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D.A. Chandekar
Editor

India's economic growth is closely tied to infrastructure development, which relies heavily on metals like aluminium and copper. The non-ferrous metals sector is witnessing significant growth, driven by increasing demand from industries such as automotive, construction, and electronics. Aluminium production in India grew 1.5% in FY26, while refined copper production increased 15.6%. The country's per capita aluminium consumption is 3 kg, compared to the global average of 12 kg, indicating significant growth potential.

The government's focus on infrastructure development is expected to drive demand for metals. The National Infrastructure Pipeline identifies projects worth $1.4 trillion spanning 2020-2030, with current execution rates achieving 72% of targeted capacity additions. The metals sector is projected to reach $1.5 trillion by 2035, driven by urbanisation and manufacturing growth. Initiatives like 'Make in India' and 'Atmanirbhar Bharat' are expected to boost domestic production and reduce reliance on imports. The government's emphasis on renewable energy, electric vehicles, and smart cities will also drive demand for metals like copper, aluminium, and lithium.

Critical minerals like lithium, cobalt, and rare earth elements are gaining importance, driven by the accelerating energy transition and electrification. India is actively seeking partnerships to secure critical mineral supplies, highlighting their strategic importance. The foundry industry is also experiencing a transformation, with advancements in recycling technologies and the adoption of sustainable practices. The non-ferrous metal recycling market is expected to reach $301.77 billion by 2030, driven by increasing demand for recycled aluminium and copper. India's demographic dividend provides unique advantages for metals market development. The population of 1.4 billion people, with an average age of 27 years, creates both consumption potential and production capacity advantages. Urban population expansion from 35% to over 50% by 2047 translates to 250+ million additional urban residents requiring metals-intensive infrastructure. As India continues to grow, the metals sector will play a crucial role in shaping the country's future, with significant opportunities for investment, innovation, and sustainable development. The industry's focus on sustainability, recycling, and innovation will be key to meeting the country's growing demand for metals while minimizing environmental impact.

Indeed, very interesting as well as challenging period for the mineral and metals sector!

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"India's Foundry Industry Can No Longer Compete on Cost Alone — Technology and Sustainability Will Decide the Next Decade"

SUSHIL SHARMA

President, Institute of Indian Foundrymen (IIF)

COMPARED TO last year, how do you assess the current health of the Indian foundry sector in 2026? What structural changes-positive or challenging-are becoming more visible across small, medium, and large foundries?

Compared to 2025, the overall health of the Indian foundry sector in 2026 remains stable and moderately positive, but with clear structural shifts underway.

India continues to be one of the world's largest casting producers, operating at multi-million-tonne production levels. Domestic demand has remained resilient, and overall foundry volumes in FY 2025–26 are expected to grow in the range of 15–18% in volume and around 20% in value terms, supported by new investments in certain regional clusters.

However, export conditions have become more challenging. Castings exports—traditionally valued at over USD 4 billion annually—have been impacted by significantly higher U.S. steel and aluminium tariffs. This has particularly affected MSME foundries that were heavily dependent on the U.S. market. Many smaller foundries have completed existing export orders, but fresh orders from the U.S. have slowed considerably.

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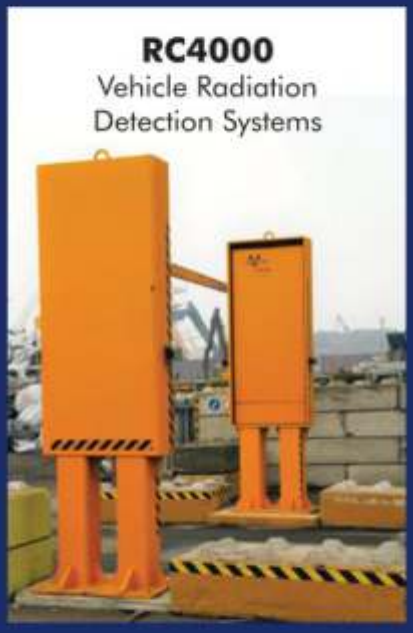

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As a result, a visible structural change is taking place. Larger and more diversified foundries are adjusting by strengthening domestic market presence and expanding into alternative export destinations. Smaller units are being forced to reassess their business models, focus on cost control, and gradually shift toward domestic OEMs or regional customers.

With global supply chains continuing to realign, how competitive is India today as a casting supplier in terms of cost, quality, delivery reliability, and technology? What gaps still need to be addressed for India to meaningfully strengthen its position in global markets?

India remains highly competitive as a casting supplier, particularly on cost. In many product categories, Indian foundries still offer a 30–40% cost advantage compared to Western suppliers, driven by lower labour costs, efficient manufacturing practices, and favourable exchange rates. This continues to make India an attractive sourcing destination for global OEMs, especially in automotive and industrial segments.

In terms of quality and delivery reliability, the performance of organised and export-oriented foundries has improved significantly over the years and is generally in line with global expectations.

That said, some gaps remain. Rising energy and raw-material costs are compressing margins and gradually reducing the cost advantage. Dependence on imported alloys and critical inputs also exposes foundries to currency volatility and price fluctuations, affecting long-term pricing stability.

On the technology front, while leading foundries are investing in modern processes, adoption across the broader industry is uneven. To strengthen India's global position, the focus must now shift from cost-led competitiveness to consistency, advanced process control, and technology-driven quality assurance.

Digitisation and automation are increasingly critical for foundries. How prepared are Indian foundries to move beyond basic digitalisation towards advanced process control, data-driven quality management, and energy optimisation, and how is IIF supporting its members in this transition?

Indian foundries are at different stages of digital readiness. Many medium and large foundries have already implemented basic digital systems such as ERP platforms, machine monitoring dashboards, and computerized maintenance systems. These have improved visibility and operational planning, but they represent only the first phase of digitalisation.

A smaller group of progressive foundries has started moving toward advanced capabilities, including real-time process monitoring, furnace analytics, and data-driven quality control. There is growing interest in AI-based solutions for thermal optimisation and defect prediction, with early adopters reporting meaningful improvements in energy efficiency and yield.

However, widespread adoption of advanced automation-such as advanced process control, predictive quality systems, or digital twins—remains limited. Many MSME foundries still operate legacy equipment that lacks sensors and connectivity, making true data-driven control difficult.

> "IIF is actively supporting members through training programs, technical audits, knowledge sharing, and exposure to best-practice case studies. The objective is to help foundries build digital capability step by step, aligned with their scale and investment capacity."

Environmental compliance, energy efficiency, and carbon footprint reduction are becoming decisive factors for customers. How ready is the Indian foundry sector to meet these expectations, and what practical challenges do foundries face in balancing sustainability with cost competitiveness?

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The Indian foundry sector is increasingly aware that environmental compliance and sustainability are no longer optional. Larger and organised foundries are reasonably well prepared, often meeting or exceeding regulatory requirements related to emissions, waste management, and effluent treatment.

Many progressive units are adopting structured environmental management systems and participating in cluster-level initiatives focused on energy audits, emission reduction, and process optimisation. These initiatives have demonstrated that meaningful reductions in energy use and emissions are achievable.

However, readiness across the sector remains uneven. Smaller foundries face significant challenges due to outdated equipment, limited capital, and the high upfront cost of pollution-control and energy-efficient technologies. Balancing sustainability investments with cost competitiveness remains a major concern for MSMEs.

The key challenge lies in making sustainability economically viable through technology support, financial incentives, and shared infrastructure at the cluster level.

In the current business environment, how is The Institute of Indian Foundrymen evolving its role to support members in areas such as technology upgradation, global benchmarking, skill development, and policy advocacy?

IIF is gradually evolving from a traditional industry association into a more strategic and solution-oriented institution.

On the technology front, IIF provides direct technical support through its Centres of Excellence, offering services such as process audits, defect analysis, simulation studies, and productivity improvement initiatives. These services help foundries address specific operational challenges.

In parallel, IIF focuses strongly on skill development through structured training programs for shop-floor personnel, engineers, and management teams. Knowledge dissemination through technical publications, case studies, and best-practice guidelines remains a core activity.

> "IIF is also strengthening its role in global benchmarking and policy advocacy by representing industry concerns related to trade, energy, environmental regulations, and MSME support, ensuring that policy frameworks remain aligned with ground realities."

Looking ahead to the 2026–2030 period, what specific policy interventions are most critical to ensure the long-term sustainability, competitiveness, and global relevance of the Indian foundry industry?

The 2026–2030 period will be critical for the Indian foundry industry. Cost advantage alone will not be sufficient to remain globally relevant.

The highest policy priority should be technology upgradation. A dedicated foundry-specific technology upgradation scheme is needed to support automation, advanced melting and pouring systems, process control, and Industry 4.0 adoption, with special provisions for MSMEs and retrofitting of legacy equipment.

Energy efficiency and environmental sustainability must be treated as core competitiveness issues. Policies should support energy-efficient furnaces, waste-heat recovery, sand reclamation, and emission-control systems, along with simplified carbon-accounting frameworks for smaller foundries.

Finally, alignment with global sustainability and trade requirements is essential. With increasing emphasis on carbon intensity and ESG compliance by global customers, supportive and practical policy interventions will determine whether Indian foundries can protect export access and move up the global value chain.

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"Scrap Is No Longer Waste - It Is a Strategic Resource for India's Industrial Future"

SANJAY MEHTA
President
Material Recycling Association of India (MRAI)

HOW DO you assess the current state of India's metal recycling industry in 2026, particularly in terms of capacity, formalisation, and integration with primary metal producers?

India's metal recycling industry in 2026 is at a clear inflection point. The sector is growing rapidly, supported by strong policy intent, rising metal demand, and the country's long-term capacity expansion plans. Overall, the metal recycling market is expected to grow at a CAGR of around 6–7 percent, with the total market projected to exceed USD 21 billion by 2030.

Steel scrap remains the primary growth driver. As India moves toward 300 million tonnes of steel capacity by 2030 and 500 million tonnes by 2047, scrap-based steelmaking is gaining strategic importance. Currently, recycled steel contributes about 21 percent of crude steel production—still below the global average of around 33 percent but steadily rising. Domestic scrap availability is expected to

Mr. Sanjay Mehta is the President of Material Recycling Association of India (MRAI) and Mr. Mehta heads MTC Group, a 50 years old business group employing more than 5000 personnel in the Group. MTC Group has business activities in Trading of Ferrous & Non-Ferrous scrap, Ferro Alloys, Manufacturing of steel billets, TMT Bars Structrual steel, Copper Tubes. The Group is also into Automobile dealerships (for Toyota cars) at Mumbai. MTC Group is the largest Ferrous Scrap procurement, processing, recycling & steel manufacturing company in India, handling yearly volume of around 1.8 million tons all ferrous Non-Ferrous metals scrap and prime materials. Mr. Sanjay Mehta holds a Bachelor Degree in Commerce and brings along a vast experience of more than 38 years in Metal Scrap Recycling in India & International trade. Having his offices in USA, UK, Singapore and Dubai .

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approach 36 million tonnes as capacity expands.

Formalisation is progressing, particularly through Registered Vehicle Scrapping Facilities (RVSFs), battery recycling plants, and authorised metal processors. However, this progress is uneven. While some states have developed strong recycling clusters, other regions still lack adequate collection and pre-processing infrastructure.

