u>Rio Tinto's Dash 9</u> <u>and EVO locomotive fleets</u> to support the AutoHaul® system.

The AutoHaul® project performed a world-

first fully autonomous heavy haul journey in September 2017, successfully travelling 100km from Wombat Junction to Paraburdoo. The project is currently focused on increasing system reliability and engineering the system to fully support the new generation of AC locomotives and minimise in-train forces. Rio Tinto has now achieved accreditation to operate fully autonomous AutoHaul® trains from the Office of the National Rail Safety Regulator and will be undertaking a phased ramp-up of autonomous train operation across Rio Tinto's Pilbara network to attain full safety and cycle time reduction benefits in 2018.

To date, deliverables for the AutoHaul® project have included:

- Integrated locomotive on-board systems including an enhanced Automatic Train Protection system and a collision detection system
- Communication system upgrades to the Rio Tinto Data Network (RTDN)
- Additional signalling on mainline rail and at load out loop and rail yard handover points
- Enhanced wayside asset protection systems
- Additional level crossing protection including obstruction detection systems to enhance public safety, and Modified work stations at the Operations Centre.

Komatsu Claims zero system-related incidents or injuries.

Komatsu boasts of having more than 130 autonomous mining trucks in operation on three continents and they are closing in on 2 billion tons of material hauled in the last 10 years—with zero system-related incidents



or injuries. These trucks are serving in mines to produce oil sands, copper, iron, and coal

The company has equipped its 830E, 930E, and 980E mining haul trucks to operate autonomously, completing cycle after cycle without operators in the cab. They arere at work in the oil sands of Canada, with Codelco in Chile, and in **mines in Australia**. Typically, one or two operators work in a control center to monitor the vehicles as they are loaded and run haul-and-dump cycles at **mines and quarries**. An occupied pickup truck is also roaming the area monitoring the action, and all light vehicles at a work site are equipped with monitors that show the haul vehicles' locations.

Right now, WiFi and satellites are used for communication and positioning, but the company says it will be going to LTE soon for stronger, more consistent signals.

In a recent demo at Komatsu's Arizona Proving Grounds in Sahuarita, Arizona, observed four haul trucks simulating being loaded by a PC7000 mining shovel, and completing a run over haul roads to a dumping area. Two trucks can approach a shovel at one time, one on each side.

Blast kills 13 people in deadliest Czech mine tragedy since '90

A news from Prague says a methane explosion took place in a mine near the town of Karvina, Czech Republic on December 21, 2018. The explosion report says that a methane blast occurred at more than 800 metres (875 yards) depth of the CSM hard coal mine near the town of Karvina located at the Polish border. The explosion killed 13 people. The accident is the worst mining disaster in the Czech Republic since 1990, when 30 miners died in a fire at a mine near Karvina in the same region. It is reported that the mine had monitoring system. However, the network of methane sensors deployed in the mine had not detected anything unusual prior to the blast.

SWELL/ BULKING FACTOR OF BLASTED ROCK : A CRITICAL TECHNICAL FINDINGS

Compiled by : Prof. (Dr.) Subir Kumar Mukhopadhyay*, MMGI

ABSTRACT

Swell / bulking of rocks in terms of percentage swell and swell / bulking factor often pose confusions while calculating the percentage and or the factor. The author studied various technical reports on the subject and has critically reviewed the same, the findings of which are presented here briefly. Rocks in-situ/ in-place/ in bank, when blasted, form swelledblasted muck piles, consisting of boulders, rubbles, cobbles, pebbles and further smaller rock pieces and fragments. The information collected/ reviewed here, includes data consisting mainly from hard rock blasting in open pit (surface) and underground mines and clears confusion in terminology and calculation, if any.

DEFINITION OF SWELL/ BULKING FACTOR

The swell or bulking factor is a parameter that is used to describe "the increase in volume that may occur when a rock mass volume in-situ/ inplace/ in-bank is blasted and which breaks up in to fragments of rock pieces.

Goktepe and Lav (2004) expressed that the swell factor has the same definition as bulking factor. Rock swells after blasting.

The swell factor/ bulking factor, B for rock may be defined using the following equation: $B = [(V_B/V) - 1]$ (i) Where, $V_{\rm B}$ is the volume of broken rock formed from breakage of a rock block of volume V (Bechtel SAIC Company, LLC, 2004). Pappas and Mark (1993) stated that swell/ bulking factor is change in volume of broken rock relative to the original *in-situ* volume of rock. Figure 1 schematically shows the air spaces in a blasted muck pile.



