

Annual Issue

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**"The Indian Aluminium Industry has Witnessed Substantial Growth".**

Satish Pai, President,  
Indian Institute of Metals



**"ASM can become the voice of the materials science professionals."**

Pradeep Goyal,  
President, ASM International



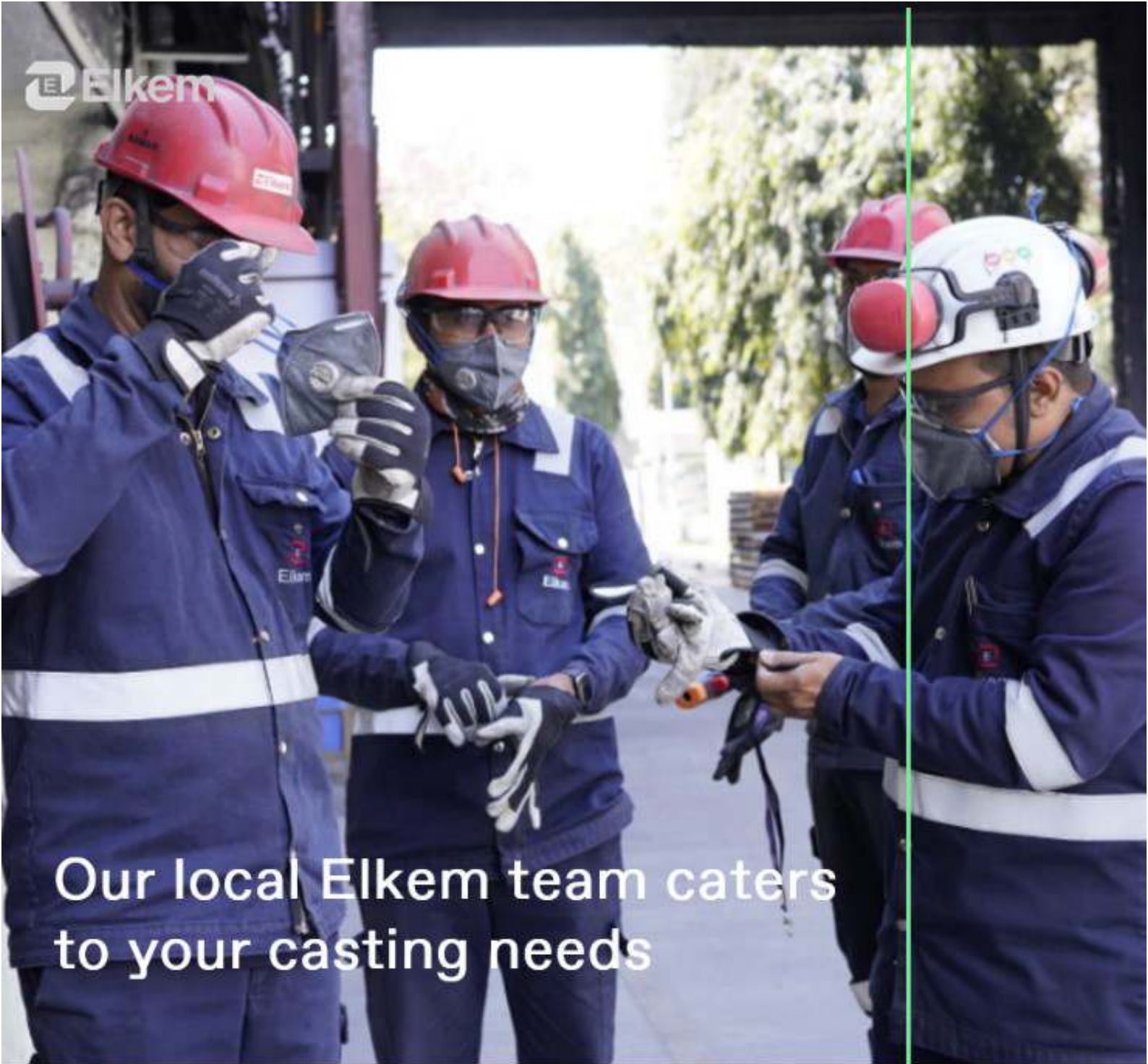
**"Middle East: Rising Hub in Global Metal Recycling"**

Mir Mujtaba,  
President: Bureau of Middle East  
Recycling (BMR)



**"Foundries are Adopting New Technology"**

Sandeep Kulkarni,  
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## D. A. Chandekar Editor

Dear Readers,

Very happy to share this annual issue of 'Metalworld'. It has been a long tradition to compile an annual issue to take stock of the previous year. In this issue we have few industry veterans expressing their views, analysis by the experts and also the vital industry statistics. I hope you will enjoy reading and also I am benefit from the contents.

The economic growth of any region has a strong co-relation with the geopolitics and so the minerals and metals sector is also dependent on the international geopolitical situation.

Today, the uncertainty in the world is increasing. We thought the Ukraine – Russia war will get over in few weeks but even after more than a year, it is still continuing. This has not only affected international trade of Russia and Ukraine but has also damaged few shipping routes. The clash between Hamas and Israel started in early October. Everybody thought it is a question of just few days for Israel and also the problem is small and localized. Now more than four months have passed and the problem is far from over. More and more groups and countries are getting involved in this issue, directly or indirectly, and now it seems that the whole middle east region is affected by this issue. We all know that conventionally the MENA region is a big importer of metals from Turkey, China, CIS etc. But now the future of this trade remains hung due to war like situation in the region. Also going down of China's GDP growth rate has affected its international trade.

## Editorial Desk



All the above factors have contributed to induce fluidity in the global geopolitical situation and has naturally affected the industry and mainly the international trade. This is where one can understand the rising importance of India. To understand the situation in India better, we have to take into consideration two important points. Firstly, India is a consumption driven economy (unlike China, which is a investment driven economy) and secondly, it has a small international trade component. Though in normal situations this would have been considered as a negative point, in stressful situations like today, this becomes a positive point. Also our huge population, may be a negative point otherwise, but it certainly pushes the consumption up. Most countries in the world are fearing a recession due to the disturbances mentioned above but the sentiment in India is totally different. We are expecting a robust economic growth in coming years which surely translate in to a big metals demand. No wonder in the chart of 'Countries facing recession probability' India rightfully assumes the last position.

Along with the primary metals sector, I understand the foundry sector did better in 2023 than in 2022. The exports have also shown signs of upward mobility and even the domestic consumption of castings is expected to rise substantially. Not only auto but the other sectors like power, infra are also witnessing a boom and it will surely reflect in the enhanced castings demand. I am quite sure that this upward trend in minerals & metals sector will continue in 2024 as well.

Friends, this does not mean that the minerals & metals industry in India is free from all the problems and challenges. The future road is going to be corrugated and with stiff competition. Only the best is going to survive. On one hand it has a lot of opportunities and on the other, a lot of challenges.

Write your comments :

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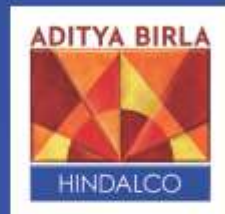
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# “The Indian Aluminium Industry has Witnessed Substantial Growth”.

**Satish Pai, President,  
Indian Institute of Metals**



Satish Pai is the President of Indian Institute of Metals and also the Managing Director of Hindalco Industries Ltd. He is recognized for his leadership in steering Hindalco's transformation into a value-added solutions provider in the aluminium and copper sectors. He emphasizes sustainability and innovation, driving initiatives such as renewable energy adoption and circular economy solutions. Under his stewardship, Hindalco has been acclaimed as the world's most sustainable aluminium company multiple times. Mr. Pai has also focused on cultural transformation, promoting gender diversity and enhancing performance accountability. He has driven significant projects like the Aditya and Mahan smelters and led Novelis' acquisition of Aleris, expanding Hindalco's presence in premium market segments. His interest in R&D has resulted in new product lines and numerous patents, positioning Hindalco-Novelis as leaders in innovative manufacturing technologies. With extensive experience in global operations, including roles at Schlumberger, Mr. Pai is a respected influencer advocating for the strategic importance of aluminium and copper across various industries. He holds key positions in industry organizations and serves as a spokesperson highlighting the significance of these metals.

D A Chandekar, Editor & CEO of Metalworld had an exclusive interaction with Satish Pai to understand more about present situation in Indian aluminium industry, future of Indian aluminium industry, reduction of carbon footprint of our industry, present activities of Indian Institute of Metals, etc.

## *Excerpts;*

***1) How is the present situation in Indian Aluminium Industry considering the robust economic growth expectations?***

India, with its rapid economic growth, has been recognized as the world's fastest-growing economy. Sustaining an annual growth rate of 6-7% over the past decade, India has ascended to become the fifth-largest economy globally and is poised to secure the third spot by 2027, surpassing the US\$5 trillion mark. Despite facing various external headwinds, the country's economic activity has displayed resilience. Looking ahead, we anticipate this momentum to persist, supported by a widespread strengthening of economic activity, facilitated by reduced input costs, corporate profitability, and the ongoing momentum in public capital expenditure.

The Indian aluminium industry has also witnessed substantial growth in the last



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## Face to Face

decade, with consumption more than doubling from 2.2 million metric tons in 2010 to the current 4.5 million metric tons. Significant investments of around Rs 1.2 lakh crores made by the domestic primary aluminium sector between 2007 and 2017 have contributed to a doubling of production to 4.1 million metric tons in the last eight years. Today India is the second largest producer and third largest consumer of aluminium in the world. As sustainable urbanization gains momentum, the use of aluminium in construction, infrastructure, transportation, and packaging is expected to surge. We foresee a 7% Compound Annual Growth Rate (CAGR) in consumption over the next decade (FY23-33E) in response to these evolving trends.

The domestic industry on its part can produce enough high-quality metal to not only cater to the growing market but also ensure self-reliance in its defence and critical infrastructure needs to avoid global volatility in supply and prices due to geopolitical uncertainties. As a country endowed with rich and good quality coal and bauxite reserves, significant primary aluminium capacity, and downstream processing capacity there is immense potential to further scale up. The Indian aluminium industry can take advantage of China plus one strategy given its inherent competitive advantage in this space.

**2) There is a perception that Indian companies do very little in the field of R&D. What is the status of metals companies in this regard?**

Today, most of the Indian companies are spending heavily on Research & Development and Innovation to stay ahead of competition and meet expectations of both new and existing customers.

In past few years Hindalco has further strengthened R&D and innovation across all core areas. Hindalco has four Innovation centres in



India with more than 50 experts / talent pool in various areas. Hindalco Technology University and digital team are reskilling talent pool for new Transformation technologies. We also have long term research programs for critical technologies development with Aditya Birla Science & Technology Centre, corporate R&D of Aditya Birla Group. In last three years:

- Hindalco have launched more than five novel products in speciality alumina & hydrate areas covering electronics to refractory applications.
- With ABSTC we have developed patented

Copper collector bar and pot design to reduce specific energy consumption in aluminium smelting, which is implemented across all our smelters. This is also helping us to reduce our carbon footprint, Hindalcois setting up booster section of 10 pots to demonstrate a new 400 KA pot design.

- In aluminium downstream Hindalco's technology team is working with various partners for new applications such as light weighting in personal and commercial mobility and successfully launched aluminium trailers and railway wagons. Additionally, our R&D team is working on aluminium foils, enclosures & separators for Li-ion battery, new anode alloys for aluminium-air battery.
- Our Copper Innovation centre has collaborated with one of the customers to produce Cu-Mg wires as per the RDSO



requirements for railways applications.

- Our Best-in-Class waste management practices have helped us achieve more than 100% utilisation of Bauxite Residue in cement Industry. Other



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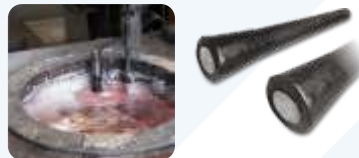
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## Face to Face

initiatives for Red Mud utilization such as backfilling, road development, mineralisation and development of red mud aggregates are being evaluated.

And finally, Hindalco under its own door and windows brand 'Eternia' has uniquely designed window solutions customized to deliver high performance by combining advanced design with unique alloys. Duranium® is a world-first patented aluminium alloy developed by engineers at Hindalco. It makes windows highly dent and wind load resistance. It can withstand high cyclonic winds, and also allows you to have large size windows, letting in maximum light and the best view with minimum obstruction. Aluminium is also an eternally recyclable metal, which makes our Duranium®-made windows ultra sustainable. In FY2023 Hindalco successfully developed 62 new products at its Innovation Centres.

At our Overseas subsidiary Novelis, we are focusing on expanding our product portfolio through innovation and newer

technologies with our eight dedicated R&D facilities spread across North America, Europe, and Asia. Our global research and technology centre in Kennesaw, Georgia, offers state-of-the-art R&D capabilities. This helps our plan to meet the global long-term demand for aluminium in the automotive, beverage, and aluminium specialties markets. Our R&D facilities are dedicated to developing newer technologies and products, which will help us stay ahead of the competition. In the reporting period, our R&D team filed 529 patents and had 427 patents granted in the last fiscal year.

### **3) How do you see the future of Indian Aluminium industry, short term as well as long term?**

We are very optimistic about the future growth potential of the Indian Aluminium market. We expect demand for aluminium to double over the next 10 years to 9 million tons. Indian aluminium industry today is at the cusp of growth across market and product segments. There is immense headroom for a growing

aluminium market in India with per capita Aluminium consumption in India almost 1/4<sup>th</sup> of global average (3.3kgs). There is huge scope of growth in under represented segments like packaging, transport, and construction. (Automotive casting and Electrical accounts for 2/3rds of consumption in India) Given the various benefits of aluminium such as light weight, recyclability, conductivity, non-corrosiveness, non-toxic and durability aluminium penetration in other sectors can increase immensely. We are already witnessing higher adoption of aluminium by way of light-weighting initiatives in commercial vehicles, personal mobility, etc. and government's focus on EVs. India's long-term goal to reach net zero by 2070 will also drive demand for green buildings, renewables and sustainable packaging where aluminium will play a critical role.

In FY25, we expect Aluminium consumption in India to grow by 7% with broad based growth across sector like Automotive, Electrical, Building and Construction, Packaging, Consumer Durables, & Defence. As the high growth low penetration markets defines India potential, in the medium to long term, demand for aluminium is expected to grow across segments at a 7-8% CAGR. Focus on decarbonisation efforts, physical infrastructure push and a favourable regulatory landscape will drive growth going forward. In India, the large players are fully integrated in the upstream



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## Face to Face

segment and companies like ours (Hindalco) are also building downstream capability to cater to growing demand from new age segments like personal and commercial mobility, sustainable packaging, and construction industry. Overall, the Indian aluminium industry is poised to evolve in response to the growing emphasis on sustainability, safety, and global demand for lightweight, eco-friendly materials. These trends represent opportunities for growth, innovation, and positive environmental impact.

#### **4) What needs to be done to reduce the carbon footprint of our industry?**

Changing the energy mix to incorporate renewables and low-carbon fuels, along with electrifying certain thermal processes like steam generation, recycling, Carbon Capture, Utilization, and Storage (CCUS), and utilizing carbon offsets are key strategies to reduce the carbon footprint in this industry. Usage of nuclear energy for supplying power has the ability to slash carbon emissions by about 50 percent from the current levels.

At Hindalco, we have established a well-defined decarbonisation plan, and are committed to achieving Net Carbon Neutrality by 2050. In addition, we have set a target to reduce specific Greenhouse Gas (GHG) emissions by 25% by FY 2024-25, measured

against the FY 2011-12 baseline for our Novelis operations, we plan to reduce the absolute carbon foot print by 30% by FY 2026 and 100% by 2050 against the base year FY 2016. Further, we aim to reduce energy intensity by 10% by FY 2026 against the base year FY 2020.

Hindalco is targeting a renewable capacity of 300 MW by 2025, with 200 MW featuring no storage and 100 MW incorporating storage. We are actively investigating the green hydrogen market and exploring opportunities to utilize captured CO<sub>2</sub>, with plans to launch a pilot Carbon Capture project. Given the lower energy demands of secondary aluminium compared to primary aluminium, we are expanding our current recycling capabilities at Novelis operations globally.