Integration with primary metal producers is improving, especially as steelmakers and non-ferrous producers increasingly recognise scrap as a decarbonisation enabler. Scrap-based steelmaking helps reduce iron ore and coking coal consumption, lowers emissions, and supports India's net-zero commitment by 2070. In non-ferrous metals, aluminium recycling is growing steadily, although India still relies on imported scrap due to limited domestic end-of-life generation.

Critical mineral recycling-covering lithium, cobalt, and nickel-is also gaining traction, supported by dedicated government schemes under the National Critical Mineral Mission.

With increasing global emphasis on circular economy and resource security, how critical is metal recycling to India's long-term metals strategy, and where do you see the biggest opportunities for growth?

Metal recycling is no longer a peripheral activity—it is central to India's long-term metals and resource security strategy. India is heavily dependent on imports for several critical metals used in EVs, renewable energy, electronics, and defence. Recycling offers a practical pathway to recover these materials domestically and reduce supply-chain vulnerabilities.

The biggest growth opportunities lie in building a comprehensive circular economy across multiple material streams. Steel scrap will remain dominant, but aluminium, copper, and battery metals are becoming increasingly important. The rapid adoption of electric vehicles is accelerating demand for recycled aluminium, copper, lithium, and nickel.

> "The biggest growth opportunities lie in building a comprehensive circular economy across multiple material streams. Steel scrap will remain dominant, but aluminium, copper, and battery metals are becoming increasingly important."

Urban mining represents a major untapped opportunity. End-of-life vehicles, e-waste, construction debris, batteries, and solar panels will generate substantial recyclable volumes over the next decade. With strong policy backing, recycling can evolve from a fragmented activity into a technology-driven manufacturing sector that delivers high-quality secondary raw materials.

Importantly, recycling aligns closely with India's green steel and decarbonisation roadmap. A few years ago, India was almost entirely dependent on imported scrap. That dependency is gradually reducing, and domestic recycling capacity is now emerging as a strategic pillar of industrial planning.

Policy and regulation play a decisive role in recycling. What key policy interventions or regulatory reforms are required to strengthen the scrap ecosystem and improve the availability and quality of recyclable metals in India?

While policy intent is clearly positive, several regulatory gaps still constrain the sector's full potential. One of the most critical issues is taxation. The recycling industry currently faces an 18 percent GST rate, combined with rising working capital

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costs. Reducing GST on scrap to around 5 percent would significantly accelerate formalisation and make domestic recycling more competitive.

Import duties also need urgent attention. The 2.5 percent duty on aluminium scrap sends mixed signals at a time when global scrap availability is tightening. Aligning aluminium scrap with ferrous scrap—which already enjoys zero import duty—would help stabilise supply and support downstream manufacturing.

Globally, governments are actively incentivising recycling through subsidies, tax credits, and green financing mechanisms. India needs similar instruments to encourage investment in modern recycling infrastructure, advanced sorting technologies, and environmental compliance systems.

Another emerging policy priority is solar panel recycling. With an estimated 200,000 tonnes of solar waste expected by 2035, India must proactively develop standards, collection frameworks, and processing capacity to manage this upcoming waste stream.

Overall, rationalised taxation, import duty reforms, and targeted incentives are essential to move recycling from policy aspiration to large-scale execution.

Quality, traceability, and compliance are becoming increasingly important for end-users. How is the recycling industry responding to expectations around material consistency, environmental compliance, and international standards?

The recycling industry is undergoing a fundamental shift—from being collection-driven to becoming quality-driven. End-users now expect secondary metals to match the performance and reliability of virgin materials.

Material consistency is improving through the adoption of global specifications, such as ReMA standards, which define purity levels, acceptable compositions, and contamination limits. Many facilities are moving away from manual sorting toward AI-driven optical sorting and robotic systems, enabling recyclers to deliver consistent, high-quality secondary raw materials.

> "Material consistency is improving through the adoption of global specifications, such as ReMA standards, which define purity levels, acceptable compositions, and contamination limits."

Traceability is another major transformation area. Digital platforms, blockchain-enabled scrap certificates, and batch-level digital IDs are being introduced to ensure ethical sourcing and regulatory compliance. Centralised digital reporting systems are reducing "paper-only" compliance and improving transparency across the value chain.

Environmental compliance is no longer just a regulatory requirement-it is directly linked to ESG ratings and access to green financing. With Extended Producer Responsibility (EPR) norms tightening between 2026 and 2032, recyclers are preparing for mandatory recycled-content targets in non-ferrous metals. Third-party audits and verification are increasingly becoming standard practice to meet international buyer expectations.

Global scrap trade dynamics continue to evolve due to geopolitical shifts, sustainability norms, and trade restrictions. How are these developments impacting Indian recyclers, and how should the industry adapt to remain competitive?

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Global scrap trade is undergoing a structural shift. Many exporting nations now view scrap as a strategic resource rather than waste. Countries such as the UK and UAE have introduced export curbs, contributing to a decline in India's scrap imports. Proposed EU Waste Shipment Regulations, expected to tighten further by 2026, could significantly restrict scrap flows to non-OECD countries.

These developments are likely to increase scrap prices across Asia and intensify competition for high-quality material. Additionally, mechanisms such as the EU's Carbon Border Adjustment Mechanism (CBAM) are placing cost pressures on Indian exporters, forcing them to internalise carbon costs.

> "MRAI is also supporting the development of circular economy parks in collaboration with state governments, providing shared infrastructure for MSMEs."

To remain competitive, Indian recyclers must transition from a trade-dependent model to a self-reliant circular economy. This includes strengthening domestic collection networks through EPR mandates, modernising RVSFs, and investing in advanced sorting technologies.

Capital availability is no longer the main constraint. ESG-focused investors and green funds are actively backing recyclers with verified environmental impact. The key challenge is policy alignment and infrastructure development. Regional partnerships, particularly with the Middle East, may also help balance logistics efficiency with India's processing capabilities.

Looking ahead to the 2026–2030 period, what is your vision for MRAI's role in shaping the future of India's metal recycling industry, and how can recyclers, metal producers, and policymakers work more closely to build a robust circular metals ecosystem?

Between 2026 and 2030, MRAI's vision is to help position India as a global hub for green metals and resource efficiency. With steel capacity targeted at 300 million tonnes by 2030, scrap will be a critical decarbonisation input.

Key priorities include advocating tax rationalisation-especially reducing GST on scrap to 5 percent-and abolishing import duties on aluminium scrap. Standardisation efforts with policy bodies aim to address structural gaps in collection and processing.

MRAI is also supporting the development of circular economy parks in collaboration with state governments, providing shared infrastructure for MSMEs. Advanced technologies such as AI-based sorting, digital twins, and urban mining solutions for EV batteries and e-waste will be essential to improve recovery rates and energy efficiency.

Equally important is workforce formalisation. A significant share of scrap collection still comes from informal channels. Integrating this workforce through digital payments, traceability, and safer working conditions is vital. Initiatives to improve gender inclusion are also gaining momentum.

Ultimately, building a robust circular metals ecosystem will require sustained collaboration between recyclers, metal producers, and policymakers. Recycling must be treated not as a waste activity, but as a strategic industrial capability central to India's economic and environmental future. ■

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"India Is Moving from Catch-Up to Execution in Advanced Materials and Metallurgy"

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Chair, ASM International India Chapter

HOW DO you assess the current state of materials science and metallurgy in India in 2026, particularly in terms of industry adoption of advanced materials, processes, and global best practices?

India's materials science and metallurgy ecosystem is at a meaningful inflection point in 2026. We have clearly moved beyond a phase dominated by basic metal production and are now selectively adopting advanced materials and processes across high-impact sectors such as aerospace, defence, renewable energy, medical technology, and core electronics.

What is encouraging is that India is no longer merely trying to catch up with global benchmarks. There is now a strong understanding of international best practices in materials design, processing, and performance evaluation. This reflects the combined impact of global supply chain integration, increased exposure to advanced applications, and stronger research capabilities within the country.

The next phase, however, will be defined by execution. Scaling advanced materials, strengthening industry-academia collaboration,

Mr. Rajesh Shah is an electronics engineer with over 35 years of industry experience, spanning instrumentation, process industries, and advanced engineering applications.

He joined the ASM International India Chapter in 2008 as an e-member and has since been actively involved as a volunteer across multiple initiatives and projects. Over the years, he had the opportunity to work closely with—and be mentored by—Sh. Pradeep Goyal Ji, Sh. Jayesh Mukadam, Sh. Suhas Sabnis, and Late Sh. Prem Aurora, whose guidance played a key role in his professional and leadership journey within ASM. Building on this experience and long-standing association, Mr. Shah currently serves as Chair of the ASM International India Chapter for the 2025–2027 term.

In parallel, he is the CEO of Navin Corporation, a company engaged in the manufacture of thermocouples for process industries, supporting applications across metals, energy, and industrial manufacturing.

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and translating research excellence into consistent manufacturing outcomes will determine whether India can convert materials knowledge into long-term industrial leadership.

As Chair of the ASM International India Chapter, how is the chapter strengthening the connection between materials research, industrial application, and manufacturing competitiveness in sectors such as metals, automotive, energy, and aerospace?

My primary focus as Chair of the ASM International India Chapter is to act as a bridge between materials research and industrial application, ensuring that knowledge directly enhances manufacturing competitiveness.

We are doing this through three practical initiatives. First, we translate research into industry-relevant language. Through focused technical talks, workshops, and webinars, we bring global best practices in metallurgy, materials processing, and failure analysis directly to engineers and plant professionals, especially in alloy manufacturing, defence, nuclear, aerospace, and automotive sectors.

Second, we focus strongly on talent development and manufacturing readiness. Through Materials Camps and student engagement programs, we help young engineers connect theoretical fundamentals with real-world industrial challenges. At the same time, we encourage Indian industry professionals to engage with global peers through ASM India memberships, which provide access to international expertise, benchmarking insights, and the ASM Handbooks-an invaluable technical reference for industry.

Third, we actively promote industry-academia collaboration through our flagship biennial event, MET & HTS (Materials Engineering Technology & Heat Treat Show). This conference and expo brings together researchers from IITs, international laboratories, and manufacturing leaders to discuss future-oriented topics such as lightweighting, materials reliability in energy systems, and performance alloys for aerospace and nuclear applications. The next edition is scheduled from 16-18 December 2026 in Mumbai. Our objective is clear: ensure that advanced materials knowledge moves beyond journals and laboratories into real manufacturing practice.

“This conference and expo brings together researchers from IITs, international laboratories, and manufacturing leaders to discuss future-oriented topics such as lightweighting, materials reliability in energy systems, and performance alloys for aerospace and nuclear applications.”

Advanced materials, surface engineering, heat treatment, and failure analysis are becoming increasingly critical for performance and reliability. How prepared is Indian industry to leverage these capabilities, and where do you see the biggest knowledge or skill gaps?

Indian industry today is in a phase of partial readiness combined with rapid improvement. Awareness of the importance of advanced materials, surface engineering, heat treatment, and failure analysis has grown significantly, particularly in aerospace, nuclear, and defence manufacturing.