Figure 1. Schematic diagram showing empty spaces and rock fragments after rock blasting Swell/ bulking factor also may be specified as a parameter in rock blasting in a particular type of rock.

Pappas and Mark (1993) had expressed swell/ bulking factor in terms of \mathbf{B}_1 as in Eq. (2)

(i.e., ratio of Broken volume to the *in-situ* rock volume).

 B_1 related to B through the following equation (e.g., Ofoegbu, et al., 2007; CNWRA, 2007)

$$B_1 = (1 + B)$$

Substituting B, from equation (i)

* **Council Member, MGMI,** Former: Professor and Visiting Professor, Dept. of Mining Engg., IIT Kharagpur Equation (ii), also represent the swell/bulking of excavated rock, wherein, V is the in-situ/ inplace/ in-bank volume of the rock and V_B is the volume of the blasted or caved rock after excavation. V_B is usually greater than V.

Swell/ bulking factor is used in mining engineering to estimate the volume of materials generated from excavation after blasting or collapse of rock surrounding the mine openings/ stoping/ caving. The swell or the swell/ bulking factor depends on *rock type*, *particle size and shape distributions, and other characteristics of broken rock*. The *ambient and/ or induced environment also may affect swell/bulking factor* values.

Swell is expressed as a percentage of natural volume, for example, if 100 m^3 rock in-situ/ inplace become 180 m^3 after blasting, the swell percentage is 80% (Figure 2)

[Rock Bank Cubic-metre (BCM): Material in its natural state before blasting (in-place/in-situ)

Rock Loose Cubic-metre (LCM): Material has been loosened by blasting or disturbed by excavation.]

[Material after Compaction, Compacted

Cubic-metre (CCM) has not been discussed here



Figure 2. Figurative representation of three states of rock

LITERATURE REVIEW

The literature review considered are published information on swell/ bulking factor, in a number of different contexts, in surface and underground excavation-operations in hard rock mining,

Percentage swell from the natural bed (or *in-situ* state) to the loose condition is calculated as **Swell (%) = 100 [(** $_{in-situ}/_{loose}$ **-1]**

Where,

in-situ is unit weight in the in-situ condition. loose is unit weight in the loose condition.

It can be **noted** that the **materials** having 'bulk in-situ densities' between 2.41 and 2.95 have swell/bulking factor varying between 60 and 72%. Church (1981) assigned a default value of 67 % to solidly for the un-weathered rocks, if no swell factor data is available.

In considering haulage of material, swell/ bulking factors varies considerably between materials excavated with and without blasting.

For well-blasted rock with good fragmentation, swell is 49 %, and for poorly blasted rock, swell is 67 %. These values reflect transfer of material from a stockpile using a front-end loader/ shovel into a haultruck.

Even in the absence of subsequent compaction, these high swell factors often are reduced due to the *loading effects* of haulers, tractor-bulldozers, water wagons, and other heavy machinery moving over it.

SWELL/ BULKING FACTOR IN SURFACE EXCAVATION

Swell/ Bulking Factor in Hard Rock Mining

For **hard rock broken** by a **crusher**, the swell/ **bulking factor is on the order of 35 %** if all sizes are mixed and the rock is shaken slightly.

Hard rock blasted in large pieces and loaded into cars typically has a swell/ bulking factor between 66% and 84 % as shown in Table A below:

Table below is based on Church (1981), but values for weight have been converted to bulk density.

Table Typ	oical Bulking Factor	rs for Mined Rock	
Back True	Bulk Densit	Bulking Factor	
Rock Type	In-place	Broken	(Percentage)
Dolomite	2.16	1.30	66
Gneiss	2.27	1.30	75
Granite & Porphyry	2.30	1.31	76
Greenstone & trap	2.52	1.39	81
Limestone	2.27	1.30	75
Quartz	2.23	1.27	76
Sandstone	2.08	1.16	79
Slate	2.36	1.28	84

Table A. Typical Swell/ Bulking Factor^{*} values for Mined Rock

^{*} These values represent clean broken rock without fines and are similar to those given in above.

After blasting the swelling/ bulking of rock depending on the

- (i) type of material,
- (ii) excavation method, quality of blast etc.,
- (iii) range of particle sizes it is broken into,
- (iv) rock strength, and
- (v) thickness-to-width shape ratio,

Typically, strong rocks break into more uniform blocky pieces than do weak rocks and soils, and broken material derived from strong rocks therefore, has a larger proportion of voids space and hence a higher swell/bulking factor. Swell/ Bulking factors for rock are typically in the range of 33 % –50%.