In this industry there will be a continued strong emphasis on sustainability and safety. Aluminium is gaining ground as a 'material of choice' over steel and plastic due to its unique properties of lightweight, high tensile strength, and infinite recyclability. These properties make it environmentally a more



sustainable material and a key tool to meet emission

reduction goals, mainly through recycling, as recycling and circular economy practices will continue to gain importance that will have an integral role to play. As lighter weight improves a vehicle's range/mileage, the automotive industry is incrementally shifting from mild steel to aluminium and the growth of electric vehicles (EVs) is further accelerating this trend. Due to its infinite recyclability, even the packaging industry is incrementally shifting to aluminium cans, from glass and plastic (PET).

#### **5) What are the present activities of Indian Institute of Metals and what new activities do you intend to pursue during your tenure as the president?**

As President of IIM, my primary focus is to enhance collaboration between industry, academia, and research. As the representative from the metal's fraternity, I am facilitating discussions with the Ministry of Steel, and Ministry of Mines. Efforts are also being made to strengthen collaborations with metal institutes globally spanning Australia (AusIIM), USA (ASM), Europe (GDMB) and Japan (JIIM), focusing on critical areas like decarbonisation and adoption of new transformational technologies. As a personal initiative, I am working to increase student engagement with IIM and is actively holding discussions with student chapters from the metallurgy fraternity.

#### **6) What support does the metals industry need from the policy makers?**

The Indian aluminium



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## Face to Face

industry has the ability to take advantage of China plus one strategy given its inherent competitive advantage in this space. Policy makers can play a significant role here. Some of the focus areas where government can hand hold the industry according to me are:

**Focus on downstream industry:** The government support for technology upgradation, credit availability at cheaper rates for MSME and skill development for downstream processes can go a long way in strengthening the aluminium value chain. Of course, large players like us can also play a role.

**Ensuring Quality Standards for aluminium products -** Develop performance and quality standards for downstream applications in key sectors like B&C, packaging, defence (in consultation with BIS) is critical for industry's growth and export strategy. Detailed set of standards for aluminium products to prevent import of sub-standard products from the point of view of health, safety, environment, prevention of deceptive practices, and consumer security are needed. Industry needs to work with BIS on suggestions related to all products generated from primary or secondary route covering foreign material content, mechanical properties (tensile strength, hardness), hazardous

material, freedom from defects, dimension tolerances, heavy metal content, sampling & testing and many more. Similarly, for downstream industry specially in packaging, building and construction there should be emphasis on stricter enforcement on existing guidelines and new standards in areas where they do not exist.

**One nation one carbon tax-** The green regulation landscape is undergoing an overhaul. With the developed world coming up with their own carbon tax regimes, Indian policymakers are also tightening climate regulated regulations in the country. Indian industry already pays carbon tax in various forms like coal cess, levies and taxes on mining, Renewable Purchase Obligations, etc. India is also already gearing up to formulate its own Carbon Credit Trading Scheme (CCTS), the modalities for which are being worked out by the Bureau of Energy Efficiency under Ministry of Power. Ideally the CCTS should be a single carbon tax regime in India with all other forms of carbon taxes like coal cess, RPO, mining taxes etc. being subsumed under them. This will allow Indian industry to deal with a single carbon tax at the national level and give the government a lever to set stringent decarbonization targets for the Indian industry by doing away with all other forms of carbon taxes.

**Skill development-** Skill

development is one of the critical areas where govt and industry can work together/partner with other institutions for providing specialised courses in partnership with National Skills Development Corporation. For example, skill upgradation in areas such as fabrication / machining, cutting, drilling, and anodizing, pharma foil conversion courses, façade engineering, assembly etc.

**Focus on recycling -**To encourage domestic scrap recycling to move towards a circular economy it is imperative that India develops an efficient scrap collection system. The government can take a key role here. Creating Recycling Parks, setting best practices for the industry, acquiring best in class process, setting up dedicated Technology Centres in public private partnership, promoting start-ups in recycling ecosystem and standards for imported scrap are some of the important areas where policymakers can lay a pivotal role. ■



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**“ASM can become the voice of the materials science professionals.”**

**Pradeep Goyal,**

**President, ASM International**

Pradeep Goyal, President, ASM International, also the Founder Chairman & MD of Pradeep Metals Limited, hails from a technical and socially oriented family in Mumbai. He earned his B.Tech in Metallurgical Engineering from IIT Kanpur, graduating top of his Metallurgy class in 1978 and receiving a silver medal from the President of India. Recognized as the Best Metallurgist of the Year by the Indian Institute of Metals, he pursued his Masters at MIT on a full scholarship. Returning to India in 1983, he established Pradeep Metals Limited, specializing in machined closed die forgings. Mr. Goyal is a distinguished professional. He served as a Trustee at

ASM International USA and earned various honours, including the Fellow of ASM, Distinguished Life Membership Award in 2020. Currently, he's engaged in innovative research on microwave-based steel manufacturing, with potential for significant cost savings.

D A Chandekar, Editor & CEO of Metalworld magazine had an exclusive interaction with Mr Pradeep Goyal to understand more about the current status of ASM in India, how can ASM help metallurgical associations, his vision as the President of ASM International, etc.

**What is the current status of ASM in India and what position do you envisage it to take?**

ASM was started in India by Dr. H M Mehta in the year 1979. Slowly and steadily, ASM increased its Chapters in various cities to enable Material Scientists and Professionals to get together and exchange knowledge in the field of Materials Science and Engineering.

The Membership of ASM in India is still growing and is expected to grow substantially in the years to come. The rapid growth of activities in the field of Defense and General Engineering will require greater knowledge of materials and ASM is poised to provide that knowledge base to the engineering community.

**Can ASM become an umbrella organization for different metallurgical associations in India?**

The materials science community is very small compared to other engineering fields. However, there are several organizations representing various aspects



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## Face to Face

of materials science and hence I feel that the community is very fragmented. It has been my dream that ASM becomes an umbrella organization to bring other organizations to work together for the common cause of the



growth of materials science and engineering. ASM is uniquely positioned to play that role because of the large, digitalized data base which is specifically curated, and peer reviewed by the best Engineers and Scientists. ASM can provide all the knowledge for every materials field, whether it is ferrous, non-ferrous, ceramic, composites, additive manufacturing, and others.

### **Can ASM help in improving country's position in the field of Materials science in specific segments such as Defence, Energy etc. ?**

The defence industry in India is growing leaps and bound, particularly after the Government banned the import of several defence equipment. MSME and other large companies have taken up the mantle of developing these equipment indigenously, creating huge job opportunities. The development of these equipment requires

knowledge base of materials science. The same is the situation with the alternate energy sector, where new materials are desired for the development of equipment in the EV, hydrogen, solar and other alternate energy fields. Once again, ASM has the ability to support these activities.

### **Can ASM in India help the government to draft**



### **materials policy? What is your vision as the President for ASM International ?**

The Government is keen to create a group of materials science professionals to draft a materials policy. I believe CSIR is taking a lead in this activity. I am sure as soon as it materializes, ASM will certainly play an important role in supporting the vision of the Government.

The materials industry expects support from the policy makers in terms of grants and subsidized loans for new capabilities in developing materials and processes. As the President of ASM International, I believe that the axis of manufacturing is moving from the West to the East, particularly in China and India. It is time that ASM took advantage of this

situation and create an eco-system where the knowledge available with the Society is spread far and wide in these countries to support all sectors of materials science fraternity. The Membership needs to grow substantially so that ASM can become the true voice of the materials science professionals.

ASM International Headquarters understands the

unique situation in India and is very supportive in growing in the Asian sub-continent. I look forward to a fruitful growth of ASM not only during the term of my Presidentship but even later. ASM India Chapter has been organizing materials science event MET+HTS every alternate year, and with time the event has grown substantially, clearly showing the need for such events. The Government understands this need and supports this activity in every possible way.



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# “Middle East: Rising Hub in Global Metal Recycling”

Mir Mujtaba,  
President: Bureau of Middle East  
Recycling (BMR)



Mir Mujtaba, an engineer with a marketing postgraduate degree, leads Jupiter Metals Trading and founded the Bureau of Middle East Recycling. With over 33 years of experience in metal trading and various operational aspects, he actively participates in global recycling events, seminars, and workshops. Mir advocates for recycling and environmental protection through social media and collaborations with governments and associations worldwide. Recognized as a top global recycler, he fosters cooperation among Middle East recycling industries and promotes sustainability initiatives, including Global Recycling Day. Mir has signed agreements with international recycling associations to reduce carbon footprints and advance the recycling industry.

With over 35 years of experience in recycling and international trade, Mr. Sanjeev Phadke, an electrical engineer with a Master's in Marketing Management, founded MEI Group in 2004. Specializing in non-ferrous metal recycling, MEI Group is a prominent name in the industry. Mr. Phadke also serves as Secretary General of BMR and engages in philanthropy with his wife, Dr. Maneesha.

D A Chandekar, Editor & CEO of Metalworld magazine had an exclusive interaction with Mr. Mir Mujtaba and Mr. Sanjeev Phadke to understand more about the metal recycling industry in the Middle East region, what support does the industry need from policymakers, objectives and activities of BMR etc.

## ***What is the present status of the metal recycling industry in the Middle East region?***

Mir Mujtaba -The present status of the metal recycling industry in the Middle East region is promising, characterized by steady growth, and increasing recognition of its importance in sustainable resource management. With advancements in technology and heightened environmental consciousness, the Middle East is poised to emerge as a significant hub in the global metal recycling landscape. The establishment of efficient infrastructural frameworks and strategic partnerships has contributed to enhancing operational capacities and expanding market reach. However, there remain untapped potentials that necessitate further exploration and targeted interventions to fully harness the region's capabilities in metal recycling.

## ***What needs to be done to make recyclers competitive in the international market?***

Mir Mujtaba -To enhance the competitiveness of recyclers in



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the international market, concerted efforts are required on multiple fronts. Firstly, fostering an environment conducive to free and fair-trade practices is imperative, eliminating barriers to entry and ensuring a level playing field for all stakeholders. Additionally, investing in research and development initiatives aimed at innovation and process optimization can bolster efficiency and product quality, thereby enhancing market appeal. Furthermore, strategic collaborations with industry peers and governmental bodies can facilitate knowledge exchange and capacity-building initiatives, positioning recyclers to meet global standards and adapt to evolving market dynamics effectively.

**What support does the industry need from policymakers?**

Sanjeev Phadke - The metal recycling industry requires comprehensive support from policymakers to navigate regulatory complexities and capitalize on growth opportunities sustainably. Alignment of policies with overarching

sustainability goals is paramount, facilitating the adoption of eco-friendly practices and incentivizing investments in renewable energy sources and green technologies. Furthermore,



**Sanjeev Phadke**  
Secretary General  
Bureau Of Middle East Recycling

fostering a conducive regulatory environment that promotes research and development, facilitates infrastructure development, and encourages cross-sectoral collaborations is essential. Policymakers play a pivotal role in championing initiatives that prioritize resource efficiency, circular economy principles, and responsible waste management practices, thereby fostering a conducive ecosystem for the metal recycling industry to thrive. Emphasizing the importance of a unified approach, characterized by

"one language, one vision, and one goal," can further consolidate efforts and ensure coherence in policy implementation, fostering greater alignment with global sustainability agendas and enhancing the industry's competitiveness on the international stage.

**What are the objectives and activities of BMR?**

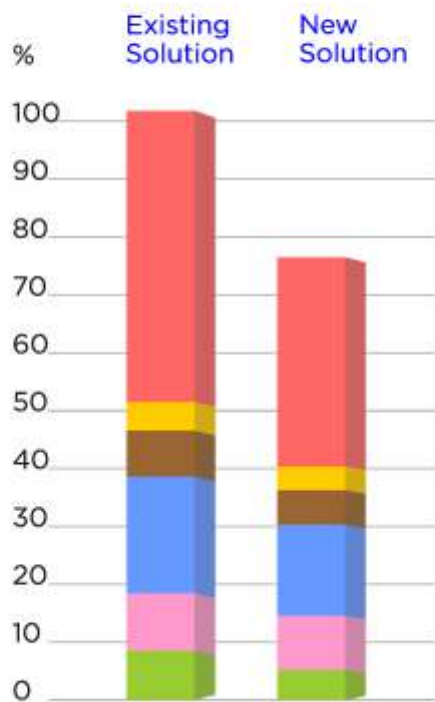
Mir Mujtaba - Bureau of Middle East Recycling, most commonly known as BMR in the recycling fraternity is an association that serves as the leading representative body for the Middle East Recycling sector. BMR was formed as a non-profit oriented, non-religious, non-political organization to mainly represent all recyclers of Middle East and to bring them under one banner and platform with the unified thoughts of promoting the Recycling Business of Middle East, protecting the environment and sharing information about recycling and to understand the new challenges and support the Recycling industry. It offers a platform to the recyclers to discuss business opportunities as well as to take up matters relating to the obstacles, hurdles and challenges faced by them. BMR has successfully forged strong alliance with reputed organizations in the world like Institute of Scrap Recycling Industry (ISRI) – USA and Bureau Of International Recycling (BIR) – Belgium and European Recycling Industries Confederation (EuRIC), Belgium which are the pioneering institutions representing recyclers across

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## Face to Face

the globe. BMR's mission is to promote responsible recycling practices and sustainability solutions in

RECYCLING, there by sustaining the earth resources.

- BMR has been



the Middle East Asia and beyond, to protect the environment and at the same time contribute to trade and commerce. BMR mission is to promote responsible scrap recycling practices and sustainability solutions in the Middle East Asia to protect the environment and at the same time contribute to trade and commerce.

### Activities: -

Human action has triggered a vast cascade of environmental problems that now, threaten the continued ability of both natural and human systems to flourish

- BMR through its different recycling awareness activities is Changing the way we view the planet and to save its resources is the need of hour. The answer lies in

continuously supporting and conducting the Global Recycling Day for the last 7 years.

***What coordination needs to be done between various regional associations supporting the recycling industry? How can it help the industry?***

Sanjeev Phadke - Effective

coordination between regional associations supporting the recycling industry is essential to harness synergies, streamline efforts, and address common challenges collectively. Establishing mechanisms for knowledge sharing, best practice dissemination, and capacity-building initiatives can foster a culture of collaboration and innovation within the industry. Moreover, signing Memoranda of Understanding (MOUs) aligned with international agreements such as the Paris Agreement can reinforce commitments to reducing carbon footprints and advancing sustainable development agendas. By leveraging collective expertise and resources, regional associations can amplify advocacy efforts, influence policymaking processes, and drive transformative change, ultimately contributing to the industry's long-term viability and resilience on a global scale.







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# “Foundries are Adopting New Technology”

Sandeep Kulkarni,  
Convener,  
Dynamic Foundry Group



Sandeep C Kulkarni is a convener at Dynamic Foundry Group and is currently working as the General Manager at Aditi Industries in Ambap, Kolhapur. He owns an extensive 32-year tenure in the foundry industry, spanning various roles. Alongside his managerial duties, he spearheads three WhatsApp groups dedicated to skill development, employee empowerment, and knowledge sharing via YouTube channels. Notably, Mr. Kulkarni has facilitated over 1000 training sessions, underscoring his commitment to professional growth and excellence. Furthermore, he serves as a behavioral mentor for multiple educational institutions, contributing significantly to personal and professional development initiatives. His multifaceted expertise and dedication epitomize his invaluable contributions to the industry and academia alike.

D A Chandekar, Editor & CEO of Metalworld magazine had an exclusive interaction with Mr. Sandeep C Kulkarni, Convener, Dynamic Foundry Group to understand more about the status of the foundry industry in the country, how to increase efficiency of the castings, various activities at 'Dynamic Foundry Group' etc.