Large OEMs and globally integrated suppliers already demonstrate strong alignment with international standards and possess advanced capabilities. However, across the broader industrial base, there is still considerable scope for improvement—especially in systematic failure analysis, advanced testing infrastructure, and consistent process control.

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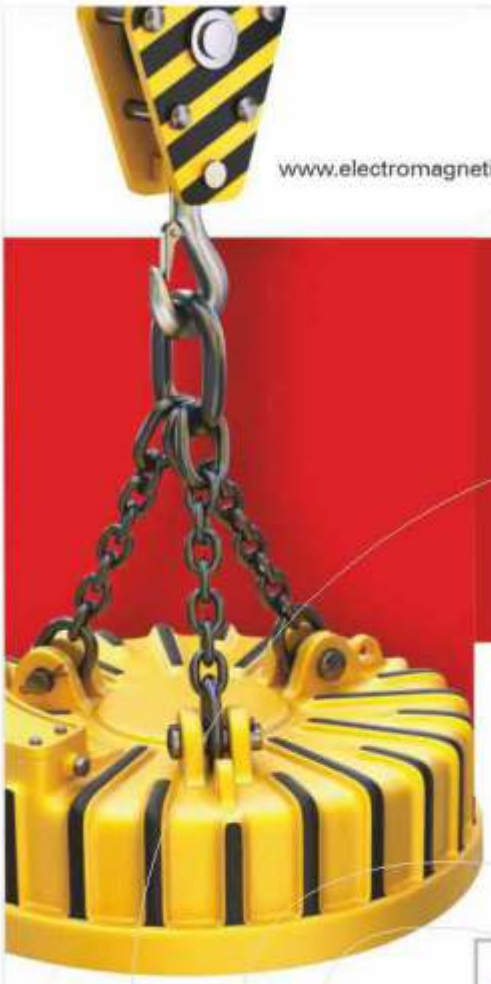

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The biggest opportunity lies in structured upskilling and deeper collaboration between academia and industry. By investing in diagnostic infrastructure, encouraging hands-on learning, and embedding materials expertise early in design and manufacturing stages, India can move beyond adoption toward leadership in reliable, high-performance engineering solutions.

With sustainability, lightweighting, and energy transition driving material innovation, what role should professional bodies like ASM play in guiding industry on material selection, standards, and lifecycle performance?

Professional bodies like ASM International must act as a trusted and unbiased compass for the industry. As sustainability and energy transition accelerate material innovation, engineers and manufacturers require clear guidance on material selection, applicable standards, and long-term performance.

ASM has a critical role in bridging research and practice by converting emerging materials knowledge into practical design guidance and best-practice frameworks. Equally important is enabling engineers to think beyond initial performance metrics and consider durability, recyclability, and total lifecycle impact.

> “Material innovation must not only be fast-it must be reliable, responsible, and sustainable. Professional societies can help ensure that innovation is grounded in sound engineering judgment and global standards.”

Material innovation must not only be fast—it must be reliable, responsible, and sustainable. Professional societies can help ensure that innovation is grounded in sound engineering judgment and global standards.

Talent development remains a key concern for the metals and materials ecosystem. How is ASM India engaging with students and young professionals to make careers in materials engineering more relevant and future-ready?

Talent development is central to the future of the materials ecosystem, and ASM India places strong emphasis on engaging students and young professionals.

We work closely with universities through student chapters, technical talks, and mentorship initiatives. Our Materials Camps are designed to connect classroom learning with real industrial applications, helping students understand how materials decisions directly affect product performance and reliability.

For young professionals, we promote continuous upskilling through short courses, webinars, and certification programs, often offered at minimal cost or through sponsored initiatives. Access to ASM Handbooks and technical literature is provided free of charge to students, ensuring that knowledge barriers do not limit growth.

Beyond skills, we focus on career relevance-connecting young engineers with industry experts, highlighting emerging opportunities, and positioning materials engineering as a future-ready discipline that underpins sustainable and high-performance technologies.

Looking ahead to the 2026–2030 period, what is your vision for ASM International India Chapter's role in India's industrial and technological growth, and what collaborations will be most critical?

Between 2026 and 2030, ASM India aims to act as a catalyst for India's industrial and technological advancement by strengthening the link between advanced materials research and real-world manufacturing.

Strategic collaboration will be key-across industry, academia, and policymakers. These partnerships will drive innovation, build skilled talent, and help establish robust standards that support quality, sustainability, and global competitiveness.

Our vision is to ensure that materials engineering becomes a core enabler of India's manufacturing future-supporting not only growth, but also reliability, sustainability, and technological leadership. ■

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Rare Earth Minerals: Geopolitics, power, and the race for strategic resources

Dilip Kumar Jha
Journalist

D. K. Jha is an independent journalist with nearly three decades of experience covering agricultural and non-agricultural commodities, base and precious metals, and major cash crops.

A DRAMATIC chapter in the geopolitics of critical minerals unfolded in late 2025 as China — the world's dominant supplier of rare earth elements (REEs) and other critical minerals — agreed to suspend export restrictions for one year under intense pressure from the United States and its allies. The move, part of a broader trade and supply-chain negotiation with the U.S., gives global manufacturers a temporary reprieve, but underscores deeper, ongoing tensions over access to strategic resources central to modern technology, defense and clean energy.

Rare earth elements are a group of 17 metallic elements with unique magnetic, catalytic and electronic properties. They are indispensable in a wide range of technologies — from electric vehicle motors and wind turbine generators, to smartphones, lasers and missile guidance systems. Their importance to clean energy transitions and military capabilities has elevated them from niche commodities to strategic resources. China has long held the edge in this domain, controlling an estimated 70% of global rare earth mining and nearly 90% of processing and refining capacity. This dominance has been built over decades, thanks to state-led investment, economies of scale, and regulatory frameworks that prioritized resource consolidation.

REEs including neodymium, dysprosium, and yttrium - have become central to modern technology, defence systems, and clean energy infrastructure. Despite their name, REEs are relatively abundant in the Earth's crust; however, they are difficult and costly to mine and refine, leading to concentrated supply chains. China currently dominates this space, accounting for the vast majority of global production and processing capacity, giving it unparalleled leverage in geopolitical and economic arenas.

Why do they matter?

REEs are indispensable in clean energy technology as permanent magnets in wind turbines and electric vehicle motors rely on neodymium and dysprosium. Its use in electronics is spread across smartphones, laptops, and consumer devices use lanthanides for screens, speakers, and batteries.

Across defence system, Precision-guided missiles, radar systems, and advanced aircraft incorporate REEs for high-performance capabilities. REEs are critical in satellite, laser, and high-temperature alloy systems. These applications underline why nations view rare earths as strategic minerals essential to both economic competitiveness and national security.

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Chinese export restrictions

In 2025, Beijing initiated a series of export restrictions on rare earths and related technologies, citing "national security" concerns in response to rising trade tensions with the United States. These measures included demands for export licenses and stringent end-use disclosures, which slowed shipments of several key rare earths - including dysprosium, terbium and yttrium - that are essential for high-performance magnets and defense systems.

The United States, alarmed by the potential for supply disruptions that could undermine both industrial and military capabilities, pushed back forcefully. Negotiators from both sides engaged in high-stakes diplomatic talks, culminating in a narrow deal between U.S. President Donald Trump and China's Xi Jinping that included a one-year suspension of the new export controls beginning in November 2025. In return, the U.S. eased some tariffs on Chinese goods as part of a broader trade truce.

For rare earths used in magnets across various industries—notably neodymium, praseodymium, dysprosium, and terbium—China accounted for around 60 percent of global mining output in 2024, followed by Myanmar, Australia, and the United States. China's dominance is even more pronounced at the separation and refining stages, where it represents about 91 percent of global production, with Malaysia a distant second. Moreover, China has significantly strengthened its position in the manufacturing of rare earth–containing permanent magnets—magnets that retain their magnetic properties indefinitely without the need for external power.

Two decades ago, China accounted for around 50 percent of the production of sintered permanent magnets commonly used in automobiles, wind turbines, industrial motors, data centres, and defence systems. This share has since surged to about 94 percent, making China the world's single largest supplier of a component that is critical to the manufacture of high-performance motors used in many cutting-edge applications. Such a high level of market concentration leaves global supply chains in strategic sectors-including energy, automotive, defence, and AI-driven data centres-highly vulnerable to potential disruptions.

Even with the temporary easing, critical aspects of the earlier restrictions - especially exports tied to military applications - remain tightly controlled, highlighting the strategic leverage Beijing retains.

One-year pause

The suspension - effectively a tactical pause - offers multinational firms and governments temporary relief. China agreed to delay enforcement of expanded export restrictions on rare earths, battery materials and other critical minerals until November 2026, giving vulnerable supply chains time to adapt and global manufacturers space to seek alternatives. However, the underlying structural dependency remains intact. China still processes the majority of rare earths, and longstanding restrictions from earlier 2025 measures (such as licensing bottlenecks) continue to affect market dynamics.

Even with the temporary easing, critical aspects of the earlier restrictions — especially exports tied to military applications — remain tightly controlled, highlighting the strategic leverage Beijing retains.

The suspension effectively grants manufacturers a temporary reprieve from one of the most destabilizing restrictions in the global materials market. For the next twelve months, shipments of medium and heavy rare earths, super-hard materials, and graphite-based anodes can resume under a "general license" regime. China has not formally described these as permanent changes, and officials

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framed the action as a "temporary adjustment" pending review in late 2026.

The Ministry's statement made no reference to the wider U.S.–China trade framework highlighted by Washington, which characterized the deal as part of a broader economic stabilization package. According to the White House fact sheet, Beijing's relaxation of mineral export controls is paired with renewed purchases of U.S. agricultural goods and commitments to stem exports of fentanyl precursors - underscoring the transactional nature of the détente.

India's stand

India has a substantial base of rare earth minerals, particularly monazite deposits spread across several coastal and inland regions. These deposits contain about 13.15 million tonnes of monazite, holding an estimated 7.23 million tonnes of rare earth oxides (REO), and are primarily found in coastal beach sands. These oxides serve as the key raw material for downstream rare earth industries, including permanent magnet manufacturing.

In addition, around 1.29 million tonnes of in-situ REO resources have been identified in hard-rock areas of Gujarat and Rajasthan. The Geological Survey of India has further augmented the resource base by identifying 482.6 million tonnes of rare earth ore resources through extensive exploration initiatives. Taken together, these assessments demonstrate the availability of substantial raw material resources to support downstream rare earth–based industries, including rare earth permanent magnet (REPM) manufacturing.

Despite India's strong rare earth resource base, domestic production of permanent magnets remains at a nascent stage, and imports continue to meet a significant share of current demand. Official trade data indicate that India sourced a major portion of its permanent magnet imports from China during 2022–23 to 2024–25. Import dependence ranged between 59.6 percent and 81.3 percent in value terms and between 84.8 percent and 90.4 percent in volume terms.

> India has faced practical hurdles, including the export of key processing equipment from China, slower development timelines, and technical gaps in refining capabilities. This has prompted the government to increase funding, streamline regulatory approvals, and encourage recycling of critical minerals.