Swell (%) = [{(weight/ bank volume) /(weight/loose volume)}-1] x100

CONCLUSION

The critical literature review identified several factors that affect the swell or the bulking behavior of rock, including the following.

Rock type or lithology *In-situ* porosity Particle size distribution Particle shape (shape of rock fragments) Rock strength Rock–mass structure The fall height Vertical stress Vibratory compaction Transportation Stockpiling, etc.

Although literature information suggests general relationships among swell/ bulking factor and several of the factors listed in items of conclusions, the combined effects on swell/ bulking factor are in general not sufficiently well understood to be described by analytical expressions that could be used to calculate swell/bulking factor.

The study can be concluded with the noting that the **materials** having 'bulk in-situ densities' varying between 2.41 and 2.95 have swell/ bulking factor varying between 60 and 72%. <u>Church (1981) assigned a default value of 67</u> % to solidly for the, un-weathered rocks, if no swell factor data is available.

LIMITATION OF STUDY

This collected literature says that, while determining swell / bulking factors, the field data is not very useful, as the relationships between swell/ bulking factor and the size and shape distributions of broken rock are not well understood, because of existence of anisotropy in the in-situ rock mass, its geological and physico-mechanical properties and variation in blasting procedure and shape and sizes of the broken rock.

REFERENCES

All data contained in this report are collected from the Geosciences and Engineering Division Quality Assurance Manual which meets the quality assurance requirements described-in and documented-in CNWRA (Center for Nuclear Waste Regulatory Analyses) San Antonio, Texas, USA, in their Scientific Notebooks.

All annotated references are available in "Total-system Performance Assessment (TPA) Version 5.1a." San Antonio, Texas: CNWRA. September 2007.

HEALTH TITBITS

Every time the weather changes, a new bout of illnesses besiege us. Change of season is usually accompanied with an outbreak of viral diseases. Each season—summer, monsoons and winter—brings a host of viruses floating down upon an unsuspecting population. Seasonal change has been found to lower immunity of a majority of the population, allowing viral infections to spread. The ones that suffer the most are those of us who already have lowered immunity due to repeated attacks. We bring to you a few tips on staying away from the inconvenience of seasonal illnesses.

About viral illness

A viral infection can be defined as an infection that is caused by a virus, a type of microorganism. Viral infections are the primary cause of many illnesses such as common cold, influenza, pneumonia, chickenpox, fever, and many other conditions ranging from mild to severe. Unlike a bacterial infection, viral infections cannot be treated by prescription drugs. Viruses must simply run their course until they are driven out of the body by the person's immune system. Viral infections are contagious and spread from one person to another through:

□ air-borne droplets

□ contaminated food and drinking water

- □ indirect transmission by a virus host, such as a mosquito, tick, or a pet.
- □ physical contact, such as a handshake with an already infected person or pets and animals
- □ touching contaminated surfaces or body fluids (e.g. open wounds)

Technical Article

Women in Mining By Prof. B. S. S. Sastry*

Today globally the mining industry not only is more accepting of women, but, in the face of mounting research showing that companies with more gender diversity enjoy greater profitability, improved safety records and higher social and environmental responsibility ratings, is also actively courting them.

Incorporating and encouraging women in the workforce- largely in the field of STEM - has been an actively pursued effort by several large industries as well as by different legislature measures in different countries. The driving forces for such measures are related to at least three considerations:

Governmental regulatory policies:

Legislation that actively mandate certain minimum percentage of women participation in workforce. For example the Department of Mines in South Africa mandates that all mining companies must have at least 10% of the workforce are women in their operations.

Better business sense: These has been growing evidence that integrating women into workforce leads to an increase in productivity, efficiency, profitability and reliability. Equipment safety studies showed that women have better safety record and not only that they cause less wear and tear on the equipment.

Societal Issues: Employing women can lead to

communities becoming more prosperous; help break cycles of poverty by contributing more towards household welfare and increasing the level of skills in the community.

The process of induction/increasing of women has different stages. These are, putting in place the policies that are specific on account of women in minings such as non-discriminatory recruitment policy, management of maternity issues, handling of sexual harrassment issues, Preparation of physical environment, such as change houses, underground toilets, different overalls, transportation arrangements, work place risk assessment has to be evaluated keeping the nees of women in mind, such as those in child bearing age group, and sensitization traning of the staff towards working with women, viewing them as fellow workers, and believing that women can indeed also do physically demanding jobs.

Priscilla Nelson became the first woman to head the university's Department of Mining Engineering, Colorado School of Mines, describes mining as an edgy, interesting and challenging industry with a lot of benefits. She hopes to encourage more women in the industry to become mentors. She also aims to improve the graduate school experience for women and interest more U.S. students overall in pursuing degrees in mining engineering and related

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fields. At CSM 17 percent of mining engineering degrees in 2013 were awarded to women compared with 6 percent in 1998.