## *Excerpts;*

### **1) How is the status of the Foundry Industry in the country?**

At present India is 2nd largest iron manufacturing in the world and I believe the way the foundry industry is growing will be number one by 2030. For this we need to give our new generation proper infrastructure, improving their skills is also required. We at DFG and IIF are already taking a lot of efforts on this front. The CEO of Mackenzie in his one interview told the 19th century what belongs to the UK, 20th to the USA but this 21st century will be India's century. We have climbed from 10th place to 5th place in economy in last 10 years and now we are aiming towards 3rd best economy in the world before 2027. More than 65% of the youth below the age of 35 years is our strength and we should cash it to become the 3rd largest economy in the



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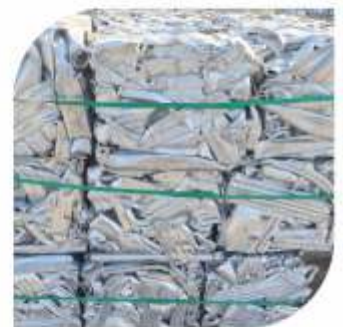


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## Face to Face

world Presently the foundries are having a great future ahead. Due to constant growth of the Indian economy. Due to the continuous growth of roads and infrastructure. Though presently there is some downfall in the industry due to Volatile situation like war, Saturation and Competition. However such types of recession are very essential for foundries to make internal improvement and for getting a better version. Such recessions will give them opportunities to reduce Wastages, overcome their weakness and to make introspection to get ready for better tomorrow. Presently Foundry is facing problems related to Skills at various positions. As the old generation is getting retired and existing foundry men are not willing to share their knowledge and experience the situation is becoming horrible. In addition to that young new generations are not willing to join the foundry due to various reasons. So it's a big challenge to attract this young generation.

### **improve the efficiency of the Castings?**

As this is an era of technology, information and AI. Foundries too need to adopt these new technologies. Old 3"D" effect of Dark, dangerous and Dirty are now replaced by 3"D" of Digital, Dynamic and Delightful. Foundries are adopting new technology like IGBT melting equipment, High pressure moulding lines, Auto Pouring and press pouring technology, 3"D" pouring for core and patterns, Simulation technology for FIR, Auto fettling machines etc to get better results and to make up "Local to Global" effect. Even documentation, record keeping, and process control are going to be digital ways. Collaboration of Educational institutes and the industry is another big step needed to attract young generations. Improving Environmental aspect and green foundry concepts will make foundry a better working space. As new era is about electric

Fast speed moving vehicles We must understand changes in demand. As electric vehicles needs to be less weights so we must be ready with less wall thickness, Less weight casting by changing material and increase material strengths. New technologies like Lost foam technology, High pressure line, Robotic and



automated Fettling, 3D printing technology for Cores and moulds and for prototype development

### **3) 'Dynamic Foundry Group' seems to be very active & vibrant tell us something about it?**

Dynamic foundry group was founded by me in 2014 with just 3 members on WhatsApp platform. Now it has 3 WhatsApp groups with more than 1500 active members from India and many other countries like Russia, Pakistan, South Africa, Bangladesh, USA, Turkey etc. The group was started to have better interaction among the foundry men and help them to get some sorts of solutions sitting at their foundry place by utilizing the expertise of various foundry men across the globe. We already completed a successful 9 years journey and the still



### **2) What needs to be done on technological front to**

vehicles. Also we are developing infrastructure for

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## Face to Face

group is very much active. Apart from the technical group discussion we also contributed to the industry by arranging live seminars, Training sessions, get together at various places like Kolhapur, Belgaum, Ahmedabad, Anand, Baroda etc. We at DFG also conducted various webinars, Panel discussions giving experts and young foundrymen to interact with each other and spread their knowledge. During the Corona time DFG has conducted 45 Webinars in the time span of 60 days. DFG also runs our own YouTube Channel "Dynamic Foundry Group" which is very popular all over the world for Very knowledgeable and technical sessions. There are almost 260 Videos available till date on this YouTube channel and every week 2 new videos are getting released. Upcoming Videos are uploaded up to 2027. Dynamic foundry group also released a nice booklet known as "Dynamic Tips" Which is pictorial

booklet guidance for foundrymen.

### **4) How do you see the Future of Foundry Industry in the country?**

In the terms of Foundry

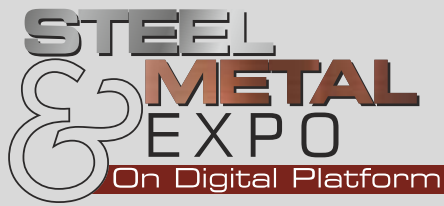
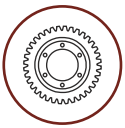


technology new materials, new processes are going to be a great future. Thin walled castings, Materials like CG (Compacted Graphite), SSF (Silicon strengthened Ferritic iron, SIMO (Silicon moly), ADI (Austempered ductile iron) are few new generation materials with Better customized properties which are going to be foundry future. As electrical vehicles and such

types of new generation concepts are becoming popular thin walled casting and Light weight material will be future trends in the automobile industry. Similarly technology

like lost foam, HPML moulding technology, 3D printing etc are going to be very much in demand in coming years. Overcoming Environment challenges and getting skilled man power will be key areas for foundry to get survival. Saturation, competition is another key area for all foundries to overcome their survival. 3"C" is going to be the biggest challenge in this journey. Competition, Change and Challenges are these 3"C". India has a bright future considering the growth and the expanding economy. We are at 5th place in the world as far as the international economy is considered but in the next 5 years India will be within the first 3 Economy in the world. Most of the leaders are saying this is India's Century and hence the future for the foundry industry is very bright. ■





# Future of Foundry Sector in India

The Asian Metallurgy Show, originally a physical exhibition since 1997, transitioned to a digital platform in 2021 due to Covid. The virtual Steel n Metal Expo held from 18<sup>th</sup> to 31<sup>st</sup> December, 2023, featured online stands and webinars covering topics like digitalization, commodity trading, green steel production, role of zinc, sustainability. A notable webinar titled 'Future of Foundry Sector in India' The expert panel featured Prayut Bhamawat, Chairman of IIF Western Region, Dr. H. Sundara Murthy, Vice-President, Laghu Udyog Bharati, Karnataka, Mahesh Date, MD of Ved Industries. This webinar was hosted by D.A. Chandekar, Editor, Metalworld.

**D.A. Chandekar (Convenor)**- It's impossible to envision any industry functioning without the presence of metal parts or castings. I'd like to begin by discussing the current state of the foundry and casting industries

**Prayut Bhamawat**- In the current landscape, industries show varied responses. Automotive and



**Prayut Bhamawat**  
Chairman  
IIF Western Region

construction face slowdowns due to factors like seasonal variations and reduced demand in agricultural machinery. However, engineering and railways experience increased demand, especially in defence, leading to challenges like overbooking for foundries supplying to this sector. Companies in engineering and railway sectors are planning expansions, while automation industries focus on internal upgrades and technological advancements during the slowdown.

**Mahesh Date** - Despite challenges, the automotive sector, particularly in passenger cars and two-wheelers, shows strong indicators with record-

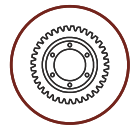


**Mahesh Date**  
Chairman  
IIF Kolhapur Chapter

breaking production and sales. Projections for the next five years are optimistic, supported by increasing infrastructure development aligned with India's goal of global economic



leadership. There's a notable shift towards reliability and technology adoption across sectors, fostering optimism, especially in heavy vehicles



and agricultural machinery crucial for rural and urban growth. Overall, a positive outlook prevails, driven by ongoing infrastructure development and government support for key sectors.



**Dr. Sundara Murthy**  
Vice-President,  
Laghu Udyog Bharati, Karnataka

**Dr. Sundara Murthy -**  
Recent discussions with government policymakers, including those from the Prime Minister's Office and

Bangalore, highlight exceptionally promising growth prospects. I encourage young entrepreneurs to expand their businesses, focusing on technically advanced sectors for maximum profitability. The export sector, especially in steel, iron, aluminium, and defense, offers significant opportunities. Engagements with defense chiefs and industry representatives reveal staggering demand for engineering goods, including castings, with the defense sector alone requiring a tenfold increase in production capacity. The impact of electric vehicles on the industry is also a key consideration. Seizing these opportunities is crucial for propelling the industry forward.



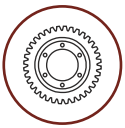
challenges our industry is currently facing, starting with Date.

**Mahesh Date-** Currently, casting constitutes 45-50% of the foundry industry, with electric vehicle (EV) casting demand relatively low compared to sectors like commercial vehicles. However, preparation for future EV demand is crucial, given the government's goal of zero net carbon emissions by 2070. Competing with China's pricing and meeting emission norms present challenges requiring strategic planning, investment in training, and green initiatives for industry sustainability and growth.

**Prayut Bhamawat -** The foundry industry faces a significant challenge with a scarcity of skilled manpower, partly due to negative perceptions about working







## Industry Update

conditions. Transitioning to cleaner and sustainable practices is crucial to attract and retain workers. Rising labor costs in India necessitate automation for cost control and efficiency. Embracing greener

discussions with certification bodies. It's essential for young workers to understand that process adherence ensures quality outcomes and customer satisfaction. Creating a supportive work environment, including

environmental concerns and external ones like workforce skills require strategic attention. Focusing on talent acquisition and creating a conducive work environment will drive growth in the foundry industry.



technologies is essential for environmental sustainability and meeting international expectations. Optimizing processes for efficiency and productivity while controlling costs is vital for global competitiveness. Addressing these challenges is critical for the industry's future success.

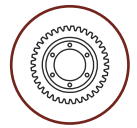
**Dr.Sundara Murthy**- The primary challenge in the foundry industry is correcting worker mindsets. Our foundry has maintained zero customer rejections for 40 years by prioritizing quality and instilling a culture of quality consciousness. Adhering rigorously to processes without shortcuts is crucial for success, as emphasized during

providing basic amenities, fosters employee motivation and value. By addressing these concerns and prioritizing quality as a way of life, sustained success in the foundry industry is achievable.

**Prayut Bhamawat** - Disparity in salary between engineering and IT sectors stems from factors like higher margins in IT and perceptions of engineering roles. While engineering roles may start with lower salaries, experienced engineers command higher pay due to expertise and contributions to profitability. Engineering industries offer continuous growth opportunities, unlike some IT roles. Internal challenges like

**D.A. Chandekar (Convenor)**- let's see the opportunities available, both domestically and internationally, particularly in terms of technological advancements and innovations.

**Mahesh Date** - Looking ahead, the foundry sector holds significant opportunities, especially as the world's second-largest casting manufacturer. To fully capitalize, we must tackle infrastructure and technological challenges. New market applications, like in mining machinery, offer promise with global manufacturers entering India. Proactive engagement and support for these companies are crucial. Initiatives like training programs and awareness campaigns are



seven years, the foundry industry has grown remarkably, reaching 2.7 billion tons and expected to increase by 5%. The automotive sector constitutes 32% of the market, with machinery and other sectors comprising 10%. Predicting future trends is challenging due to disruptions like 3D printing, which challenges traditional casting processes. To adapt and thrive, we must focus on understanding demand, identifying cost reduction opportunities, and providing innovative solutions beyond casting. Emphasizing assemblies and adding value to our offerings can capitalize on India's reputation as a reliable global source.

**Prayut Bhamawat** - In the mining sector, there's a growing trend towards replacing imports with domestic production, prompting increased interest in setting up local foundries to meet demand. However, this initiative is met with challenges such as the absence of large casting manufacturers and a lack of technical expertise. As a result, there's a push for developing technical knowledge and establishing local foundries to reduce reliance on imports. Additionally, there's acknowledgment that technological advancements in other countries are progressing faster than in India, highlighting the need to address this disparity. ■

underway to foster a positive and proactive mindset. Diversifying our products and adapting to market fluctuations will ensure sustained growth.

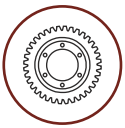
**Prayut Bhamawat** - The foundry sector in India shows promising growth opportunities, with a forecasted ten percent increase. Emphasizing high-technical areas, especially in niche markets like defence and high-precision casting, can lead to higher growth and profits. Upskilling beyond conventional processes is crucial. Sectors like defence, mining, railways, and machinery parts offer significant potential. Government investments, like the Dedicated Freight Corridor (DFC), further enhance opportunities, particularly in railways. Adapting to emerging trends, like the potential shift to magnesium in car manufacturing, is essential for sustained success.

**D.A. Chandekar**

**(Convenor)**- Let's also address international opportunities, considering the shifting landscape of the global economy.

**Dr.Sundara Murthy** - Within the foundry industry, micro-foundries, often run by single technocrat owners, excel in technical expertise but may neglect financial planning. Transitioning to small-scale units and focusing on financial management is crucial for long-term sustainability. Succession planning is essential for continuity, considering the challenge of finding skilled successors. Expanding into higher technical areas and diversifying into export markets offer growth opportunities. Embracing forward integration into product assembly and sub-assembly enhances profitability and long-term viability. Proactive measures like strategic planning and diversification are vital for future success.

**Mahesh Date** - In the past



# Vedanta Aluminium Renews Commitment to Empower Indian Youth'

On the occasion of National Youth Day, Vedanta Aluminium, India's largest producer of aluminium, reiterates its commitment to empowering youth across its operations through multiple opportunities for advancement. The company has employed a two-pronged approach, generating extensive employment opportunities with rich job content across its world-class operations, and empowering youths from local communities through education, skill development, grassroots sports, and training in traditional art forms. Together, they are helping youths across India attain sustainable livelihoods and achieve new milestones, contributing to the socio-economic development of

their communities and country.

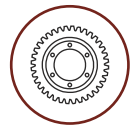
Vedanta Aluminium's operation include one of the world's largest aluminium smelters in Jharsuguda and a world-class alumina refinery in Lanjigarh, Odisha, in addition to India's iconic aluminium producer BALCO in Korba, Chhattisgarh. Over 55% of Vedanta Aluminium's employees at these locations comprise of top talent in their twenties, working on leading-edge technologies to produce the high-quality aluminium that is supplied to over 60 countries globally for high-end applications. This puts them at the forefront of India's growth story and considerable engineering prowess.

The company is also young when considered in terms of the average



employee age, which falls between 26-28 years, representing India's demographic dividend. Given the size and scale of Vedanta Aluminium's operations, these youths are employed in a diverse variety of roles such as engineering, mechatronics, sustainability, commodities, mining, geology, forensics, geophysics, deep tech, etc. The company has also established tie-ups with top educational institutions to train and further upskill high-performing employees.

Building upon its significant efforts in community development skill development, the company has successfully trained nearly 15,000 youth from its communities through its various skilling programs. These programs are helping bridge the gap between unskilled and semi-skilled



youths through training in market-relevant vocational skills, entrepreneurship, climate-resilient agriculture, revival of traditional arts and crafts such as *Saura* and *Dhokra*, amongst others. Vedanta Aluminium has rolled out Project Panchhi, a recruitment drive that aims to employ 1000 girls

(Bhubaneswar) and other top institutions to ensure that the training programs are tailored to the evolving needs of the market and the aspirations of the youth. Over the years, the company has continuously expanded its vocational skills programs, notably with initiatives like the Vedanta

promoting improved farming practices, water management, soil conservation, livestock husbandry, and other aspects, reviving farming among youths as a feasible means of livelihood. Through these efforts, the company is actively helping foster increased entrepreneurship, sustainable economic development, and vibrant local economies across the country.

Vedanta Aluminium, a business of Vedanta Limited, is India's largest producer of aluminium, manufacturing more than half of India's aluminium i.e., 2.29 million tonnes in FY23. It is a leader in value-added aluminium products that find critical applications in core industries. Vedanta Aluminium ranks 2<sup>nd</sup> in the Dow Jones Sustainability Index (DJSI) 2022 world rankings for aluminium industry, a reflection of its sustainable development practices. With its world-class aluminium smelters, alumina refinery and power plants in India, the company fulfils its mission of spurring emerging applications of aluminium as the 'Metal of the Future' for a greener tomorrow.



from marginalized rural communities, providing them with financial support in completing their collegiate education and also offering employment on successful completion.