Meanwhile, forward demand projections underscore the need to enhance domestic capabilities. India's REPM consumption is expected to double by 2030, driven by growth in electric mobility, renewable energy deployment, electronics manufacturing, and strategic applications. Developing integrated REPM manufacturing capacity is therefore critical to meeting rising domestic demand and strengthening supply-chain resilience.

Strategic push

The government of India has approved the Scheme to Promote Manufacturing of Sintered Rare Earth Permanent Magnets (REPM) with a financial outlay of Rs 7,280 crore. The scheme aims to establish 6,000 metric tonnes per annum (MTPA) of integrated REPM manufacturing capacity in India, covering the entire value chain from rare earth oxides to finished magnets.

By building a domestic, integrated ecosystem, the initiative seeks to enhance self-reliance in a critical input for electric vehicles, renewable energy systems, electronics, aerospace, and defence, while

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positioning India as a key player in the global REPM market. It also supports broader national objectives, including Atmanirbhar Bharat, resilient supply chains for strategic sectors, and the country's long-term Net Zero 2070 vision.

The scheme aims to build a fully integrated production ecosystem for high-performance magnetic materials by creating 6,000 MTPA of domestic manufacturing capacity, from oxide feedstock to the final product. This capacity will be distributed among up to five beneficiaries through a global competitive bidding process, with each beneficiary eligible for up to 1,200 MTPA, ensuring diversification alongside adequate scale.

However, India has faced practical hurdles, including the export of key processing equipment from China, slower development timelines, and technical gaps in refining capabilities. This has prompted the government to increase funding, streamline regulatory approvals, and encourage recycling of critical minerals. India's strategic intent is clear: securing a sovereign supply of rare earths to support its burgeoning EV ecosystem, defence industry, and energy transition goals.

US moves

In recent months, the United States under President Trump has revived an ambitious and controversial push to acquire Greenland, an autonomous territory of Denmark. The interest isn't merely symbolic — Greenland is believed to hold significant deposits of rare earths and other critical minerals beyond Chinese control.

United States under President Trump has revived an ambitious and controversial push to acquire Greenland, an autonomous territory of Denmark. The interest isn't merely symbolic — Greenland is believed to hold significant deposits of rare earths and other critical minerals beyond Chinese control.

The Trump administration has taken several steps that indicate a shift from rhetoric to real strategic planning for expanded access — including drafting acquisition concepts and considering multiple mechanisms of control. Analysts note that Greenland's vast mineral potential, strategic Arctic position, and resource wealth make it attractive within the larger U.S.–China competition for critical resources.

However, Greenlandic leaders and the Government of Denmark firmly reject any attempt by the U.S. to take sovereignty, emphasizing independence and self-determination. Recent diplomatic meetings reflect tensions between respecting international law and securing strategic resources.

Outlook

As global supply chains for rare earth elements come under increasing strain, India is emerging with a powerful home-grown solution—urban mining. With e-waste volumes rising sharply alongside rapid digitalisation and the expansion of electric mobility, recycling offers a dual advantage: reducing import dependence on critical minerals while addressing mounting environmental and waste-management challenges. Harnessing this untapped resource could position India as a more resilient player in the global critical minerals ecosystem, while supporting its broader goals of sustainability and self-reliance.

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In the Wonderland of Materials Technology:

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Sadguru Kulkarni, Chemical Engineer from UDCT (now ICT), with over four decades of experience in industrial research & technology, covering chemicals, metals, minerals and materials, and specializing the technology transfer. Mr. Kulkarni worked for two large multinational Research Centres for over four decades. He is an avid writer on science & technology, award-winning science fiction and popular fiction in English & Marathi. He is also on the Editorial Board of Metalworld.

IN LINE with the extended objectives of MetalWorld, we in the Editorial Board realise the importance of informing the readers beyond metals & minerals, to address the broader world of materials. The metal world seems to be rapidly getting transformed by advent of a variety of new materials, as well as step improvement in metal performance through advances in technology. In the series of articles under the theme 'In the Wonderland of Materials Technology' that we have taken up for monthly publication in 'Metalworld'- the industry trade journal, we plan to discuss how advances in materials science & technology have taken giant steps over the years and have helped transform our daily life. In this series we will cover a variety of materials including metals, polymers, composites, construction materials, rare earths, speciality materials, electronic materials, textile materials, as well as various performance materials etc.

We start this series in Jan 2026 issue of Metalworld with the first article on 'Rare Earth Elements'- a topic that is in hot discussion due to their close link with modern gadgets, rapidly increasing demand, the geopolitical situation that brings up the subject of Rare Earths, in common and technical news every day.

Summary:

The science, technology, applications & geopolitics of Rare Earths-Part 1

In past year or two, the 'Rare Earth Elements' have suddenly come in highlight. News like 'China is blocking the global supply of rare earths', 'Government of India is proposing to put up a Rare Earh Mission', 'Mineral Resources is one of the important reasons behind the Venezuela attack', and like have started appearing prominently. What are these rare earth elements? What are their applications? Where are they sourced from ? Why the importance? Why are rare earths so important geopolitically? What happens if the supply is curtailed? What is the technology used to make these products from the mineral resources? What is its importance to India? These are some of the questions, which we will try to answer in the article.

What are Rare Earth Elements?

Human progress is closely linked to the progress in materials and their applications. It is well-known that historically such progress is divided into 'ages' which are named after the primary materials used in those ages. That's how we have stone-age, bronze-age, iron-age, plastic age and silicon age. In the last century and a half, use of materials in electrical and electronic applications has led such progress. While silicon, that is the primary material used in chips has been the key element used in electronics, there are a number of materials which are used to modify the properties of the bulk materials to enhance their properties. Many elements listed in the periodic

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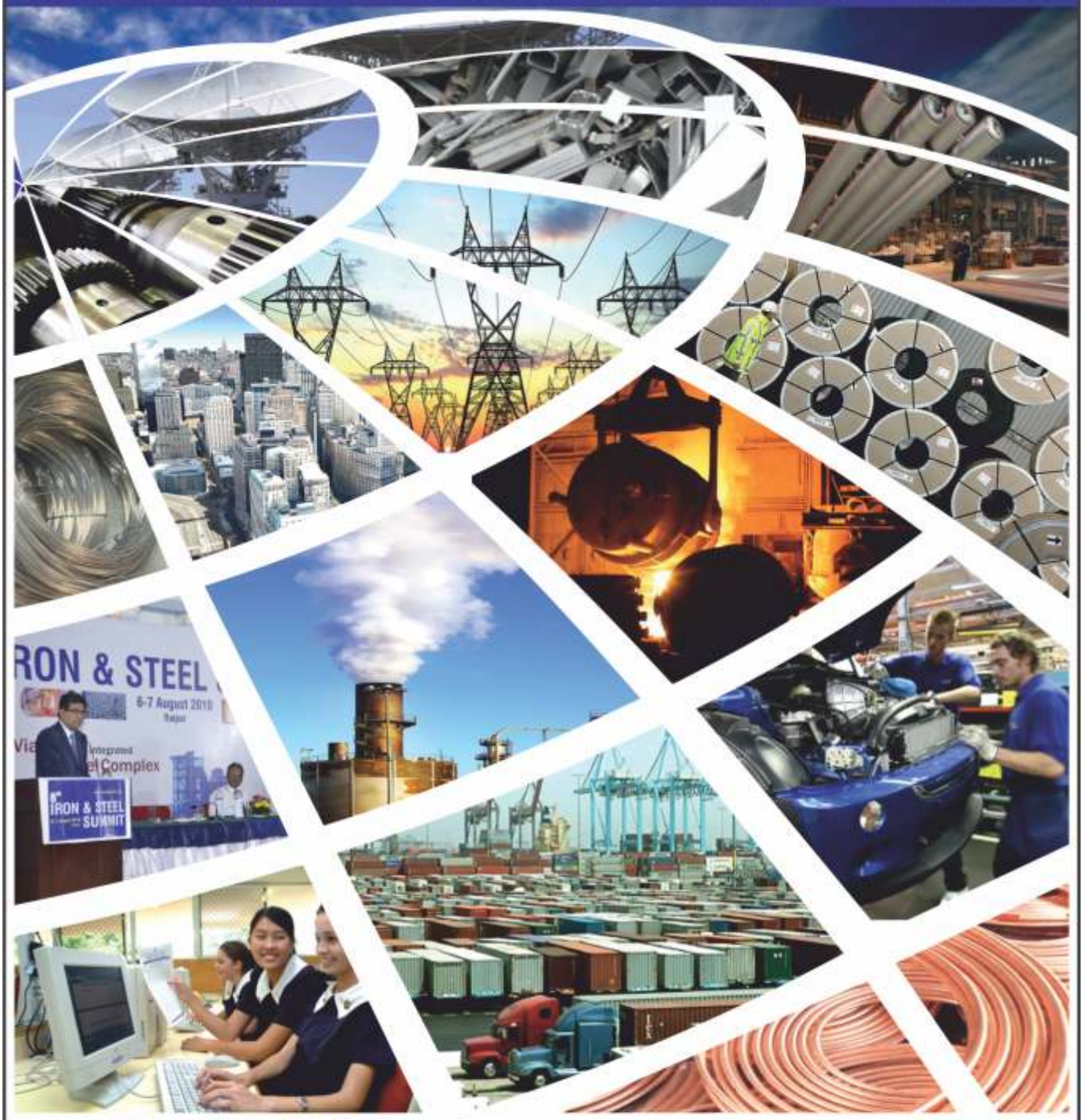

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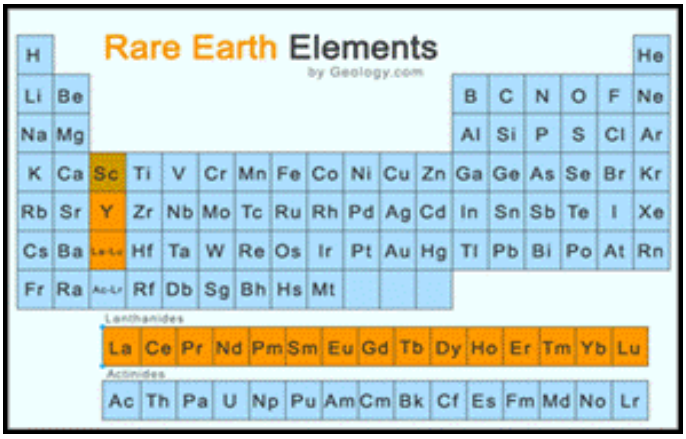

table, available in relatively small quantities on earth, have been deployed to extend the applications through property enhancement. Such materials are primarily from those named as 'Rare Earth Elements' in the periodic table. There are seventeen elements from Group IIIa in the classical periodic table (or Group 13 in the new periodic table), are collectively named as Rare Earth Elements, further classified into Light REEs and Heavy REEs. (See Fig 1 below). The light REEs (with atomic no: 57 to 63) are La-Lanthanum, Ce-Cerium, Pr-Praseodymium, Nd-Neodymium, Pm-Promethium, Sm-Samarium, Eu-Europium, plus Sc-Scandium and Gd-Gadolinium,

Tb-Terbium, Dy-Dysprosium, Ho-Holmium, Er-Erbium, Tm-Thulium, Yb-Ytterbium, Lu-Lutetium and heavy REEs, those with atomic numbers from 64 to 71 (Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu).... `

REEs are virtually never used at 100% concentration in final products; instead, they are typically used in small doses as additives, dopants, or alloying agents.