Kristin Guerin '11, a mining engineering graduate is a member of Caterpillar's autonomous haulage solutions team at the remote Solomon mine in the Australian outback, she works 12-hour shifts, one week on day shift, one week off, one week on night shift, one week off, staying in dormitory-style lodging on-site and flying back to Perth during her time off. As one of three women on the Caterpillar crew, she's charged with monitoring the company's massive new automated trucks.

Michelle Ash an engineer for 20 years with the Acacia Mining Plc Australia, is the chief operating officer recalled as a young blasting engineer being hooked from the first time one of her blast designs exploded in the mine and the productivity it created.

Close to home, Dr Chandrani Prasad Verma, the first female graduate in mining engineering who is a senior scientist at CMIFR is also a person who made it to the top 100 global inspirational women in mining.

Already, several companies, including Anglo American and BHP Billiton, have reportedly set targets for boosting the percentage of women on boards. And organizations like SME host programs such as the Women of SME Breakfast and the two-day Emerging Leaders Alliance to cultivate networking and mentoring opportunities. Roughly 10 percent of SME's membership is women, but among the 30-andunder set, that number is now closer to 20 percent, a sign that efforts to attract mProre women to the industry may be working.

And according to the PWC report, 'There is a striking correlation between return on assets and the number of women on boards,' pointing out that over a six-year period, companies with all-male boards averaged a loss of 2.86 percent while boards with two or more women posted gains of 6.40 percent.

Meanwhile, research by McKinsey & Company suggests that women tend to have a knack for teambuilding: "They are particularly good at defining responsibilities clearly, and mentoring and coaching employees."

Studies also suggest that women help improve a company's environmental and social stewardship. Women make up 16% of workforce in mining industry in Australia. The number of women working in the US mines is at similar level.

A report of McKinsey & Co suggests that as leaders women are seen to frequently demonstrate three of four behaviours that are most effective in addressing the global challenges of the future. These include intellectual stimulation, inspiration, participative-decision making, and clarity of expectations and rewards. Productivity and innovation in in mineral and mining industry can therefore be enhanced by increasing the number of women and creating work environment that will be conducive to them and thereby their contributions could be leveraged.

The link between gender inclusion and safety orientation is documented through insightful case studies and applied research in some dangerous, male dominated work settings such as offshore oil drilling platforms, coal mining and others. In such environments workers (often men) try to appear infallible to impress the co-workers and bosses. These efforts to appear invulnerable block the kinds of behaviours and discussions that encourage safety and productivity. A better gender balance reduces these tendencies.

All the CFTI in India are mandated to increase the number of women graduating from these institutes. The number of female students admitted into these institute stood at 15% (with super- numerary seats created to make up the shortfall through JEE) in the year 2018, and soon the number will be elevated to 20% even including the Mining Engineering departments. In a matter of three years these female students will be knocking on the doors of the mining companies for opportunities to work and to contribute to the safety, profitability and productivity of the industries.

It is high time that rapid policy decisions are taken in the mining and mineral sector in India so as to to not to lag behind any further, and paving way for realising the due share of the women in taking the Industry forward.

Resources:

https://www2.deloitte.com/content/.../100global-inspirational-women-in-miningl.pdf https://www.womeninmining.org.uk/ http://www.scielo.org.za/scielo.php?script=sci _arttext&pid=S2225-62532015000800004 wimcanada.org https://womeninmining.com https://womeninmining.com https://wimsa.org.za/ https://wimsa.org.za/ http://minesmagazine.com/8749/

OBITUARY

CM Deosthale

Chandrasekhar M Deosthale was born on December 30, 1924. He obtained BSc AISM from the then ISM Dhanbad and obtained FCC Certificate. He worked in various responsible positions in Keltech Engineers Ltd. He became Life Member of MGMI(LM 2808) in 1976-77.

NC Mitra

NC Mitra obtained BSc AISM (Min) from the then ISM, Dhanbad and FCC Certificate holder. He was working in NSG Corporation in a very high responsible position. He became Life Member of MGMI (LM- 2002) in 1967-68.

CP Bansal

Chandan Prakash Bansal was born on August 12, 1937. He did BSc (Min) from the then ISM, Dhanbad. He became Life Member of MGMI (LM 6471) in 1993-94. He is also a Fellow of IEI. He has specialisation in Coal Mining. He retired from CIL as an Executive Director

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