Vedanta Aluminium's commitments also aligns with key global goals, particularly the 'Skill India' vision and the United Nations Sustainable Development Goals, including SDG 1 - No Poverty, SDG 8- Decent Work and Economic Growth, and SDG 10 - Reduced Inequalities. The company has collaborated with esteemed knowledge providers such as NABARD, the National Institute of Solar Energy (NISE), Skill Development Institute

Skill School program in Korba, Chhattisgarh, offering training in various trades including food & beverage, welding, tailoring, hospitality, beauty etc. The company has also empowered women through the *Subhalaxmi* Co-operative in Odisha, supporting rural women in becoming successful entrepreneurs through micro-finance, skill development, financial literacy, and market linkage programs.

Additionally, through sustainable livelihood projects in Lanjigarh and the *Mor Jal Mor Maati* initiative in BALCO, Korba, Vedanta Aluminium offers training in integrated community-based interventions. These efforts aim to enhance incomes by





# Material Needs of the Changing World

(Part 1)

History of mankind is replete with the history of materials. This has led to classification of history by 'ages' defined by the name of the primary material used in that era, such as stone age, copper age, bronze age, steel age and plastic age. Discovery, manufacturing processes and applications in these eras have focused on the respective materials. Material consumption per capita is a direct indication of the stage of development of a society. The type of materials consumed goes on changing depending on the state of development of technology and the exposure of that society to the technology; and the state of development of a society and a country is characterized by the material consumption per capita. Changes in resource availability, discovery of hitherto unknown resources, societal or environmental changes and pressures thereof, uncommon situations such as Natural disasters, wars, etc. may also lead to the new materials or new applications.

Today the world is changing rapidly, and resource crunch is imminent. A need to forecast the needs for medium- and long-term

future is evident. We, at Metalworld tried to raise several relevant questions and seek answers based on a detailed study of published information, using conventional literature search, access to quantitative data published in open literature, chat-GPT AI tool, analyzed based on insights into the field based on personal experience and expertise. The qualitative study, summarized here in a question -answer form, points to what these areas are and may guide the uninitiated to plan a program. For the



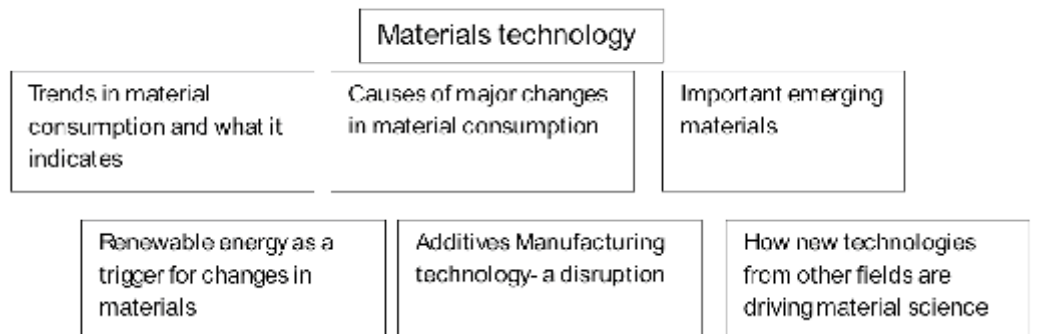
**Sadguru Kulkarni**  
Retired President-  
Technology, Hindalco  
Industries Ltd Corporate,  
covering Research &  
Technology, Technical.  
Now a Freelance  
Consultant in FMCG,  
Minerals & Metals,  
Chemicals and  
Sustainability

convenience of the reader, the article is organized in the form of probing questions and the answers thereof.

**1. What are the trends on material consumption worldwide & what are the primary drivers?**

Past data is a mirror to the future. Tracking the trends in material consumption globally of regionally, gives an idea about which materials are getting phased out, which are rising, and why. The qualitative and quantitative data available till 2022 indicate the following.

1.1. Growing Global Consumption: Historically,





global material consumption per capita has been on the rise, particularly with the growth of industrialization and urbanization. As economies develop, there tends to be an increased demand for raw materials, energy, and manufactured goods.

1.2. Urbanization needs and infrastructure development: Urbanization trends often correlate with higher material consumption per capita. Developing and expanding infrastructure, constructing buildings, and supporting transportation systems contribute to increased material use.

1.3. As countries experience economic growth, there is often a shift in lifestyle and consumption

raw materials and energy.

1.4. In response to environmental concerns, resource efficiency and sustainable consumption practices have gained importance. Some countries and industries are implementing measures to reduce material consumption per unit of GDP, promoting circular economy principles and recycling.

1.5. Technological changes & Advances: Advances in technology can influence material consumption trends. For example, the development of lightweight materials in automotive and aerospace industries may reduce overall material requirements.

economic loop for as long as possible, influence overall material consumption.

1.7. Alternative & Renewable Energy Transition: The transition to renewable energy sources and the development of green technologies can impact the types and amounts of materials consumed, such as those used in the production of solar panels, wind turbines, and energy storage systems.

1.8. Evolution of global supply chains: The interconnectedness of global supply chains can impact material consumption patterns. Changes in production locations and trade dynamics can affect the distribution of material use.

1.9. Consumer Awareness: Increased awareness among consumers about environmental issues and sustainable practices can influence purchasing decisions. This may lead to a shift in demand towards products with lower environmental footprints.

1.10. Policy Regulation: Government policies and regulations play a significant role in shaping material consumption patterns.

Environmental regulations, waste management policies, and initiatives promoting sustainable practices can impact how resources are



patterns. Increased incomes can lead to higher demand for goods and services, which, in turn, requires more

1.6. Circular Economy Practices: The adoption of circular economy principles, where materials are reused, recycled, and kept in the



## Analysis

used.

### **2. What are the important emerging materials in next decade 2025 to 2035?**

**The following materials appear to be important, based on their consumption trends, links with emerging areas of technology, societal pressures and demands, links with critical issues like climate change, globalization, etc.**

2.1. Graphene & 2 Dimensional Materials: Graphene, a single layer of carbon atoms arranged in a hexagonal lattice, has exceptional electrical, thermal, and mechanical properties. Research into other 2D materials, such as transition metal dichalcogenides (TMDs), could lead to new materials with unique properties.

2.2. Metamaterials: These are materials engineered to have properties not found in nature, often achieved by manipulating their structure at the nano scale. Metamaterials have applications in optics, acoustics, and electromagnetic shielding.

2.3. Advanced Polymers: Innovations in polymer science could lead to the development of lightweight, strong, and versatile materials. These materials could find applications in areas such as aerospace, automotive, and medical devices.

2.4. Smart Materials: Materials that can respond to external stimuli, such as temperature, light, or pressure, are gaining interest. Shape-memory

alloys, self-healing materials, and materials with tunable properties are examples of smart materials.

2.5. Nano-materials: Continued progress in nano technology may lead to the development of novel nano materials with enhanced properties. This includes nano composites, nano particles, and nano structured materials with applications in various fields, including medicine and electronics.

2.6. Fully biodegradable materials: With an increasing focus on sustainability there's a growing interest in materials that are environmentally friendly and can be easily degraded. Biodegradable polymers and materials derived from renewable resources fall into this category.

2.7. Quantum Materials: The myth of quantum science is slowly evolving to offer applications for societal use. Number of Noble prize awardees for quantum science is rising in recent past. Materials with quantum properties are being explored for applications in quantum computing, quantum

communication, and other quantum technologies. Superconductors, topological insulators, and quantum dots are examples of quantum materials.

2.8. Energy storage materials: Energy/ alternative is a key area both in terms of science and application. It is also linked to the well being of the society and planet at large. Advances in energy storage technologies are crucial for renewable energy integration. Improvements in battery materials, super capacitors, and other energy storage solutions are expected.

2.9. Advanced Ceramics: High-performance ceramics with improved mechanical, thermal, and electrical properties are continually being developed. These materials have applications in electronics, aerospace, and medical devices.

2.10. 3D Printing Materials: As 3D printing technology evolves, there will likely be advancements in the materials used for additive manufacturing. This includes metals, polymers, ceramics, and even bioinks for printing biological tissues. ■





ASKCHEMICALS



# ASK Chemicals unveils feeding revolution at IFEX tradeshow

ASK Chemicals, a global leader in the foundry chemicals industry, is excited to announce its participation in the upcoming International Foundry Exhibition (IFEX) in Bangalore. Here, the company will unveil the latest innovation in feeding technology: The most competitive compaction riser ever developed – ECOCAST ONE, alongside newly developed foundry chemicals from the recently acquired manufacturing site in Ranjangaon, Pune.

New solutions from the Ranjangaon plant

This full-fledged, top-notch manufacturing site is set to serve the growing demands of the Indian and Asian markets with leading foundry and other industrial solutions. ASK Chemicals India is proud to launch several groundbreaking products, such as new binders for steel and iron casting applications, and the leading SOLITEC coating technology for unparalleled quality and reliability in high-production automotive environments. On stage will be also the companies REZIANCE resin solutions for refractory applications. REZIANCE phenolic resins are available in liquid or

powdered form.

ECOCAST ONE - the feeding revolution

The highlight on stage at IFEX will be ECOCAST ONE - 'the metal feeding revolution' for the industry. The new patented metal compaction riser stands as the most cost-effective compaction riser solution ever developed and offers a quality quantum leap to riser cap users throughout the Indian foundry landscape.

ECOCAST ONE incorporates key elements from ASK Chemicals' long-standing experience in successful riser solutions. This offers especially clear quality and performance advantages at an excellent cost-performance ratio for foundries that are using riser caps.

"With ECOCAST ONE, we are setting new standards for cost-conscious users of innovative feeder technologies. This product overcomes design and casting technology

limitations, prevents casting defects, and offers on-top significant environmental benefits," states Marcus Friederici, Technical Product Manager Riser and Filter. "Additionally, we have completely eliminated foreign chemical substances with this feeder innovation, providing our customers a safe and emission-free solution. Furthermore, ECOCAST ONE is 100 % recyclable and can be reintroduced into the foundry cycle without any loss." ASK Chemicals will showcase its new solutions from February 2 to 4, 2024 at IFEX in Bangalore, India, in Hall 4, Booth B1.



Fig. 1: ECOCAST ONE's (concept drawing) unrivaled advantages lie in its qualitative and economic supremacy





# Responsible mining in India - from dark holes to smart zones

Mining, once criticized for its traditional, unsafe, and male-dominated nature, is now rapidly evolving into a progressive industry. With a focus on safety, digitization, sustainability, and inclusion, mines are becoming modernized hubs of innovation. India's smart mines showcase advanced technology and inclusive workforce initiatives. Women are breaking barriers in roles traditionally dominated by men, driving the industry's transformation towards green mining. As the world moves towards net zero, sustainable mining practices are crucial, with diversity and inclusion playing key roles. Despite progress, McKinsey reports that women still represent a small fraction of

the global mining workforce, highlighting the need for continued efforts to promote diversity and inclusion. Collaboration among industry, associations, and academia is essential for driving these initiatives forward.

## ***Understanding Diversity and Inclusion in Mining:***

Diversity encompasses multifarious dimensions such as race, gender, age, ethnicity, sexual orientation, disability, and socio-economic background. On the other hand, inclusion denotes the creation of an environment wherein diverse individuals feel valued, respected, and empowered to contribute their unique perspectives and talents. In the mining context, diversity



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Co-Founder,  
Women in  
Mining - India

extends beyond the confines of the traditional workforce to encompass stakeholders like local communities, indigenous groups, and suppliers. One of the critical aspects of responsible mining is creating an environment where every individual, regardless of their gender, can thrive and contribute to the fullest of their potential.

## ***Mining ecosystem and unleashing the power of collaboration***

Mining as a career choice is unheard of at dinner table conversations in families unless a family member is either engaged within mining or is a part of any mining community. This is where the seed needs to be sown. Young school going children need to be made aware of mining as a



career choice. Even during engineering discipline selection, mining doesn't get preference unless someone is extremely passionate. Hence, awareness creation plays a pivotal role here. The dimensions of awareness creation therefore include type of growth career progression mining offers, change in perception of mining, extent of challenge & opportunities for innovation and excellence in mining.

Women in Mining (WIM) India, an industry body is making an on-ground effort with key Industry leaders like Tata Steel, Vedanta, Sandvik etc. to change the perception of present-day mining. Women In Mining (WIM) India joins together to partner and support global

active network of 500 + Globally Inspirational women in mining is at the forefront of transformation in mining.

The vision of WIM India is to see Indian women leading change and creating a meaningful impact in the mining and associated industries. WIM India actively participates as an Industry body towards promoting employment, retention, participation, empowerment, and upward mobility of women and to contribute progressively to the mining Industry. The organization is leveraging active networking, participation in industry events as thought leaders and mentorship to achieve these objectives, as they collaborate with corporates, associations, institutes, and

mining companies, refining companies, researchers, analysts, suppliers, entrepreneurs, consultants, students, retired subject matter experts and so on.

### **Benefits of Diversity and Inclusion in Mining:**

#### **Improved productivity:**

Diversity also has a business case; some Australian studies have shown that women operators of heavy mining equipment have been able to significantly improve the productivity and life of the machines with significantly reduced need for maintenance and changing spares. This stems from the very fact that women are nurturers and handle everything with utmost care which clearly reflects on the job also.

#### **Accelerated transformation:**



WIM groups across 6 continents, 38 countries, collaborating closely with WIM UK during its establishment phase. This global cohort and strong and

autonomous bodies in this field. WIM India's span of influence includes women and men associated with end-to-end value chain and ecosystem of mining –

Diverse teams are more adaptable and amenable to any kind of transformation. Especially, for sustainable mining it is imperative that teams challenge status quo,



## Analysis

unlearn conventional methods of mining and embrace new ways across the mining value chain with agility and speed. Diversity and inclusion in the teams certainly accelerates this transformation.

### **Effective Decision-Making:**

Diverse teams amalgamate diverse perspectives embracing distinct experiences, knowledge, and viewpoints. This diversity of thought

to come up with innovative solutions to the myriad challenges confronting the mining industry, be it operational efficacy, sustainability paradigms, community relationships or green product certifications like Green Steel, Green Aluminium, Copper Mark.

Elevated Employee Engagement and Retention: Inclusive workplaces nurture a sense of belonging and allegiance among

their allegiance to social responsibility and ethical business ethos. This engenders trust and goodwill among stakeholders, including investors, customers, governments, and local communities, ultimately burnishing the company's reputation and social license to operate.

### **Strategies for Promoting Diversity and Inclusion in Mining:**

**Leadership Advocacy:** Senior



enriches problem solving acumen and decision-making processes, fostering comprehensive solutions that account for a spectrum of factors and potential impacts.

**Heightened Innovation:** Inclusive environments incubate creativity and innovation by fostering collaboration and ideation among diverse cohorts. When employees feel encouraged to express their ideas, they are more inclined

employees, fostering heightened levels of engagement and retention. When individuals feel esteemed and respected for their intrinsic worth, they are more predisposed to remain steadfast in their commitment to their work and the organization, thereby mitigating turnover rates and associated costs.

### **Enhanced Reputation and Stakeholder Relations:**

Companies that prioritize diversity and inclusion signal

leadership must spearhead diversity and inclusion initiatives, seamlessly integrating them into the company's overarching strategy and ethos. Leaders should serve as sponsors, walking the talk and advocating diversity through their actions, cultural shifts, policies, and decision-making paradigms.

**Diversified Recruitment and Hiring Practices:** Adoption of recruitment and hiring practices that prioritize diversity and inclusivity is



paramount. This encompasses instituting diverse hiring panels, leveraging diverse sourcing channels, and ensuring job descriptions are devoid of biases. Additionally, initiatives should be enacted to attract and retain talent from underrepresented demographics in the mining industry.

**Agile Policies:** When it comes to retaining diverse employees, which is where most of the organizations struggle, it is imperative that people policies and practices are agile and flexible. Job rotations, Flexi-days, timings, extended maternity work from home days, paternity leaves, in-house day-care facilities etc. are just some of the tools to ensure diverse workforce is supported across the career and biological lifecycle.

**Ecosystem:** For a very long time, there have been debates about absence diverse ecosystem for fostering inclusion. For instance, ladies' washrooms, ramps for mobility in the vicinity of mine sites, Personal Protective Equipment (PPEs) designed for a diverse set of workforces rather than force fitting standard sizes and types available

**Spouse placement:** Another rather unplugged lever is spouse placement, when it comes to men, a lot of times, their educated and experiences wife's give up on their flourishing careers to relocate to a remote mining site. Organizations have this category as a readily available untapped talent pool when the entire family can be engaged for a

very long term.