What are the major applications of Rare Earth Elements?

REEs are virtually never used at 100% concentration in final products; instead, they are typically used in small doses as additives, dopants, or alloying agents.

Their unique electronic configuration imparts them with physical, chemical, and magnetic properties such that only a small amount is often necessary to achieve a desired, significant effect in a host material. These, for example Magnetic properties, Colour emission, Catalytic properties. For example:

High Power Magnets: Neodymium, Samarium used in magnets at up to 30% dosage help increase the magnetic power by 2 to 7 times more than conventional magnets; and provide magnetic field that is 5 to 10 times stronger. This helps in high power motors, with applications in power generation, electric vehicles etc. A neodymium alloy with iron and boron (NdFeB) is used for this purpose. Global Neodymium market size has thus risen to $5.52 billion in 2023 & is projected to grow from $5.78 billion in 2024 to $8.77 billion by 2032.

LEDs: Europium (Eu), Terbium (Tb), Yttrium (Yb) have luminescence property, i.e. they can emit visible light on exposure to electromagnetic radiation. Visible light emission upon exposure to electromagnetic radiation. It is therefore used to make Light emitting diodes (LED). Such LEDs have applications in smart phone displays, smart TV screens and in lighting. In fact the advent of such materials has revolutionised lighting industry, offering energy efficient lighting, making the classical bulbs. redundant, while also providing sustainable, low CO2 gadgets. While the technology for red LED based on Gallium Arsenide, invented at Texas Instruments in 1962, is already half a century old, the discovery of REE-LEDs has offered. Flexibility and variety such as as blue light to soft white light, making its application very broad in lighting.

Colour Displays:

Colour displays are indispensable in most modern devices. Remember the one line small texts shown on the Nokia black & white screen or the unstable TV screens of Weston or ECTV? The technology responsible for this advent is named as phosphorescence? When a surface is illuminated with light, and the light is put off, a phosphorescent surface continues to glow for seconds or minutes, causing 'afterglow'. The colour of the afterglow depends upon what element is used in the coating.

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Use of various REEs has enabled generation of red or green afterglow and creation of the basic colours, with which the entire colour spectrum can be generated. Europium is the key for red and blue in the displays; neodymium for pink/violet/ blue-violet; praseodymium for yellow & green; erbium for pale pink and terbium for green colour.

High Efficiency Catalysts:

The use of a range of REEs (Lanthanum, Cerium Neodymium Erbium Europium Terbium) to enhance the and efficiency of conventional catalysts, has offered significant benefits top chemical manufacturing industry. These include, for example, Emission control in cars through catalytic converters. Some REEs such as electride materials reduce the inhibiting effect of hydrogen (Metal Hydride production) on the catalyst surface, thus improving catalytic activity and hence the per pass conversion. Ammonia production to make fertilizers, Green hydrogen production and waste-water treatment. This development has been crucial to step reduction in automobile exhaust controls and hence has contributed a lot to the growth of automobile industry. In ammonia production process, where nitrogen and hydrogen gases are reacted on a catalyst, the use of cerium oxide as a promotor has facilitated the use of less severe conditions (400 °C temperature and 5 MPa. pressure compared to 400-600 °C and 15-25 MPa for conventional processes), making ammonia production facile. This has revolutionized fertilizer production and hence agriculture as a whole.

Ammonia production to make fertilizers, Green hydrogen production and waste-water treatment. This development has been crucial to step reduction in automobile exhaust controls and hence has contributed a lot to the growth of automobile industry.

New generation Batteries:

The fastest growing application of REEs in batteries: Rare Earth addition to battery design has helped improvement in key performance parameters of batteries such as:

improving energy density, increasing lifespan, faster charging, and reducing weight. primarily in Nickel-Metal Hydride (NiMH) batteries for hydrogen storage in hybrid cars (using La, Ce, Nd) and in permanent magnets for EV motors (neodymium, dysprosium) rather than the Li-ion battery chemistry itself, though some advanced lithium-sulfur batteries use them as cathode hosts to manage shuttle effects. Even in standard Lead0-acid batteries, doping with REEs reduce anode corrosion and enhance battery life.

Improved optical properties of glass:

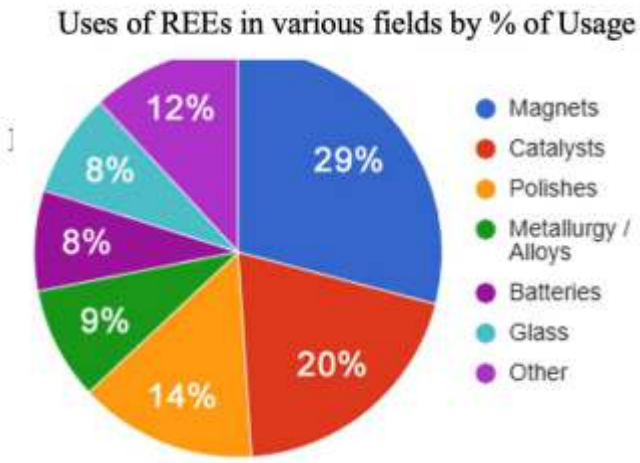
Refractive Index (RI) of glass is important for its performance in lenses. The normal RI of glass is 1.5 to 1.6 units. The REEs can impart denser packing and higher polarizability of glass, based on generation of finer mesh structure of SiO2. A finer melt structure arrangement can be effected by use of Lanthanum Oxide complexes. These complexes can help improve the RI significantly. For example: Note the step improvement in RI with small doping of REEs: Lanthanum - Niobate (La_2O_3-30% +Nb_2O_5-70%: RI of 2.3), Lanthanum-titanate (La_2O_3 +Ti_2O RI of 2.37), Lanthanum Borate gives RI of 1.7 to 1.9, Lanthanum doped with Zinc Boro-tellurite gives RI of 2.19 to 2.5.

Better RI of glass lenses helps in growing applications such as cameras, microscopes, mobiles etc.

- Many such examples of the key role the REEs are playing in the modern world gadgets can be given to illustrate the importance of REEs in today's world.

Demand & Supply of REES:

The global market for REES is estimated to be about 200,000 Tons per annum, distributed across the applications, valued at USD 4 billion USD, with an



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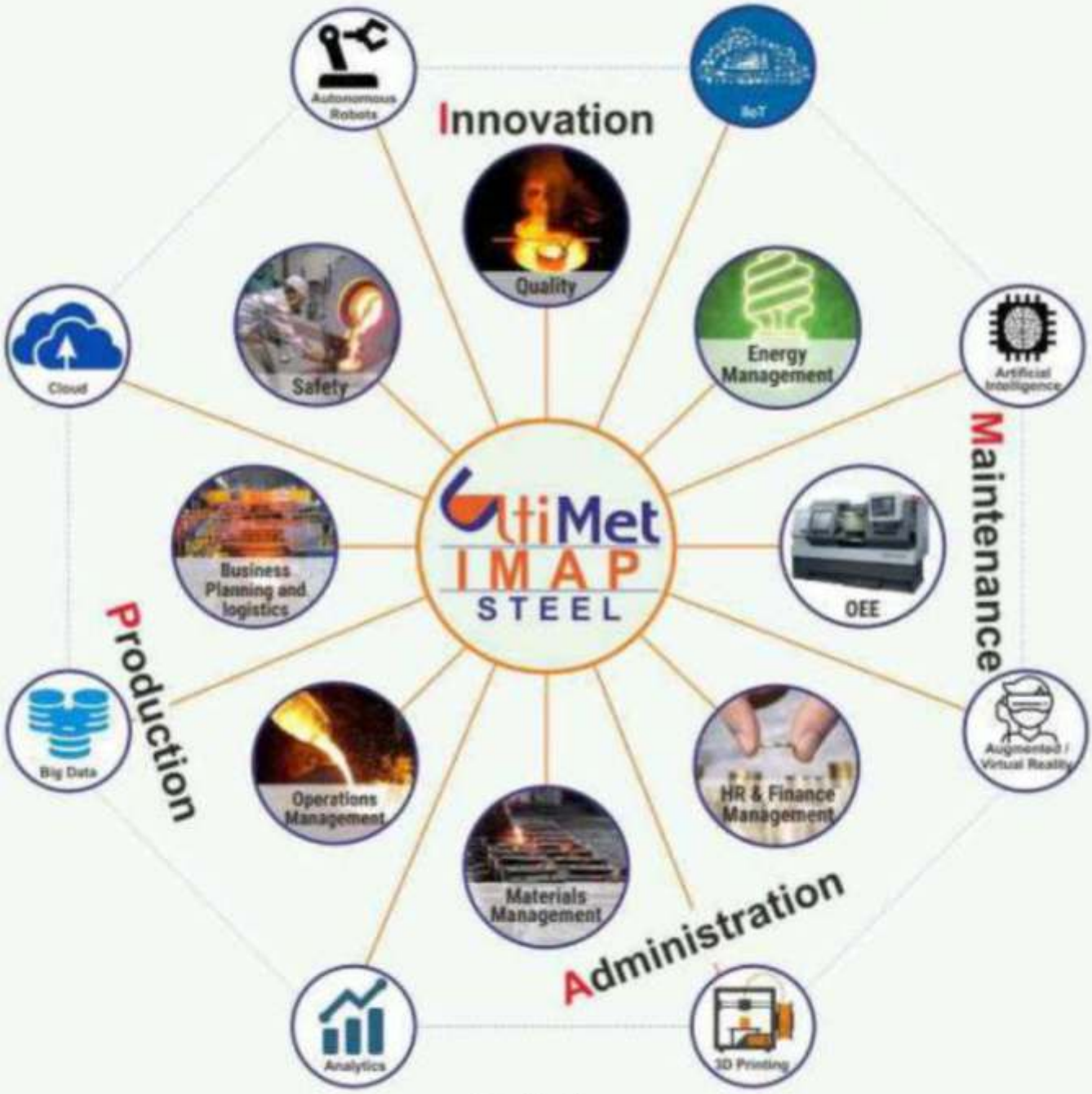

Contact us

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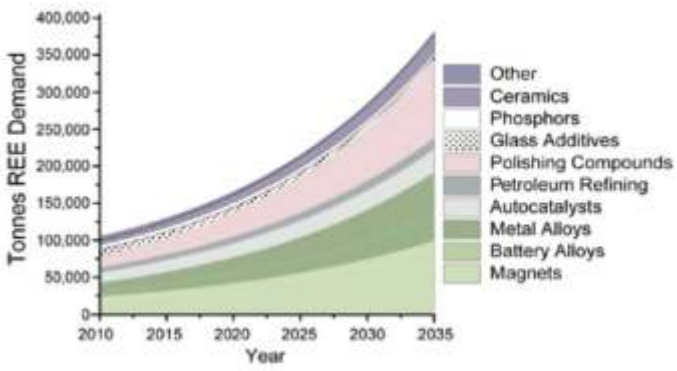


average price of USD 20 per T. It is growing at about 10% CAGR. The materials are primarily available as metal oxides.