**Training endeavours:** Participation in regular training programs around gender sensitivity should be encouraged to foster awareness about unconscious biases, nurture cultural competence, and amplify inclusive conduct



among employees irrespective of gender and levels within the organization.

**Mentorship:** Structured mentorship programs provide a safe space for employees to voice their concerns and shorten the learning curve with experience sharing by carefully mapped mentors. Most of the International Women in Mining groups run

these curated programs with a right mix of group and one on one sessions. It is a very powerful tool for retaining diverse employees across the career lifecycle.

**Supplier Diversity Programs:** Efforts to foster diversity and inclusion should extend beyond the workforce to encompass suppliers and contractors. Implementation of supplier diversity programs that accord primacy to collaboration with minority-owned, women-owned, and indigenous-owned enterprises fosters economic opportunities and propels diversity across the supply chain.

**Community Engagement and Partnerships:** Active engagement with local communities, indigenous groups, and other stakeholders is indispensable. Genuine partnerships founded on mutual respect, trust, and collaboration should be forged. Skill Council for Mining sector is working with local administration in mining communities and Corporates to upskill, reskill and provide vocational trainings to locals.

**Conclusion:**

Embracing diversity and inclusion isn't merely a moral obligation but a strategic imperative for the mining industry's sustained viability, business value and efficacy. By fostering a culture of diversity and inclusion, mining enterprises can harness the full spectrum of their workforce's potential, catalyse innovation, fortify stakeholder relations, and foster a positive social and environmental outcome. As the mining landscape continues to evolve, prioritizing diversity and inclusion will serve as an anchor in navigating



# ALUCAST 2023 attracts good number of Visitors



The Aluminium Casters' Association (ALUCAST)®, India hosted its annual event – ALUCAST 2023 on the theme INTEGRATED APPROACH TO FUNDAMENTALS & ADVANCED TECHNOLOGY IN DIECASTING on the 24<sup>th</sup>-25<sup>th</sup> November 2023 at at Taj Vivanta, Vadodara, Gujarat it was Organized by Aluminium Casters' Association (ALUCAST)®, the two-day Event attracted a good number of Delegates, Exhibitors, and Visitors.

ALUCAST 2023 was inaugurated by Mr. Ganesh Jivani, Managing Director at Matrix Comsec Pvt. Ltd. based out of Vadodara, Gujarat, in the presence of Mr. Niranjana Toraskar, Trustee & Hon. Treasurer ALUCAST, Mr. Natarajan Ganeshan, Trustee ALUCAST, Ms. Kirti Ramdasi, Secretary

ALUCAST & several top executives & delegates from the various die casting & the allied industries. During his inaugural address, Mr. Jivani spoke at length about the latest developments & the future of the electronics & telecom industry in the country & the role the Indian die casting industry can play to cater to the casting requirements of the electronics & telecom industry. Mr. Jivani stressed that it is the need of the time that the die casting industry also explores customer base beyond the automotive sector. He stated that the electronics &

security systems industry sector looks forward to hand holding & collaboration for the production of specialized casting components. He further added, "ALUCAST 2023 is a fantastic forum which has brought together members across the die casting value chain - be it die casters, tools manufacturers – the entire eco system. The theme of the event "Integrated approach to fundamentals & advanced" is pertinent and well chosen.

The focus of ALUCAST 2023 was to strengthen the engineering fundamentals of die casting to steer innovation & development of advanced technologies to produce quality castings & meet the expectations of the changing industry scenario to seek more sustainable & environment friendly casting solutions.

The event comprised of the 2-day Technical Conference &





Table Top Display. The Technical Conference had fifteen Research Paper Presentations & Technical Presentations from the leading Die Casting Experts. Sixty delegates from the die casting industry & the allied industry attended the Conference.

The special highlight at the Conference was the "OPEN DISCUSSION FORUM". The Expert Panel –

Former GM, Buhler India (Die Casting), Mr. Natarajan Ganeshan, Director, Ultraseal India, Mr. Tej Bambra, Chief Sales & Marketing Officer, Rockman Industries & Mr. Rajesh Aggarwal, Director, Techsense Engineering Services addressed the challenges faced by the die casting industry with respect to raw material, operations, quality, sales & marketing through QA.

several leading global Aluminium Castings manufacturers, equipment & allied product manufacturers who showcased their latest, technically advanced products, tools, equipment and consumables. The Table Top Display gave opportunity for the Die Casters and the manufacturers and the suppliers from the Allied Industry to showcase their products and services and connect with their prospective clients and customers.

ALUCAST 2023 received participation from more than



40 companies and leading brands – Tata Motors, Buhler, Honda Motorcycles & Scooters, ASK Automotive Ltd., Rockman Industries, Frech India Machinery, Foseco, Lubrikote, Fondarex, Silcarb, Magma Engineering, Proterial India, Marposs, Carl Zeiss to name a few of them.

The ALUCAST 2023 Technical Volume & the ALUCAST Technical Journal December 2023 Special Issue were released during the inaugural.

ALUCAST 2023 – the Annual Technical Conference & the Table Top Display on Die Casting Technology, concluded on a successful note on 25<sup>th</sup> November 2023. ■



Mr. Niranjan Toraskar,

The Table Top Display had



# Lithium mineral deposits in India - An overview



Figure 1: Villagers show lithium stones in J & K Reasi district.

**(1)Introduction:** Lithium, an alkali metal, is one of the key components in rechargeable batteries that are used in mobiles, laptops, electric vehicles and in medical devices like pacemakers. It is also used in energy storage solutions. India imports all major components that are required to make the lithium-ion cell. India imported lithium worth Rs 23,171 crore in FY23, for the manufacturing of electric accumulators, including separators. In FY22, Indian imports for lithium-ion were Rs 13,673.15 crore.

**(2)Quantity of Lithium deposits:** India found its first lithium deposits in Jammu

and Kashmir with estimated reserves of 5.9 million tones. With the discovery of these massive lithium reserves in Jammu and Kashmir (J&K), India would become one of the world's largest lithium producers. The Geological Survey of India (GSI) is still in the early phases of testing, but early results on the quality of the lithium are promising. The government is extremely enthusiastic about the find and plans to auction the site in blocks by the end of the year.

The quality is said to be top grade and the size of the deposits substantial. In India's quest for strategic minerals, it is no doubt a big find. Despite the good news,



**Dhiraj K. Chauhan**  
(Director: METCON-Metallurgical Consultants)

experts caution that multiple technical and ecological challenges have to be overcome before commercial lithium mining can take off in India. Getting a correct estimate on the size of the reserve is the first challenge. Though the GSI has inferred an estimate of 5.9 million tonnes – second to Chile's 8 million tonnes – this is only a preliminary evaluation.

As per The Hindu- Business Line report of 29-09-2023 BYABHISHEK LAW, Exploration for additional lithium sources over and above 5.9 MMT is already going on in the Salal Hamima region of the Resai district of Jammu.

Lithium reserves were discovered on Revant hill in



Degana in Rajasthan's Nagaur district during a survey conducted by the Geological Survey of India (GSI). It is believed that these reserves can meet 80% of the country's demand. There is evidence of 1.36 MMT of lithium here.

### (3) Nature of Lithium

**Mineral:** Lithium is embedded inside bauxite columns. The central agency will now write to the Jammu and Kashmir administration, requesting the Union Territory to take up the general exploration as per the norm applicable for bauxite mining, explained a GSI official. It can take up the G2 work only if a state or UT expresses its inability. Going by the pace of the Indian bureaucracy, this may take time. Bauxite mining is also power-intensive and the northern state will have to make arrangements for adequate electricity supply. The lithium in J&K is hard rock, not the brine commonly found in South America. Hard rock lithium, the kind typically found in the Eastern hemisphere, requires much more water and electricity to mine and process than the lithium produced from brine.

### (4) Quality of Lithium

**Deposits:** The GSI study shows the presence of best quality lithium in abundant quantities in the foothills of Mata Vaishno Devi shrine at Salal village (Reasi)," said J&K Mining Secretary Amit Sharma. Against the normal grade of 220 parts per million (PPM), the lithium



Figure 2: Lithium reserves in Degana, Rajasthan.

found in J&K is of 500 PPM plus grading.

### (5) Plans to Utilize Lithium

**resources:** An executive for a battery company told Indian outlet -The Print that "this (availability of Lithium) will have a huge impact on the cost of batteries and make EVs more affordable for consumers." The managing director of the "alternative fuel" provider Greenfuel Energy Solutions stated that "India's plan to increase EV penetration by 30 percent by 2030 relies heavily on lithium," which means the lithium reserves have great potential for "creating jobs" and "generating revenue." One government secretary likewise called the minerals stash a "game-changer in the economic development of Jammu and the country." According to NITI Aayog, the total EV sales by 2030 could go up to 80 million from the 1.3 million sales reported till July 2022. A report from the Central Electricity Authority (CEA) claims that by 2029-30 India will have 2.700 Megawatt of battery storage capacity.

The Narendra Modi

government has set an electric mobility target of 30 per cent for private cars, 70 per cent for commercial vehicles and 80 per cent for two-wheelers and three-wheelers by 2030. An alternative source will reduce dependence on China, which currently accounts for more than 50 per cent of global supply of lithium-ion batteries.

### (6) Economic prospects of Lithium mineral:

Even as the Union government is silent on why it took such a long time to announce what appears to be one of the world's biggest reserves of lithium, energy researchers hope that an indigenous source of the mineral will help India move faster on the clean energy transition path and achieve net-zero by 2070. A domestic reserve will also save a lot of foreign exchange, with India spending more than Rs 26,500 crore between FY 18-19 and FY 20-21 to import lithium and lithium-ion batteries. With a steep rise anticipated in the production of electric vehicles and scooters and expansion of solar power, the demand for lithium is set to shoot up.

"Having such a resource in India is in our favour, but we have to work hard to make a proper assessment and create a roadmap on processing once the initial euphoria is over. Otherwise, we would be back to square one and continue to depend on imports said B K Mishra, former director of CSIR's Institute of Minerals and Materials Technology, Bhubaneswar. With GSI taking





## Technology

more than 20 years to move from reconnaissance (G4) to prospecting (G3) stage, experts say the agency and the government need to work hard to quickly progress to general exploration (G2) for better assessment of the shape, size and grade of the deposit. Also, a clear picture is needed on the deposit's depth to determine what kind of mining technology is needed, and whether the use of such technology is feasible and desirable in the earthquake-prone areas close to the Himalayas.

### (6) Plans for Exploration:

India's federally administered region of Jammu and Kashmir will auction its lithium reserves over the next few weeks, a government source with close knowledge of the matter said. "The auction will happen soon and some overseas miners have shown interest," the source said, declining to be identified because of the sensitive nature of discussions. The Ministry is in the process of working out the ASP or the reserve price of these reserves. Mines Secretary V L Kantha Rao told news agency PTI that, The Centre will soon invite bids in the next two weeks for 20 critical mineral blocks, a top government official said on Tuesday. The auction process will involve minerals such as lithium and graphite.

Last month, the Union cabinet approved royalty rates for three critical and

strategic minerals. The approved royalty rates for lithium, Niobium and REE are 3 per cent, 3 per cent and 1 per cent, respectively.

The news has given hope to manufacturers of lithium-based batteries, electric vehicles, solar equipment, and other industries that are currently dependent on lithium imports from China and other countries.

According to government data from the Ministry of Commerce and Industries, between April-December of 2022-23, India shelled out Rs



163 billion for the import of lithium and lithium-ion.

### (7) Concerns on Exploration of lithium mineral:

Other young villagers in Reasi, the lush Jammu district where the lithium was found, told the financial outlet Money control that they worry about the destructive potential of large-scale lithium mining on the glacier-packed Himalayan mountain ranges which include soil, trees, farms, water supplies, air quality, and hydroelectricity plants located in and around

the Salal-Haimana area. (Like much of the rest of India, Reasi has been battered by the effects of climate change, suffering from frequent earthquakes and droughts and erosion). More residents told the publication that the introduction of miners and machines could lead to government land grabs on developers' behalf, thus displacing the population. Many have brought these concerns to government officials; additionally voicing fears that security needs for mineral operations will install even more Indian troops in the region.

### (8) Plans to acquire overseas mines:

Khanij Bidesh India Ltd, (KABIL) was formed in August 2019 to identify, acquire, develop and process strategic minerals overseas for use in India. This state-owned joint venture formed to scout for minerals overseas, was in the "final stages" to secure a few lithium blocks in Argentina. Discussions with the Chilean government were also underway to secure lithium blocks although talks were still in early stages, the source added.

Other countries like Australia are also on the radar. Australia with a vast lithium reserve is another country India is eyeing for cooperation.

It remains to be seen whether the Khanij Bidesh India Limited, which is partnering with foreign companies on lithium prospecting and exploration, can successfully use the GSI announcement to secure a better deal for India, which



does not have much experience in lithium mining. (Report from Deccan Herald

of positive results (more lithium finds) this year itself. This could add to our lithium



published on 19<sup>th</sup> Feb. 2023). Additionally, lithium mining and mineral mining in general has historically been an exploitative industry that benefits Western manufacturers instead of raw material producers in the Global South.

India has much to gain from lithium, but it must develop the industry carefully to harmonise the people-profit-planet triple bottom line.

India is hopeful of finding more lithium reserves in the Union Territory of Jammu and Kashmir and continues exploration in the region. According to officials, exploration for additional lithium sources is already going on in the Salal Hamima region of the Resai district of Jammu. As per Mr Vivek Bharadwaj, Secretary, Mines Ministry "Exploration continues in the region (Resai), and we are hopeful

resource base,"

GSI has started the G2 survey to explore the possibility of discovering more reserves of lithium. The discovery of the lithium reserves in Degana can pose a challenge to China's global lithium monopoly.

Hindu Businessline reported quoting ministry officials that, in Bolivia the government is looking at downstream tie-ups, wherein it will facilitate EV battery-making and processing set-ups by Indian companies who will invest in the South American nation.

Prominent energy giants like Coal India Ltd. and NTPC Ltd. have been planning to foray into the mining sector to tap into these essential materials.

**(9) Impact of Lithium mineral processing:** India must also be cautious about the potential environmental impact of the processing

phase. With lithium ore processing, the largest contributor to carbon emissions is the efficiency of the power grid itself. Despite India's sizeable renewable capacity, the Indian power grid still has a relatively high carbon intensity per unit of electricity produced. Linking lithium processing plants to the power grid in its current state would therefore result in much higher carbon emissions from the process than usual. In addition to its renewable energy targets, the government can also try to mitigate the environmental effects of lithium production by encouraging the construction of plants in regions of India with relatively greener power grids.

**(10) Conclusions:** India can benefit from the production of EV batteries themselves. A robust Indian EV battery sector would benefit the country as it moves towards electric vehicles and contribute to export-driven economic growth. The government has already begun to encourage the nascent sector by introducing the National Programme on Advanced Chemistry Cell (ACC) Battery Storage as part of the Make in India initiative earlier this year. The programme will grant over US\$2 billion in incentives to EV manufacturing companies like Hyundai Motor India, Reliance Limited, Ola Electric, and Rajesh Exports. Equipping the Indian economy for every step in the lithium lifecycle is the best way to ensure that the benefits of Indian lithium mining stay in India. ■



# Castings & Foundries Expo India – A Huge Success



The inaugural Castings & Foundries Expo India, a concurrent event launched by ENGIMACH, proved to be a resounding success. This concurrent event marked the first attempt at establishing an Indian Castings Bazaar for international buyers, garnering positive feedback and a desire for regular biennial editions.

Feedback from participants was overwhelmingly encouraging, with many expressing a keen interest in promoting the Indian castings market globally and committing to future participation. The average exhibitor goal achievement rating was notable, and active participation in the formal survey yielded constructive suggestions for enhancing future editions. The organizers are pleased

with the reception of the event, noting the strengthened determination to improve further in subsequent editions. Exhibitors, including representatives from BEHARI LAL GROUP, ELECTROTHERM (INDIA) LIMITED, and GORECHA METAL TECH PRIVATE, etc lauded the event's impact on raising awareness and fostering connections within the foundry industry.

37 Foundries from all over India participated in the Buyer-Seller Meets with 30 International Buyers from 14 countries. This was a significant first step to fulfilling the aim of the trade show - hosting an Indian Castings Bazaar! In conclusion, the Castings & Foundries Expo India demonstrated significant potential in advancing the

castings sector, with a promising outlook for future editions.







# Enhancing Casting Filtration Efficiency with 3D Printing

Ceramic foam filters have become the leading choice for metal filtration in casting since the 1980s. They are extensively used across various alloys and casting technologies, providing cleaner castings with improved properties. Over the years, our understanding of filter application has advanced significantly and guidelines have been developed to ensure their durability. Despite their limitations in pore size and design flexibility, ceramic foam filters outperform other filter types in terms of filtration efficiency and turbulence control. The emergence of additive manufacturing, particularly 3D printing, offers new opportunities for customised filter designs with precise pore sizes and structures, further optimising casting filtration

## INTRODUCTION

Ceramic foam filters (Figure 1) became extensively used in the filtration of castings in the 1980's and are now the leading type of metal filtration system used to produce castings in most alloys and casting

technologies.

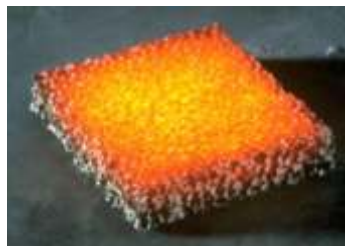


Figure 1. Ceramic Foam Filters



Figure 2. Research into the production of extruded 3D printed filters

Over the last 40 years our knowledge and understanding of all aspects of filter application has advanced considerably; filter application is now established in the production of castings of less than 100 g to more than 25 tons. A variety of materials are used as the ceramic base, the selection is based on the alloy to be cast and the required temperature performance. Filters are also commonly applied in "Direct Pour Units" removing the need for a separate running system providing enhanced yield and directional solidification. Application



**Nick Child**  
International Marketing Manager, Clean Iron & Steel



**Stephan Giebing**  
European Product Manager, Ferrous Filtration

requirements are understood and guidelines developed, to ensure filters do not break in the very demanding application conditions. Filter limitations are also recognised, including the mechanisms and materials that block filters, so that flow rates and capacities in specific applications can be predicted. Casting simulation and flow modelling through computer simulation packages, now provides greater insight into the molten metal flow enhancement generated by filters. The reduction in turbulence decreases the potential for mould erosion and misses run defects, together with reducing exposure to air and the generation of oxide films and inclusions. Ceramic Foam Filters have restrictions including, pore sizes and limitations in the flexibility in design. Other filter types are commercially available but not extensively used as they in general provide a lower level of filtration efficiency and turbulence control

## ADDITIVE MANUFACTURING TECHNOLOGIES DELIVERING NEW STRUCTURES

Using additive manufacturing technologies (3D Printing) in casting filtration technology, allows for



the creation of objects which are built up layer by layer. The term Additive Manufacturing covers a number of different techniques including stereo lithography, sheet lamination and binder jetting. Foseco used a binder jetting technique as the base for launching its first 3D printed filter - STELEX\* Optiflow3D (Figure 3).



Figure 3. Additive manufactured filters - STELEX Optiflow3D



Figure 4. STELEX Optiflow3D available in a range of structures and sizes

Ceramic Foam Filters have served the industry very well, but as previously mentioned different alloys and casting types have varying filter performance needs. The first structures to be offered in the STELEX Optiflow3D product range are based on Gyroid and Voronoi structures, the filters are available in an increasing range of product sizes and porosities (Figure 4). STELEX Optiflow3D filters are based on a carbon bonded alumina ceramic and therefore have a low density and thermal heat capacity. The filters are

suitable for application to both iron and all steel alloys. Foseco have their own inhouse foundries and have developed tests to replicate some of the most demanding conditions the filters will experience in customers applications. These tests are used both during the development of new products, and for production batch quality control during manufacturing, to ensure confidence that the required performance standards have been met for application by our customers (Figure 5). Additive manufactured filters extend the range of castings that are filterable. Very large castings are commonly not filtered due to the complexity of applying the large number of filter units required. With the advent of alternative structures to foam, the capacities of filters will be extended so a more manageable number of filters will be required, particularly for heavier castings (Figure 6). For example, a 22 tonnes ductile iron windmill rotor hub may require 18 ceramic foam filters to be applied, this can lead to a complex gating system for the filter application and in some cases bypassing of safe filter application (Figure 7). The new STELEX Optiflow3D filters will facilitate the need for fewer filters, and the possibility to filter even larger castings.

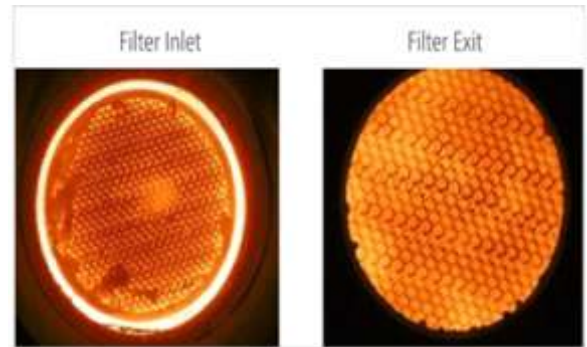


Figure 5. STELEX Optiflow3D after R&D testing with molten stainless steel



Figure 6. 22 pieces of STELEX ZR applied to a large SG Iron casting requiring Holloware for each filter



Figure 7. 18 pieces STELEX PrO 150x150x30/10 ppi applied to an iron windmill rotor hub



# Gargi HA Stall: Bridging Indian and Overseas Foundry Professionals

From 2<sup>nd</sup> to 4<sup>th</sup> February 2024, GARGI HA Stand (Stand No. B2, Hall 4 @ IFEX-2024) was Meeting Point for Foundrymen from all parts of India and Abroad. Members of Kapur Family and other team members of Gargi HA were busy welcoming the delegates and discussing about their products / technologies and exchanging thoughts and information. The exhibit stands showcased various case studies from several key customers as well new/upcoming products in Gargi HA product portfolio.

Mr. Gaurav Kapur, Mr. Varun Kapur and GARGI HA team were making special efforts to welcome

Foundrymen worldwide to develop deep understanding and strong business relations among the Foundrymen.

Mr. Franz Butz - President, Mr. Amine Serghini – Vice President(Global Sales & Marketing), Mr. Bernhard Mueller - Regional Vice President Asia & Pacific, Mr. Klaus Oosterhof, Business Development Manager, Mr. Markus Schabrucker – Director(Product Management & Application Management), Mr. Holger Barth – Product Manager(3D Binders), Mr. Lars Zumbusch - Managing Director(Chemex Foundry Solutions GmbH) and Mr. Georg Grassl - Global Product Manager(Chemex

Foundry Solutions GmbH) of M/s. Huttenes Albertus Chemische Werke GmbH (Member of HA Group), Germany, interacted with the foundrymen and shared their experience on Resins & Coatings.

They have huge Stand of 288 Sq meters (24 m x 14m) with 50 GHA employees on the stand. Mr. Franz Butz was moderator for Moderator for one of important Plenary session “Tech Process for Tomorrow – What does the future unveil” & Presentation of Technical paper by Mr. Holger Barth – Challenges of 3D Printing in Foundry Applications.

Mr. Mark Fenyes Chairman & Mr. Andy Pickering, Sales



Director of Omega Foundry Machinery Ltd., U.K. along with Mr. Nitin Sane, Managing Director of Omega Sane Foundry Machinery Ltd., Pune welcomed foundrymen and explained them about the use of various types of Continuous Mixers, Sand Reclamation and Green sand. They explained in detail about the advantages/benefits of the system.

**Gargi Huttenes Albertus Pvt.Ltd.**- HA Group of Companies – A leading manufacturers of Foundry Resins & Coatings in India.

**Gargi Industries** - Since last 62 years, Gargi Industries is engaged in manufacturing Foundry Fluxes, Chemicals and Metal Feeding Aids suitable for Ferrous and Non-Ferrous Foundries.

**Gargi Engineering Enterprises Pvt.Ltd.** is in operation for more than 41 years. It represents many leading manufacturers of Foundry Plant, Machinery and Materials from India and abroad. Some of these companies are:

a. **Omega Foundry Machinery Ltd., U.K.**

b. **Omega Sane Foundry Machinery Ltd., Pune**

With the above profile, GARGI is rapidly becoming a complete solution provider to the foundry industry.







# EMI/EMC Shielding: Metals, Alloys, and Composites

## 1. Introduction

In today's interconnected world, where electronic devices are omnipresent, ensuring electromagnetic compatibility and mitigating electromagnetic interference are paramount. The significance of this article lies in its comprehensive exploration of electromagnetic shielding using metals, alloys, and composites. With the proliferation of electronic devices in various industries such as telecommunications, automotive, aerospace, and healthcare, the demand for effective EMI shielding solutions continues to rise. Understanding the principles and advancements in shielding materials is crucial for engineers, researchers, and manufacturers to design and produce reliable electronic systems that meet stringent EMC standards. Moreover, as electronic devices become smaller, faster, and more powerful, the challenges associated with EMI and EMC become more complex. This article addresses these challenges by delving into the intricacies of shielding materials and technologies, providing valuable insights for professionals involved in

the design, development, and deployment of electronic systems. By emphasizing the importance of EMI shielding and EMC, this article contributes to the advancement of technology and the improvement of electronic devices' reliability, safety, and performance.



Uncontrolled EMI can lead to data corruption, signal degradation, or even complete system failure. Shielding is a primary method for mitigating EMI, and various materials, including metals, alloys, and composites, are employed for this purpose.

## 2. Significance of EMI Shielding

The significance of EMI shielding cannot be overstated in today's interconnected world. In applications ranging from consumer electronics to aerospace and automotive industries, reliable EMI protection is essential to ensure the proper functioning of electronic systems. For example, in



medical devices, EMI can disrupt critical signals, posing risks to patient safety. Moreover, in military and defense applications, EMI can compromise the integrity of communication and surveillance systems, jeopardizing national security. Therefore, the development of effective shielding materials and techniques is imperative to address these challenges

## 3. Properties of Shielding Materials

Metals, alloys, and composites exhibit unique properties that make them suitable for EMI shielding applications. Metals such as copper, aluminum, and steel are widely used due to their high electrical conductivity, which enables effective attenuation of electromagnetic fields.

Alloys, such as mu-metal and stainless steel, offer enhanced magnetic shielding capabilities, making them ideal for applications where magnetic interference is a concern. Composites, on the other hand, combine the advantages of different



**Digvijay Vishwanath Patankar**

Director - Technology

Euro TBA Protective Technology Solutions India Pvt. Ltd.



materials, offering lightweight and customizable shielding solutions.

Understanding their electromagnetic properties is essential for designing effective shielding solutions.

**Here's a detailed look at the key properties:**

### 3.1 Conductivity (Electrical Conductivity):

**Definition:** Conductivity refers to the material's ability to conduct electric current.

**Significance:** Materials with high electrical conductivity are effective at shielding electromagnetic fields by diverting and dissipating currents induced by external electromagnetic radiation.

**Measurement:** Typically expressed in Siemens per meter (S/m) or its inverse, resistivity in Ohm-meters ( $\Omega\cdot m$ ). Lower resistivity indicates higher conductivity.

### 3.2 Permeability (Magnetic Permeability):

**Definition:** Permeability is the measure of a material's ability to support the formation of a magnetic field within itself.

**Significance:** Higher permeability materials facilitate better magnetic shielding by attracting and redirecting magnetic fields around the shielded region.

**Measurement:** Often represented as the ratio of the material's magnetic permeability to that of a vacuum ( $\mu/\mu_0$ ), where  $\mu_0$  is the permeability of free space ( $4\pi \times 10^{-7}$  H/m).

### 3.3 Magnetic Susceptibility:

**Definition:** Magnetic susceptibility describes how easily a material can be magnetized by an external magnetic field.

**Significance:** Materials with high magnetic susceptibility can effectively redirect and absorb magnetic fields, contributing to effective shielding.

**Measurement:** It is dimensionless and often expressed as a unitless ratio.

### 3.4 Dielectric Constant (Relative Permittivity):

**Definition:** Dielectric constant is a measure of a material's ability to store electrical energy in an electric field.

**Significance:** Materials with high dielectric constants can attenuate electric fields, contributing to electromagnetic shielding.

**Measurement :** Relative to the permittivity of free space ( $\epsilon_0$ ), often symbolized as  $\epsilon_0$  (dimensionless).

It's worth noting that the effectiveness of a shielding material depends not only on these properties but also on the frequency range of the electromagnetic radiation being shielded. Different materials may be more effective at shielding certain frequencies due to their inherent properties and the skin depth phenomenon, where electromagnetic fields penetrate materials to different depths depending on frequency.

### 4. Mechanisms of shielding Material

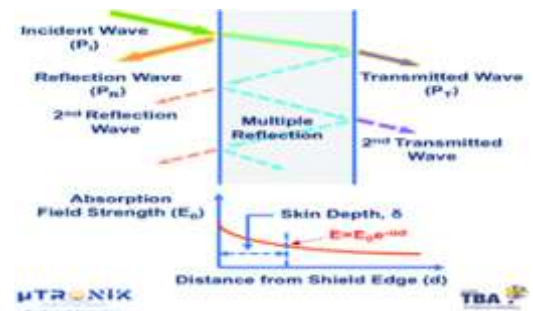


Figure 1 Mechanism of EMI Shielding

The mechanisms underlying EMI shielding involve the absorption, reflection, and/or redirection of electromagnetic waves.

When an electromagnetic wave encounters a shielding material, it induces electric currents within the material, which dissipate the energy of the wave through Joule heating. Additionally, materials with high permeability can redirect magnetic flux lines, effectively diverting magnetic fields away from sensitive components. The microstructure and composition of shielding materials play crucial roles in determining their shielding effectiveness.

### 5. Metals in EMI Shielding

Metals have been the traditional choice for EMI shielding due to their excellent electrical conductivity and ease of fabrication. Copper and aluminum are particularly favored for their affordability and effectiveness in attenuating electromagnetic radiation. Copper, in particular, is widely used in applications requiring high-frequency shielding, such as telecommunications and data centers. Aluminum, on the other hand, offers a lightweight and corrosion-resistant



## Technology

alternative, making it suitable for aerospace and automotive applications.

Different metals and materials are utilized for EMI shielding based on their conductivity, magnetic properties, and other characteristics.

### Here's an overview of some common materials used for EMI shielding:

**5.1 Copper:** Copper is one of the most widely used metals for EMI shielding due to its excellent conductivity and relatively high magnetic permeability. It can effectively redirect electromagnetic fields away from sensitive components.

**5.2 Aluminum:** Aluminum is another commonly used metal for EMI shielding, valued for its lightweight properties and good conductivity. It is often used as a cost-effective alternative to copper.

**5.3 Nickel:** Nickel offers good magnetic properties and is frequently used in alloys for EMI shielding applications. Nickel-based alloys such as nickel-iron (permalloy) and nickel-copper are commonly employed for their high permeability and attenuation properties.

**5.4 Steel:** Steel, particularly alloys like stainless steel, can provide effective EMI shielding due to its magnetic properties. It is often used in applications where mechanical strength and durability are important in addition to shielding effectiveness.

### 6. Alloys in EMI Shielding

Alloys exhibit unique magnetic properties that make them valuable for magnetic shielding applications. Mu-metal, a nickel-iron alloy with high magnetic permeability, is commonly used to shield sensitive equipment from low-frequency magnetic fields. Its ability to redirect magnetic flux lines makes it indispensable in applications such as magnetic resonance imaging (MRI) machines and magnetic sensors. Stainless steel alloys, on the other hand, offer a combination of corrosion resistance and magnetic shielding, making them suitable for harsh environments.

Alloys offer unique advantages over pure metals, including enhanced mechanical properties and tailored electromagnetic characteristics.