How is the rapidly rising demand for REEs to be met? The present production of REEs is estimated at 390,000 TPA of rare earth (as oxides equivalent). The major producers of the material sources are: China (270,000 TPA at 70% of global production), US, Myanmar, Australia, Thailand, Nigeria, India, Russia, Madagascar, Vietnam, Brazil.

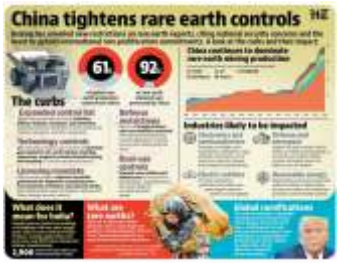
Interestingly the distribution of REE (proven and estimated. Reserves) in the earth crust shows a significant difference: with China (44 M T, 48%), Brazil (21 MT, 23%), India (6.9 MT, 7.6%), Australia (5.7 MT, 6.3%), Russia (3.8 MT, 4.2%), Vietnam (3.5 MT, 3.85%), US (1.9 MT, 2.1%), Greenland (1.5 MT, 1.65%), Canada (0.83 MT, 0.91%), South Africa (0.86 MT, 0.95%), Tanzania (0.9 MT, 0.9%).

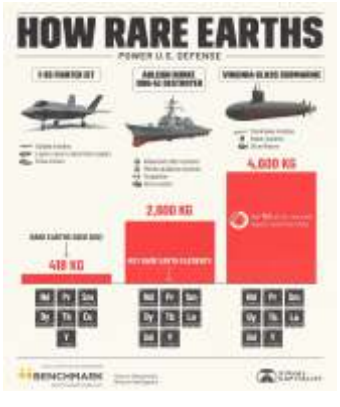
A close look at the reserves clearly brings out the reasons for the geopolitical situation with respect to the national ownership of REEs and why it can cause serious geopolitical tensions across the globe. Newspaper clippings over last one to two years bring up the importance of the issue.

Rare Earth Elements appearing in Recent Newspaper Clippings

The spread of subject titles in the new clips above indicates the global importance of the topic of rare earths; how REEs are important to all countries from US to India to China; how India is striving to become Atmanirbhar (Self-reliant) in REEs, how applications from EVs, to wind power generation to defence gadgets are looking forward to REEs; how REEs is fats becoming a strategic subject than mere technical etc. Recent hot news about China's control of REEs through 'chokehold' by controlling and blocking supply of REEs to the worldwide customers, US president trying to acquire the hitherto neglected island of Greenland for the REE deposits, Indian government starting up a national mission on REEs with targeted investment plan of Rs 5000 Cr; discovery of rare earth deposits in the rebel-stricken minor country of Myanmar… .

Over the. Next article in the series (Summary: The science, technology, applications & geopolitics of Rare Earths-Part 2, Feb 2026), we will address the subject in more details.





Emerging Downstream applications

Rajiv Parulekar
Freelance Consultant

ALUMINIUM IS such a wonderful metal that it contains corrosion resistance of gold and tenacity of Iron and lightness of plastic so it can be given any desirable shape as per designer's imagination, it can be added more strength by making wrought alloys thereby making effective strength to weight ratio. It can be coated effectively with different shades & moreover recycled endlessly due to which it is the most preferred metal when considered for any new product development. As India is developing very fast its requirement for Aluminium and Aluminium based downstream products and its applications are growing substantially & across many segments.

Some of the emerging downstream applications are :

Electrical vehicle segment

Due to need of the hour, all 2 wheeler and 4 wheeler passenger vehicle manufacturers in India are expanding their manufacturing capacity in the form of Electrical vehicles & already started ramping up production of Electrical vehicles. This has resulted in conversion of 5% sales volume for Electrical vehicles. This will enhance requirement of batteries and other parts. To increase efficiency & reduce weight of the vehicle, Aluminium being a first choice due to high corrosion resistance will increase requirement of Aluminium extrusions and sheet metal for different applications like battery cover, mounting, crash guard etc.

Aluminium Container vans for Electrical light commercial vehicles

Due to its light weight and high weight bearing capacity and high corrosion resistance aluminum container vans for Electrical light commercial vehicles will become more popular in coming 3 - 4 years time. This is the need of fast growing E commerce business & will serve this business segment effectively. More fabricators to be engaged to cater this segment.

Solar panels

Photo voltaic solar panels are becoming popular due to abundance solar power available throughout the year in India and Govt subsidy available for residential uses. In this application, solar panel frames, mounting

structures are made out of Aluminium extrusions & this will boost the demand of extrusion industry.

Building and Construction segment

Focus efforts from Central Govt towards affordable homes for Indians across India, tier 2 and tier 3 cities are getting developed at great pace and so the residential buildings and commercial malls. Pvt. building are also developed in all cities across India.

This will boost requirements of Aluminium windows, doors and facades. New investments in Industries are coming up very fast. This will increase requirement of Aluminium roofing which is rust proof for more than 25 years. Fancy shopping malls, Theaters will increase usage of facades (either solid or Aluminium composite panel), Curtain walling/Glazing. New concept of GCC (Global capability centers) is getting fast established in India by global leading industries like Google, Microsoft. This will increase demand for windows, partitions, Facades.

Installation of Data Centers is one more upcoming new activity in India. This will also increase usage of Aluminium windows, doors and specific application extruded profiles suitable for data centers.

Aerospace segment

Due to make in India approach, Boeing, Airbus are setting up manufacturing facilities in India for commercial aero planes and HAL is tying up with Russian firm to manufacture small commercial aero planes in India. This will boost demand for

aluminium extrusions and rolled products. Apart from this aero plane component manufacturers will emerge as suppliers to local aero plane factories as well as outside India aeroplane manufacturing factories and increase the demand for extrusions and rolled products.

Due to plans of ISRO, many space application programmes are lined up which will increase the demand for extrusions.

Defense segment

Due to make in India approach, defense segment is growing very fast. Also export of defense products like missiles, Drones, Military vehicles, guns etc. has increased substantially. This initiative has created lot of demand for aluminium extrusions and rolled products. This demand will be sustainable for couple of years more.

Consumer segment

Aluminium Cans and containers will be growing very fast to serve soft drink, beer market and save energy substantially compared to glass. Due to ban on plastic aluminium semi rigid containers & house foils is a very fast growing segment in India. Lot of secondary players can enter into this segment.

A Legacy of Leadership: SMS Group's Journey Toward Next-Generation Extrusion Technology

Dr. Hansjörg Hoppe
Sales Director – Aluminum Processing Machines

THE EVOLUTION of modern extrusion and forging technology is inseparably linked with a group of pioneering engineering brands whose innovations shaped the metal forming industry for more than a century. Names such as Schloemann, Hasenclever, Sutton, Eumuco, and later SMS Meer laid the technological foundations for today's high-performance extrusion presses. Under the unified identity of SMS Group, this heritage continues-not as a legacy frozen in time, but as a platform for continuous innovation.

Many extrusion presses developed decades ago by these historic brands remain in productive operation around the world. Supporting these systems with spare parts, modernization solutions, and engineering upgrades remains an integral part of SMS Group's responsibility. At the same time, the company has consistently pushed the boundaries of press design, efficiency, automation, and sustainability, ensuring that extrusion technology evolves in step with the demands of modern industry.

The Early Roots of Extrusion Technology

The origins of extrusion technology can be traced back to Germany in 1895, when Deutsche Delta-Metallgesellschaft Alexander Dick & Co. manufactured one of the first extrusion presses on the European continent. Based on a patented process developed by British chemist Alexander Dick, this early breakthrough marked the beginning of a forming technology that would rapidly gain industrial relevance.

A major milestone followed in 1901 with the founding of Eduard Schloemann OHG in Düsseldorf-today represented by the first "S" in SMS Group. Initially established as a trading company, Schloemann quickly transitioned into machine building and by 1910 was already developing hydraulic press control systems. The partnership with M.A.N. in 1915 significantly expanded manufacturing capabilities, enabling the delivery of complete hydraulic press systems and rolling mills. By 1918, more than 100 plants had already been supplied worldwide.

Responding to Aluminium's Rise

The 1940s marked a turning point as aluminium gained strategic importance in aerospace and automotive applications. Lightweight design, combined with high strength requirements, drove the need for more powerful and precise extrusion presses. In response, Schloemann engineers developed tube and extrusion presses exceeding 100 MN press force-an extraordinary achievement at the time.

From the outset, the engineering

philosophy extended beyond simply increasing press force. SMS engineers consistently adopted a holistic approach, focusing on entire machine systems rather than isolated components. This mindset would define decades of innovation.

Engineering Milestones That Defined an Era

One of the most significant advancements came in the late 1950s with the transition from water-hydraulic to oil-hydraulic drive systems. This shift delivered major improvements in lubrication, sealing, service life, and maintenance efficiency, while also enabling more effective power transmission.

In the 1970s, the introduction of prestressed press frames marked another decisive breakthrough. FEM-optimized laminated tie-rod and pressure-box designs delivered exceptional rigidity, long service life, and improved profile quality-features that remain hallmarks of SMS extrusion presses today.

Further refinements followed over the decades. The introduction of wear-free linear guide systems for containers and moving crossheads in 2003 reduced friction and improved alignment accuracy. Self-adjusting discard shears were developed to automatically compensate for die-stack tolerances, enhancing operational consistency and reducing manual intervention.

The Front-Loader Concept: A Defining Innovation

A major leap in press design occurred in 1998 with the development of the short-stroke front-loader extrusion press. This concept fundamentally changed the dynamics of extrusion operations. By ensuring centric billet loading and significantly reducing dead cycle times, the front-loader design improved productivity, uptime, and profile quality while reducing material waste.