This section examines popular alloy compositions used for EMI shielding, such as brass, bronze, and nickel-based alloys. It discusses their composition-property relationships and suitability

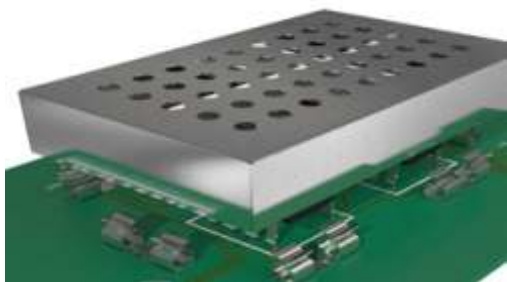


Figure 2 BeCu PCB Shielding CAN by ETIPL



Figure 3 Mu-Metal RFI Shielding by ETIPL

for specific shielding requirements.

**6.1 Mu-Metal:** Mu-metal is a specialized nickel-iron alloy with very high magnetic permeability, making it highly effective for EMI shielding, particularly in applications where magnetic fields need to be redirected or contained.

**6.2 Titanium Alloys:** Titanium and its alloys offer a combination of lightweight, strength, and corrosion resistance, making them suitable for aerospace and military applications requiring EMI shielding along with other performance criteria.

### 7. Composites in EMI Shielding

Composites offer a versatile approach to EMI shielding, combining the advantages of different materials to achieve optimal performance. Carbon fiber composites, for instance, are lightweight and electrically conductive, making them ideal for aerospace and automotive applications. Graphene-based composites, on the other hand, exhibit exceptional electrical conductivity and mechanical strength, offering promising solutions for next-generation EMI shielding materials. By tailoring the composition and structure of composites, researchers can develop

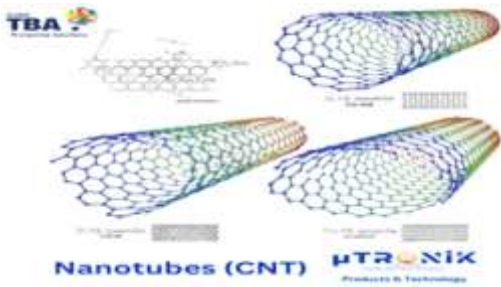


Figure 4 CNT by ETIPL

materials with tailored EMI shielding properties.

### 7.1 Carbon-Based

**Composites:** Carbon-based materials, such as carbon fiber and graphite, can offer excellent electromagnetic shielding properties, especially in applications where weight reduction and mechanical strength are important considerations.

### 7.2 Polymer-Matrix

**Composites:** Polymer-matrix composites reinforced with conductive fillers like carbon nano tubes or metallic particles can provide lightweight and flexible EMI shielding solutions, particularly in applications where conformability and versatility are required.

### 7.3 Ceramic-Matrix

**Composites:** Ceramic-based materials can offer high-temperature stability and corrosion resistance, making them suitable for harsh environments requiring EMI shielding, such as in aerospace and automotive industries.

### 7.4 Other Metals and Metal

**Alloys:** Various other metals and metal alloys, including brass, bronze, and tin-plated steel, are also used for EMI shielding depending on specific application

requirements such as cost, weight, and performance.

## 8. Recent Advancements in EMI Shielding Technologies

Recent advancements in materials science and nano technology have led to significant improvements in EMI shielding technologies. Nano structured materials, such as carbon nano tubes and metallic nano particles, exhibit unique electromagnetic properties that enable superior shielding performance. Meta materials, engineered structures with unconventional electromagnetic properties, offer unprecedented control over electromagnetic waves, paving the way for innovative EMI shielding solutions. Additionally, additive manufacturing techniques enable the rapid prototyping and fabrication of complex shielding structures with enhanced performance and functionality.

## 9. Challenges and Future Directions

Despite the progress made in EMI shielding technologies, several challenges remain to be addressed. One of the primary challenges is achieving broadband EMI shielding across a wide frequency range, particularly in wireless communication systems operating at multiple frequencies.

Moreover, there is a growing need for environmentally sustainable shielding materials that minimize the use of hazardous substances and reduce the carbon footprint of electronic devices. Future research directions include the development of multifunctional materials that combine EMI shielding with other desirable properties, such as mechanical flexibility and thermal management.

## 10. Conclusion

In conclusion, Electromagnetic Interference (EMI) poses significant challenges in modern electronic systems, necessitating effective shielding solutions to ensure reliable operation.

Metals, alloys, and composites play crucial roles in EMI shielding, offering a diverse range of properties and mechanisms for attenuating electromagnetic radiation. Recent advancements in materials science and nano technology have led to the development of innovative shielding materials with superior performance and functionality.

However, challenges such as broadband shielding and environmental sustainability remain to be addressed.

By addressing these challenges and exploring new avenues for research, the field of EMI shielding is poised for further advancements, enabling the continued evolution of electronic technologies in the years to come.



### Copper Market Forecast 2023/2024

The International Copper Study Group (ICSG) met in Lisbon, Portugal, on 3-4 October 2023. Government delegates and industry advisors from most of the world's leading copper producing and using countries participated to discuss key issues affecting the global copper market. In the meeting of the Statistical Committee, the ICSG view of the world balance of refined copper production and use was developed.

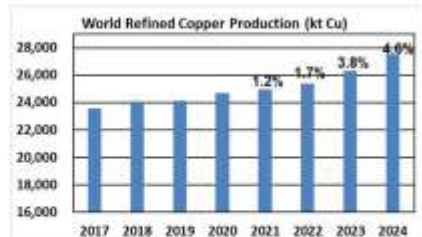
**World copper mine production is expected to increase by 1.9% in 2023 with growth of about 3.7% forecast in 2024:**

- The rate of growth of world copper mine production in 2023 has been revised downwards vis-à-vis ICSG's April 2023 expectations from 3% to 1.9%, mainly due to geotechnical issues, equipment failure, adverse weather, community actions, a slower than expected ramp-up of projects, revised company guidance and lower grades.
- Despite this, world mine production this year will benefit from additional output from new or expanded mines, mainly in the D.R. Congo, Peru and Chile. In addition, output in a number of countries will be higher due to the fact that production at the beginning of 2022 remained restricted as a result of Covid-19-related problems.
- World mine production in 2024 is forecast to rise by 3.7%. Besides additional output from new or expanded mines, production rates are expected to improve in countries affected by operational constraints in 2023, namely Chile, China, Indonesia, Panama and the USA.
- Major projects starting or expanding in the period 2022 to 2024 include Kamo a Kakula and Tenke in the D.R Congo, Quellaveco and Torromochu in Peru, Quebrada Blanca QB2 in Chile and Malmyzhskoye and Udokan in Russia. A number of medium and small projects, as well as expansions, will also add to output. Most of the projects starting in this period are concentrate producing mines.



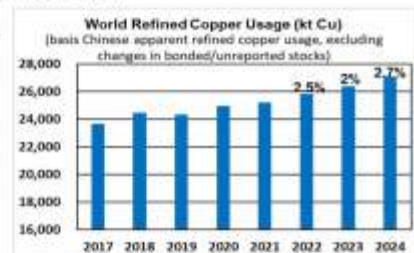
**World refined copper production is forecast to rise by about 3.8% in 2023 and 4.6% in 2024:**

- 2023 projected refined copper output is expected to be limited by operating constraints/maintenance works in Chile, Indonesia, Sweden and the United States.
- World growth in 2023 and 2024 will be mainly sustained by the continued expansion of Chinese electrolytic capacity. However, 2024 will also see the startup of new or expanded smelters/refineries in Indonesia, India and the United States that will also contribute to higher production.
- World primary refined output from concentrates will benefit from additional availability arising from the start-up of new mine projects.
- World electrowinning (SX-EW) output is expected to remain essentially unchanged as growth from new or expanded capacity in the DRC is offset by a further fall in production in Chile.
- World secondary production (from scrap) is expected to increase in both 2023 and 2024 supported by the development of new secondary smelter and refinery capacity.



**World apparent refined copper usage is expected to increase by about 2% in 2023 and 2.7% in 2024:**

- In 2023, a world usage growth rate of 2% is mainly due to a strong Chinese apparent usage growth of about 4.3%.
- World ex-China usage in 2023 is expected to decrease by about 1%, mainly impacted by declines in refined usage in the EU countries and North America.
- Although the global economic outlook is challenging, an expected improvement in manufacturing activity, the ongoing energy transition and the development of new semis production capacity in various countries should support higher growth in world refined usage in 2024.
- Overall, growth in world refined usage of about 2.7% is forecast for 2024.
- Copper is essential to economic activity and the modern technological society. Additionally, infrastructure developments in major countries and the global trend towards cleaner energy and electric cars will continue to support copper demand in the longer term.



**World refined copper balance projections indicate a deficit of about 27,000t for 2023 and a surplus of 467,000t for 2024:**

- ICSG recognizes that global market balances can vary from those projected owing to numerous factors that could alter projections for both production and usage. In this context, it should be noted that actual market balance outcomes have on recent occasions deviated from ICSG market balance forecasts due to unforeseen developments.
- In developing its global market balance, ICSG uses an apparent demand calculation for China that does not consider changes in unreported stocks (State Reserve Bureau (SRB), producer, consumer, merchant/trader, bonded) which can be significant during periods of stocking or de-stocking and which can markedly alter global supply-demand balances. Apparent copper demand for China is based only on reported data (production + net trade +/- SHFE stock changes).
- ICSG expects a deficit of about 27,000 t for 2023 compared to a deficit of about 114,000t forecast last April mainly due to a higher anticipated growth rate in Chinese apparent usage. A surplus of about 467,000t is expected in 2024 as a consequence of additional supply compared to a surplus of 298,000t previously predicted in April 2023.

The next Meetings of the International Copper Study Group will be held in Lisbon in April 2024.

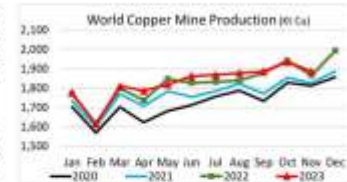
(Supply and Demand forecast table on next page)



**World copper mine production increases by approximately 1% over the first eleven months of 2023**  
: (ICSG)

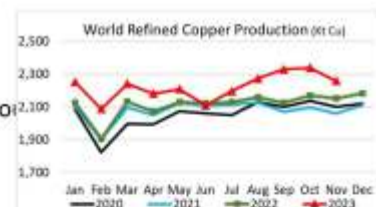
**Preliminary data indicates that world copper mine production increased by approximately 1% over the first eleven months of 2023**, driven by a 1% rise in concentrate production with solvent extraction-electrowinning (SX-EW) remaining essentially unchanged.

- Although global mine production over the first eleven months of 2023 benefitted from some start-ups and expansions, world growth was limited by operational issues in Chile, China, Indonesia, Panama and the United States.
- Production in Chile declined by 1.5% in the first eleven months, primarily due to the fact that a number of mines in the country were negatively impacted by operational issues, lower grades and reduced water supply due to a drought in the central region. However, after a 3.9% YoY decline in 1<sup>st</sup> half, Chilean production improved, presenting 4% YoY growth in the 3<sup>rd</sup> quarter.
- Indonesian output was down by 7.5% due to operational constraints at the Grasberg and Batu Hijau mines in the 1<sup>st</sup> half; Panamanian production growth was limited at 3.4% as output at Cobre Panama mine was temporarily interrupted earlier in the year as a result of export restrictions before production was suspended in November; United States output declined by 9% principally due to reduced production at Kennecott as a result of weather related issues and the technical failure of a conveyor belt; Chinese production was lower by 8% principally as a consequence of operational issues at two major mines, Jiama and Julong.
- In Peru, local communities' actions continued to impact production at a number of mines. However, despite these constraints Peruvian mine production increased by 14%. This rise was primarily a result of additional output from Quellaveco (commissioned in July 2022), the continued ramp-up at Mina Justa and improved production at Cujajone and Las Bambas after last year's temporary shutdown.
- Output in the D.R.Congo (DRC) is estimated to have grown by about 6% mainly as a consequence of the expansion of the Kamoamine together with new/expanded capacity at other mines.



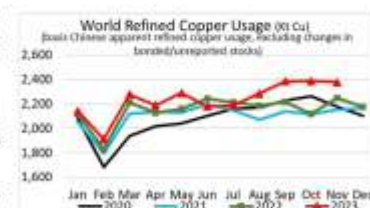
**Preliminary data indicates that world refined copper production increased by about 5.5% during the first eleven months of 2023** with primary production (electrolytic and electrowinning from ores) up by 5% and secondary production (from scrap) up by 7%.

- Growth in world refined production was mainly as a result of strong performances in China and the DRC, due to expanded capacity, with global output elsewhere declining by 1%.
- Preliminary official Chinese refined production data indicate a rise of about 13%.
- Refined output is estimated to have grown by 5% in the DRC due to the continued ramp-up of new or expanded electrowinning plants.
- Chilean total refined copper production was down by 2.7%: electrowinning (SX-EW) output declined by 4.2% whilst electrolytic production remained essentially unchanged.
- A series of maintenances, accidents or operational issues led to declines in production in a number of other major producing countries including Japan (-2.8%), the United States (-10%), India (-5%), Indonesia (-24%), Finland (-14%) and Sweden (-52%).
- Preliminary data indicate that global secondary refined production (from scrap) increased by 7% mainly due to a rise in China.



**Preliminary data suggests that world apparent refined copper usage grew by about 4% over the first eleven months of 2023:**

- Growth in world refined usage has been mainly supported by strong apparent demand in China, with usage in the rest of the world estimated to have declined.
- Chinese apparent demand (excluding changes in bonded/unreported stocks), grew by around 9%. (Chinese net refined copper imports declined by 5% but refined production increased by 13%).
- Lower demand in the EU, Japan and the United States negatively impacted world ex-China refined usage which is estimated to have declined by about 2.5%.



**Preliminary world refined copper balance during the first eleven months of 2023 indicates an apparent deficit of 130,000 t:**

- In developing its global market balance, ICSG uses an apparent demand calculation for China that does not consider changes in unreported stocks [State Reserve Bureau (SRB), producer, consumer,



## Statistics

merchant/trader, bonded]. To facilitate global market analysis, however, an additional line item - Refined World Balance Adjusted for Chinese Bonded Stock Changes - is included in the attached table that adjusts the world refined copper balance based on an average estimate of changes in bonded inventories provided by two consultants with expertise in China's copper market.

- In the first eleven months of 2023, the world refined copper balance, based on Chinese apparent usage (excluding changes in bonded/unreported stocks), indicated a preliminary deficit of about 130,000 t. The world refined copper balance adjusted for estimated changes in Chinese bonded stocks suggested a market deficit of about 152,000 t.

### **Copper Prices and Stocks:**

- Based on the average of estimates provided by two independent consultants, China's bonded stocks are thought to have increased by about 22,000 t in the first eleven months of 2023 compared to the year-end 2022 level.
- As of the end of December 2023, copper stocks held at the major metal exchanges (LME, COMEX, SHFE) totalled 213,850 t, an increase of 24,345 t (+13%) from stocks held at the end of December 2022. Stocks were down at SHFE (-55%) and at COMEX (-46%) and up at the LME (+87%).
- The average LME cash price for December was US\$ 8,394.11 /t, up 2.7% from the November average of US\$ 8,173.95 /t. The 2023 high and low copper prices were US\$ 9,436 /t (on 18<sup>th</sup> Jan) and US\$ 7,812.50 /t (on 5<sup>th</sup> October), respectively, and the year average was US\$ 8,477.77 /t (-3.6% below the 2022 annual average).

**(World Refined Copper Usage and Supply Trends table on next page)**





**World Refined Copper Usage and Supply Trends**

Thousand metric tonnes, copper

	2019	2020	2021	2022	2022	2022	2022	2022	2022	2022
					2	3	3	3	3	3
					Jan-Nov		Aug	Sept	Oct	Nov
World Copper Mine Production (Concentrates & SX-EW)	20,669	20,768	21,301	21,950	19,955	20,121	1,877	1,887	1,936	1,887
World Copper Mine Capacity	24,328	25,197	26,237	27,021	24,683	25,787	2,410	2,339	2,425	2,354
Mine Capacity Utilization Rate(%)	85.0	82.4	81.2	81.2	80.8	78.0	77.9	80.7	79.8	80.1
Primary Refined Copper Production	20,152	20,829	20,815	21,248	19,419	20,397	1,895	1,943	1,957	1,882
Secondary Refined Copper Production	4,007	3,843	4,149	4,153	3,802	4,082	378	387	383	376
World Refined Copper Production (Primary & Secondary)	24,159	24,672	24,964	25,401	23,220	24,479	2,274	2,330	2,339	2,258
World Copper Refinery Capacity	29,565	30,216	30,733	31,426	28,726	29,496	2,749	2,666	2,761	2,677
Refinery Capacity Utilization Rate (%)	81.7	81.7	81.2	80.8	80.8	83.0	82.7	87.4	84.7	84.3
World Refined Copper Usage 1/	24,321	24,953	25,216	25,835	23,661	24,610	2,284	2,386	2,387	2,377
World Refined Copper Stocks End of Period	1,215	1,236	1,210	1,373	1,336	1,318	1,289	1,350	1,341	1,318
Period Stock Change	-12	21	-26	163	126	-55	21	61	-9	-23
Refined Copper Balance 2/	-162	-281	-252	-434	-440	-130	-10	-56	-48	-119
Seasonally Adjusted Refined Balance 3/					-403	-93	-41	16	-37	-57
Refined Balance Adjusted for Chinese bonded stock change 4/	-340	-171	-450	-561	-563	-152	-13	-68	-70	-128

Due to the nature of statistical reporting, the published data should be considered as preliminary as some figures are currently based on estimates and could change.

1/ Based on Chinese and EU apparent usage.

2/ Surplus/deficit is calculated using refined production minus refined usage.

3/ Surplus/deficit is calculated using seasonally adjusted refined production minus seasonally adjusted refined usage.

4/ For details of this adjustment see the paragraph of the press release on "World refined copper balance".





# International Lead and Zinc Study Group

## PRESS RELEASE

18 December 2023

The International Lead and Zinc Study Group (ILZSG) released preliminary data for world lead and zinc supply and demand during the first ten months of 2023. A brief summary is listed in the tables below. **Full details are available in the December 2023 edition of the Group's 44 page 'Lead and Zinc Statistics' Bulletin.**

World Refined Lead Supply and Usage 2018 - 2023											
000 tonnes	2018	2019	2020	2021	2022	Jan - Oct		2023			
						2022	2023	Jul	Aug	Sep	Oct
Mine Production	4,572	4,697	4,441	4,540	4,448	3,644	3,700	388.8	370.7	377.6	388.1
Metal Production	12,381	12,589	12,301	12,718	12,506	10,346	10,636	1,076.8	1,098.3	1,115.0	1,117.0
Metal Usage	12,439	12,591	12,139	12,659	12,666	10,559	10,596	1,056.3	1,043.0	1,131.1	1,130.8

Source: ILZSG

- Provisional data reported to the ILZSG indicate that world refined lead metal supply exceeded demand by 41kt during the first ten months of 2023 with total reported stock levels increasing by 129kt.
- World lead mine production rose in Bolivia, Kazakhstan, South Africa and Australia, where Galena Mining successfully commissioned their 95 thousand tonne per year Abra mine in January. These increases were partially balanced by reductions in Europe, Mexico and the United States resulting in an overall rise globally of 1.5%.
- A 2.8% rise in global lead metal production was mainly a result of higher output in Australia, China, Germany, India, Taiwan (China) and the United Arab Emirates. In Bulgaria, Italy, Japan, the Republic of Korea and the United Kingdom, however, output declined compared to the same period in 2022.
- Global lead metal usage rose by 0.3%, primarily influenced by increases in Europe, China, India, Mexico and Taiwan (China) that were largely offset by falls in the Republic of Korea, Türkiye and the United States.
- Chinese imports of lead contained in lead concentrates increased by 22% to 562kt. Net exports of refined lead metal totalled 153kt, an increase of 60kt compared to the first ten months of 2022.

World Refined Zinc Supply and Usage 2018 - 2023											
000 tonnes	2018	2019	2020	2021	2022	Jan - Oct		2023			
						2022	2023	Jul	Aug	Sep	Oct
Mine Production	12,745	12,799	12,223	12,755	12,427	10,285	10,111	1,037.9	1,015.1	1,024.4	1,054.8
Metal Production	13,142	13,546	13,788	13,894	13,353	11,137	11,565	1,155.6	1,144.7	1,158.4	1,177.7
Metal Usage	13,726	13,829	13,300	14,043	13,451	11,170	11,270	1,199.1	1,163.1	1,220.4	1,230.2

Source: ILZSG

- According to preliminary data recently compiled by the ILZSG the global market for refined zinc metal was in surplus by 295kt over the first ten months of 2023 with total reported inventories increasing by 33kt.
- World zinc mine production fell by 1.7%, mainly as a result of reductions in Australia, Bolivia, Canada, the United States and Ireland, due to the suspension of activities at Boliden's Tara operation in June. Mexican output was also lower, primarily as a consequence of a strike at the large Penasquito mine. These falls more than offset rises in Brazil, Kazakhstan and Peru.
- A significant rise in Chinese refined metal production was the main driver behind an overall increase globally of 3.8%. Output also rose in Australia, benefiting from the commissioning of additional capacity at the Sun Metals Zinc Refinery, and in Mexico. However, in Europe, Canada and Japan production was lower than during the corresponding period of 2022.
- Increases in the usage of refined zinc metal in China and India were partially offset by reductions in Europe, Brazil, Japan, the Republic of Korea, Taiwan (China), Thailand and Türkiye, resulting in an overall global rise of 0.9%.
- Chinese imports of zinc contained in zinc concentrates rose by 24% to 1894kt. Net imports of refined zinc metal totalled 301kt compared to net exports of 19kt in the first ten months of 2022.

Further details about the International Lead and Zinc Study Group (ILZSG) together with a full list of publications are available on the Group's website at [www.ilzsg.org](http://www.ilzsg.org)



# Passenger vehicle wholesale surges 14% in Jan: SIAM

The passenger vehicles grew 14% year-on-year to 3,93,074 units in January this year as against 3,46,080 units in the same period last year buoyed by positive consumer sentiments, according to the latest data by the Society of Indian Automobile Manufacturers (SIAM).

Among passenger vehicles, Maruti Suzuki, the country's largest automobile manufacturer, sold 1,66,802 units in the domestic market in January, up 13.2% against 1,47,348 units in the same period last year.

The company's exports during the month under review stood at 23,694 units, as against 17,083 units in January last year.

This was followed by South Korean automaker Hyundai Motor India, whose domestic wholesales stood at 57,115 units, witnessing a growth of 13.9% as against 50,106 units in the same period last year.

However, Hyundai Motor's exports declined in January by 13.7% to 10,500 units as against 12,170 units in the same period last year amidst the red-sea crisis. Notably, Mahindra and Mahindra, the country's largest sports utility vehicle (SUV) manufacturer, witnessed a 23.2% increase in domestic wholesales to 43,068 units against 33,040 units in the same period last year.

Like its peers, the company's exports also witnessed a decline of 44.5% to 1,474 units, as against 817 units in the same period last year. Among automakers, the domestic wholesales of South Korean automaker Kia India, however, slumped 16.9% to 23,769 units in January this year, against 28,634 units in the same period last year.

The company's exports declined by 80.2% year-on-year to 1,305 units as against 6,608 units in the same period last year.

Meanwhile, the domestic wholesales of two-wheeler manufacturers including electric vehicles grew by 26.2% YoY to 14,95,183 units against 11,84,376 units in the same period last year owing to an increase in rural demand. The two-wheeler manufacturers' exports in January this year stood at 2,60,308 units as against 2,20,103 units in the same period last year.

The domestic three-wheeler wholesales in January increased by 9.4% to 53,537 units as against 48,903

units in the same period last year. "Passenger Vehicle sales have remained resilient led by positive consumer sentiments, while the two-wheeler Segment witnessed good growth in January as well, as the rural market continues to recover.

The three-wheeler segment has also performed better. Though the Commercial Vehicle Sector did not grow in January 2024, it is likely to see good offtake in the next 2 months of this financial year. Government's strategic focus on mobility in Budget 2024, including strengthening the electric vehicle ecosystem, especially the charging infra and public transport, should help in continuing with the overall growth momentum for the Auto Sector," says Vinod Aggarwal, president, of SIAM.

Uttar Pradesh recorded the highest number of vehicle sales in October-December 2023, followed by Maharashtra, Gujarat and Tamil Nadu, according to Society of Indian Automobile Manufacturers.

As per data from Society of Indian Automobile Manufacturers (SIAM), Uttar Pradesh clocked a total sales of 8,22,472 units across passenger and commercial vehicles; and two and three-wheeler categories.

Maharashtra was second with 6,88,192 units across the four categories followed by Gujarat with 4,21,026 units and Tamil Nadu 4,19,189 units in the quarter.

Uttar Pradesh witnessed the highest number of three-wheelers sold in the quarter at 23,859 units, followed by Maharashtra (20,495), Gujarat (19,743) and Bihar (14,955).

Similarly, in the two-wheeler category, Uttar Pradesh topped the list with a total of 6,73,962 units sold in the state, followed by Maharashtra (5,15,612), Madhya Pradesh (3,35,478) and Tamil Nadu (3,24,918).

However, in passenger vehicle sales, Maharashtra clocked the highest sales with 1,21,030 units, followed by Uttar Pradesh (1,01,568), Gujarat (85,599) and Karnataka (71,549).

In the commercial vehicles category also, Maharashtra topped the list with 31,055 units, followed by Uttar Pradesh (23,083), Gujarat (20,391) and Karnataka (16,966).



# Statistics

SIAM

Segment wise Comparative Production, Domestic Sales & Exports data for the month of January 2024						
Category Segment/Subsegment	Production		Domestic Sales		Exports	
	January		January		January	
	2023	2024	2023	2024	2023	2024
<b>Passenger Vehicles (PVs)*</b>						
Passenger Cars	1,87,543	1,71,437	1,36,931	1,26,505	31,001	29,812
Utility Vehicles (UVs)	1,79,899	2,33,373	1,49,328	2,00,917	24,586	18,853
Vans	13,040	13,138	11,834	12,019	22	580
<b>Total Passenger Vehicles (PVs)</b>	<b>3,80,482</b>	<b>4,17,948</b>	<b>2,98,093</b>	<b>3,39,441</b>	<b>55,609</b>	<b>49,245</b>
<b>Three Wheelers</b>						
Passenger Carrier	60,016	63,962	37,061	41,837	22,995	19,616
Goods Carrier	8,807	10,017	8,346	10,000	85	374
E-Rickshaw	4,376	2,569	3,188	1,262	-	-
E-Cart	378	576	308	438	-	-
<b>Total Three Wheelers</b>	<b>73,577</b>	<b>77,124</b>	<b>48,903</b>	<b>53,537</b>	<b>23,080</b>	<b>19,990</b>
<b>Two Wheelers</b>						
Scooter/ Scooterette	4,04,468	5,44,342	3,76,032	4,87,534	30,256	36,322
Motorcycle/Step-Throughs	10,12,291	12,46,701	7,71,621	9,65,613	1,89,439	2,23,986
Mopeds	37,727	41,620	36,723	42,036	408	-
<b>Total Two Wheelers</b>	<b>14,54,476</b>	<b>18,32,663</b>	<b>11,84,376</b>	<b>14,95,183</b>	<b>2,20,103</b>	<b>2,60,308</b>
Quadracycle	371	594	72	33	306	372
<b>Grand Total</b>	<b>19,08,906</b>	<b>23,28,329</b>	<b>15,31,444</b>	<b>18,88,194</b>	<b>2,99,098</b>	<b>3,29,815</b>

\* BMW, Mercedes, JLR, Tata Motors and Volvo A..to data is not available  
Society of Indian Automobile Manufacturers (14/02/2024)

SIAM

Summary Report: Cumulative Production, Domestic Sales & Exports data for the period of April-January 2024						
Category Segment/Subsegment	Production		Domestic Sales		Exports	
	April-January		April-January		April-January	
	2022-23	2023-24	2022-23	2023-24	2022-23	2023-24
<b>Passenger Vehicles (PVs)*</b>						
Passenger Cars	18,02,968	18,37,121	14,36,828	12,80,889	3,47,280	3,60,181
Utility Vehicles (UVs)	18,25,695	22,20,894	16,18,920	20,20,396	1,98,966	1,88,819
Vans	1,15,055	1,19,681	1,14,104	1,21,391	317	6,452
<b>Total Passenger Vehicles (PVs)</b>	<b>37,43,718</b>	<b>39,77,696</b>	<b>31,69,852</b>	<b>34,22,686</b>	<b>5,46,573</b>	<b>5,55,462</b>
<b>Three Wheelers</b>						
Passenger Carrier	6,04,601	7,08,896	2,82,186	4,69,543	3,22,433	2,47,054
Goods Carrier	81,362	93,351	77,968	89,851	4,142	2,801
E-Rickshaw	22,125	27,983	21,321	28,086	-	-
E-Cart	2,648	2,840	2,551	2,982	-	-
<b>Total Three Wheelers</b>	<b>7,10,736</b>	<b>8,33,070</b>	<b>3,84,026</b>	<b>5,80,442</b>	<b>3,26,575</b>	<b>2,49,855</b>
<b>Two Wheelers</b>						
Scooter/ Scooterette	46,72,260	52,74,722	43,62,031	48,67,373	3,40,836	4,21,086
Motorcycle/Step-Throughs	1,15,07,664	1,20,99,719	87,11,119	97,08,775	28,27,909	23,80,466
Mopeds	3,84,240	4,01,856	3,69,407	3,99,877	2,916	1,656
<b>Total Two Wheelers</b>	<b>1,65,44,164</b>	<b>1,77,76,297</b>	<b>1,34,42,557</b>	<b>1,49,66,025</b>	<b>31,71,461</b>	<b>28,03,217</b>
Quadracycle	1,904	3,865	513	658	1,506	3,080
<b>Grand Total</b>	<b>2,10,00,522</b>	<b>2,25,90,928</b>	<b>1,69,98,948</b>	<b>1,89,88,811</b>	<b>40,46,115</b>	<b>36,11,614</b>

\* BMW, Mercedes, JLR, Volvo A..to data is not available and Tata Motors data is available for April-December only  
Society of Indian Automobile Manufacturers (14/02/2024)



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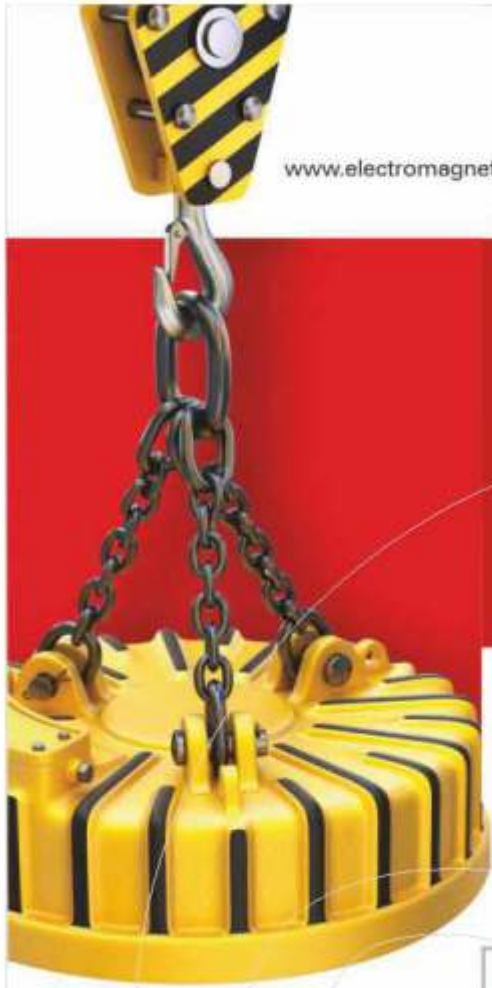
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