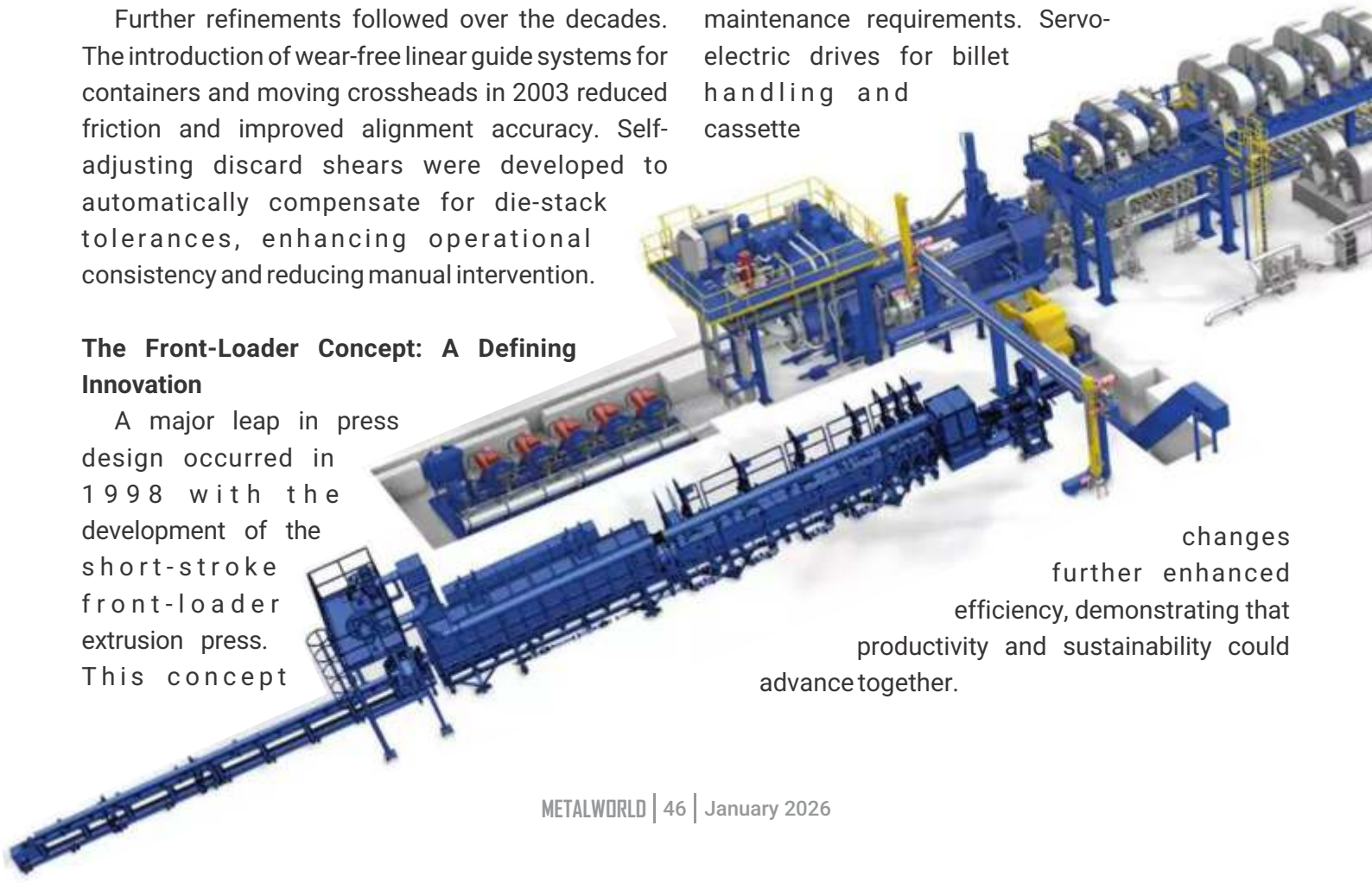
More than two decades later, the front-loader remains a defining feature of SMS press technology-a testament to its robust engineering and long-term relevance.

Automatic shutdown of hydraulic pumps during idle periods, frequency-controlled pump speeds, reduced thermal loads, and lower maintenance requirements. Servo-electric drives for billet handling and cassette changes further enhanced efficiency, demonstrating that productivity and sustainability could advance together.

Driving Efficiency Through Advanced Drive Systems

As energy costs and environmental considerations became more prominent in the 2000s, SMS Group intensified its focus on energy-efficient drive technology. The introduction of ECOdraulic and ECOdraulic 2 systems enabled substantial reductions in energy consumption-up to 25 percent in many applications.

Key features included automatic shutdown of hydraulic pumps during idle periods, frequency-controlled pump speeds, reduced thermal loads, and lower maintenance requirements. Servo-electric drives for billet handling and cassette changes further enhanced efficiency, demonstrating that productivity and sustainability could advance together.



Digitalisation Before It Became a Buzzword

Long before digitalisation became an industry-wide priority, SMS Group had already integrated intelligent automation into extrusion press systems. As early as the late 1980s, platforms such as Picos and Cadex showcased the potential of digital control systems to improve repeatability, reduce scrap, and stabilise process parameters.

These early systems laid the groundwork for today's comprehensive digital ecosystem. Modern Level-2 automation platforms such as MIDIS, along with cloud-based tools like SMS Metrics, now support predictive maintenance, energy optimisation, and data-driven operational excellence across the entire extrusion lifecycle.

HybrEx and the Shift to Hybrid Architectures

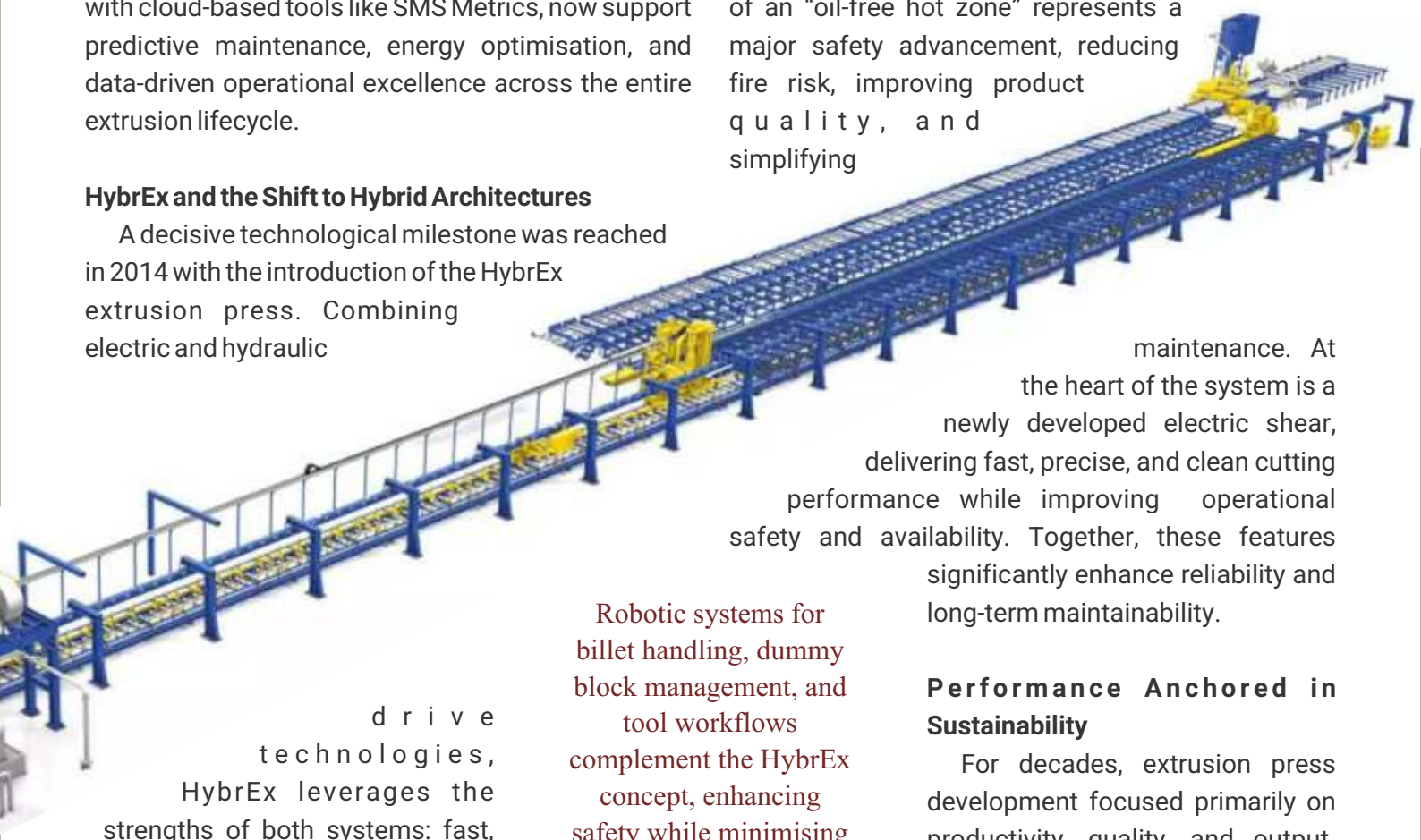
A decisive technological milestone was reached in 2014 with the introduction of the HybrEx extrusion press. Combining electric and hydraulic drive technologies, HybrEx leverages the strengths of both systems: fast, precise electric motion paired with powerful hydraulic extrusion force.

The result is a hybrid architecture delivering more than 30 percent energy savings, a compact installation footprint, lower oil volumes, reduced heat emission, and shorter non-productive times. Maintenance requirements are also significantly reduced, improving overall equipment availability. Robotic systems for billet handling, dummy block management, and tool workflows complement the HybrEx concept, enhancing safety while minimising manual operations.

The Newest Generation: Redefining Press Architecture

The newest generation of extrusion presses, launched this year, represents a further step beyond established industry standards. While retaining proven HybrEx-type main cylinders, the machine layout has been fundamentally re-engineered.

A central innovation is the optimized hydraulic tank concept, which significantly reduces oil volume, improves accessibility for service, and minimises the overall installation footprint. The introduction of an "oil-free hot zone" represents a major safety advancement, reducing fire risk, improving product quality, and simplifying maintenance. At the heart of the system is a newly developed electric shear, delivering fast, precise, and clean cutting performance while improving operational safety and availability. Together, these features significantly enhance reliability and long-term maintainability.



Robotic systems for billet handling, dummy block management, and tool workflows complement the HybrEx concept, enhancing safety while minimising manual operations.

Performance Anchored in Sustainability

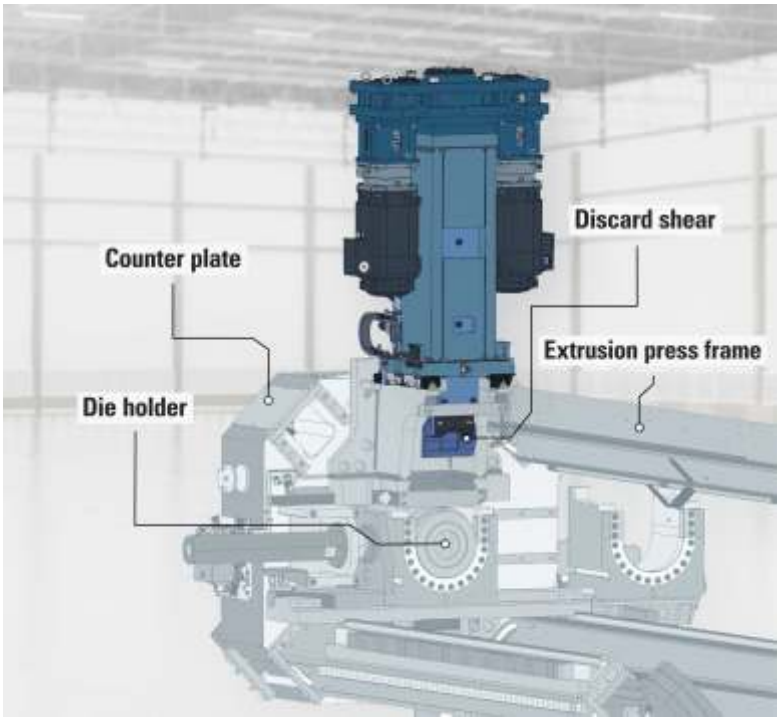
For decades, extrusion press development focused primarily on productivity, quality, and output. Today, sustainability has become an equally decisive factor. Recognising this shift early, SMS Group introduced its Ecoplants sustainability label in 2012, consolidating technologies aimed at reducing energy consumption while improving operational profitability.

The HybrEx series exemplifies this philosophy-demonstrating that high performance and environmental responsibility are not competing objectives, but complementary ones.

A Full-Line Partner for Complete Extrusion Solutions

To deliver fully integrated extrusion solutions, SMS Group has expanded its portfolio through targeted acquisitions. IAS, a specialist in induction heating systems, joined the group in 2013, followed by OMAV SpA in 2020, an Italian expert in automation and downstream extrusion equipment.

Together, SMS Group, OMAV, and IAS offer a unified SMS Extrusion portfolio covering the entire production chain—from billet heating and press technology to automation, handling, and finishing. This single-interface approach ensures harmonized engineering, optimised workflows, and consistent performance across the extrusion line. To date, more than 1,000 extrusion presses have been delivered worldwide, including some of the industry's most demanding references-such as the world's most powerful aluminium extrusion press, a 160-MN installation in China producing ultra-long profiles for railway applications.



Made in India – For India

India's non-ferrous metals industry is evolving rapidly, demanding local execution, speed, and reliability. SMS Group has responded by building a strong manufacturing ecosystem in India, combining global engineering standards with local production and expertise.

From Bhubaneswar, where heavy steel components and metallurgical services are produced, to Ahmedabad, where fully engineered extrusion presses are now manufactured, assembled, and tested, SMS Group is delivering true "Made in India - For India" solutions. Complete hydraulic units are assembled locally, and factory acceptance tests are conducted before delivery, reducing lead times and installation risks.

Modern extrusion technology plays a critical role in enabling sustainable mobility, energy efficiency, and lightweight construction.

This integrated approach strengthens regional service capabilities, reduces import dependency, and embeds technical know-how within India's industrial landscape-supporting the country's extrusion, forging, aerospace, mobility, and energy sectors in alignment with Vision 2047 and the Make in India initiative.

Shaping the Future of Extrusion

Modern extrusion technology plays a critical role in enabling sustainable mobility, energy efficiency, and lightweight construction. Improved material utilisation reduces scrap and lowers CO_2 footprints, while advanced aluminium profiles are increasingly vital across automotive, aerospace, e-mobility, battery housing, and rail applications.

With its deep heritage and forward-looking innovation strategy, SMS Group continues to shape the future of extrusion-combining engineering excellence, sustainability, and execution speed to meet the demands of a rapidly transforming global metals industry.

Solar Powering Indian Foundries: From Cost Pressure to Strategic Advantage

Dr. Kaustubh Gondhalekar

Dr. Kaustubh is a sustainability and clean energy solution provider with over a decade of experience in renewable energy solutions and strategies. He specializes in solar and hybrid energy systems, renewable integration, and the intersection of energy and manufacturing in emerging economies. Dr. Gondhalekar has worked extensively with industrial, institutional, and government clients, and is actively involved in helping energy-intensive sectors such as metals and foundries transition toward cost-efficient, low-carbon operations.

For decades, energy in the foundry business was treated largely as a controllable expense — important, but rarely central to strategic thinking. That equation has changed dramatically. As Indian manufacturing enters 2026, electricity pricing, supply reliability, and carbon visibility have become variables that influence competitiveness as strongly as labour productivity or raw material efficiency.

Power-intensive melting operations sit at the heart of every foundry. Even modest changes in tariffs can alter margins, while uncertainty in supply can disrupt production planning. Simultaneously, domestic and international customers are introducing stricter expectations regarding environmental disclosure, often asking suppliers to quantify and reduce emissions embedded in cast products.

In this evolving environment, renewable energy - particularly solar - is emerging not merely as an environmental gesture but as a serious business instrument.

A Convergence of Economics and Environment

Several forces are driving adoption. Grid tariffs in many industrial states have shown upward pressure, especially during peak demand periods. Open-access charges, cross-subsidy mechanisms, and fuel adjustments add further unpredictability. For management teams attempting to forecast long-term costs, locking a portion of energy consumption into a stable structure is highly attractive.

Solar offers precisely that possibility.

With annual generation potential commonly in the range of 1,400–1,600 kWh per kWp depending on location, output can be forecast with reasonable accuracy. This allows companies to model savings over decades, not just quarters. At the same time, decarbonisation pressure is intensifying.

Export customers, particularly in automotive and engineering supply chains, are moving toward lifecycle accounting. Demonstrable use of renewable power is becoming a visible marker of preparedness for future regulatory regimes. What makes the present moment significant is that environmental and financial logic are now reinforcing each other.

What Can Solar Reduce ?	
Metric	**Impact of Foundry Operations**
Grid Power Purchase	Reduced 20-60% depending on system size
Exposure to tariff hikes	Partially insulated for 20+ years
Co2 emissions	600-4,000 tones annually (typical mid-range units)
Peak-hour purchase	Lower dependance
Customer sustainability risk	Improved audit readiness

Matching Solar Generation with Foundry Operations

Unlike industries with highly variable schedules, many foundries operate predominantly during daylight hours. Melting campaigns, sand preparation, fettling, and machining often coincide with solar generation peaks. This alignment improves utilisation of captive production and reduces dependence on high-cost grid supply. Even partial substitution can materially change blended power cost.

Moreover, technological improvements in inverters, monitoring platforms, and integration systems have reduced performance uncertainty. Managers today can track generation in real time, compare expected versus actual output, and detect inefficiencies quickly. Solar has therefore moved from being a passive installation to an actively managed asset.

Flexible Pathways to Adoption

One of the reasons uptake is widening is the variety of implementation routes available. Rooftop projects remain popular because they use idle surfaces and can often be deployed without major disruption. CAPEX ownership appeals to companies seeking long-term control, while RESCO arrangements allow users to benefit without heavy upfront investment.

Where space permits, ground-mounted captive plants offer higher capacity and stronger offset potential. Larger consumers, particularly exporters, are increasingly exploring open-access models, sourcing power from dedicated solar parks located far from their premises. The key is not which model is fashionable, but which one best fits operational profile and regulatory environment.

Financial Outcomes: What Experience Shows

Evidence from operating installations indicates that payback periods typically fall within four to five years, depending on state charges and system size.

Recent examples include a 1.2 MW rooftop system achieving recovery in about 4.2 years, a 3 MW open-access project delivering in roughly 3.8 years, and smaller installations near 500 kW approaching breakeven within 4.5 years. Given asset lifetimes exceeding two decades, the long-term benefit profile is substantial.

Equally important are carbon reductions, which can reach several thousand tonnes annually in larger plants. For exporters, these numbers increasingly support discussions with global customers.

Typical Solar ROI for Foundries

Installation Type	Size Range	Capex Model	Typical Payback	Plant Life	Key Benefit
Rooftop Solar	300 kW-1 MW	Owned / RESCO	4-5 years	20-25 yrs	Fastest deployment, uses
Ground Captive	1-5 MW	Owned	4-4.5 years	25 yrs	idle roof
Open Access Solar	3-20 MW	PPA / Group Captive	3.5-5 years	Contract based	Higher offset of grid power Scale + tariff visibility

Note : Returns vary by state policy, open access charges, and duty structures.

Geography Matters

Policy frameworks vary widely and strongly influence viability.

Maharashtra's net-metering and group-captive mechanisms have encouraged participation. Tamil Nadu's high solar irradiation improves yield assumptions, while Gujarat's industrial infrastructure and competitive charges support larger projects.

Savvy adopters are paying as much attention to regulation as to technology, recognising that tariff structure can determine project success.

Cluster Behaviour Is Changing

Regional patterns are emerging.

In Kolhapur, many medium-scale units find installations between 300 kW and 1 MW appropriate, balancing cost with available roof area.

Pune's more export-oriented operations frequently combine rooftop systems with open access, moving toward multi-megawatt portfolios.

Around Ahmedabad, industrial estates are witnessing rapid movement toward larger, park-based supply structures.

Peer learning within clusters is accelerating decision-making. Once a few successful cases are visible, adoption tends to follow quickly.

Execution Determines Outcome

Despite favourable economics, results depend heavily on preparation. Detailed load assessment, structural evaluation, financing alignment, and careful EPC selection remain essential.

Plants that treat solar as an integrated part of energy management — rather than a symbolic addition — are reporting better returns.

From Optional to Inevitable

Perhaps the most striking shift is psychological. What began as an innovative experiment is now widely regarded as a practical necessity.

Foundries that move early gain cost visibility, reputational advantage, and operational experience. Those that delay may find themselves under greater pressure as customer expectations tighten.

As 2026 unfolds, solar energy appears set to become a defining feature of competitive strategy in Indian casting operations.

Question from Management	Practical Industry View
Will the savings really justify the investment?	Most industrial systems recover cost in ~4–5 years, while plant life exceeds 20 years. After payback, energy is effectively at marginal operating cost.
What if policies or duties change?	Regulatory structures do evolve, but projects designed with conservative assumptions generally remain viable. Proper structuring is critical.
Do we have enough load during the day?	Many foundries run melting and finishing during solar hours, making partial substitution highly effective.
What about maintenance responsibility?	Modern systems require limited upkeep. AMC or RESCO formats can transfer technical responsibility to specialists.
Will production be disrupted during installation?	Most rooftop systems can be implemented in phases with minimal interference.
Can solar support full plant demand?	Typically it offsets a portion (20–60%). Grid or other sources remain necessary.
How does this help with customers?	Renewable integration strengthens ESG credentials and improves acceptance in global supply chains.
Is financing available?	Banks and NBFCs are increasingly comfortable, especially where cash flow savings are demonstrable.

The Ambitious Rs 1,500-crore Critical Mineral Recycling Incentive Scheme Gets Momentum from the Recyclers;

Dr Anupam Agnihotri, Director, JNARDDC, at IIMRC 2026 by MRAI

Experts outline operational roadmap for Rs 1,500-crore Critical Mineral Recycling Incentive Scheme as India moves to secure scrap-based mineral supplies

THE AMBITIOUS Rs 1,500-crore Critical Mineral Recycling Incentive Scheme that was announced by the Government last October o promote recycling of critical minerals, has been fully operationalised and has been receiving strong support from the recycling industry, as over 70 recycling companies have already registered and more than 10 have already been acknowledged with clear eligibility norms and investment-linked incentives now in place, stated Dr Anupam Agnihotri, Director, Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC),which operates under Ministry of Mining, while addressing the International Material Recycling Conference – IMRC 2026 – being organised by the Material Recycling Association of India (MRAI) in Jaipur.

Dr Agnihotri added that the scheme has targeted the creation of 270,000 metric tonnes of recycling capacity and offers differentiated incentives for two categories of recyclers. Group A companies with an annual turnover of more than Rs 200 crore are eligible for incentives of up to Rs 50 crore or 20% of the cost of plant and machinery, whichever is lower, while Group B companies with turnover below Rs 200 crore can avail incentives of up to Rs 25 crore or 20% of plant and machinery cost.

With operational guidelines, eligibility norms and institutional mechanisms now in place under the National Critical Mineral Mission, speakers emphasised that recycling rather than primary mining alone will determine India's ability to secure long-term access to critical minerals amid tightening global supply chains.

Dr.Agnihotri said, "India has identified 24 critical minerals, many of which remain fully or largely import-dependent, making scrap availability, processing and recovery a strategic priority." He added, "There is a narrow window of five to six years. Countries are already moving towards resource nationalism. Soon, they will restrict exports not just of ores but also of scrap and waste. India must act now to build domestic recycling and recovery capacity if it wants secure supply chains."

Explaining the design of the incentive framework approved by the Union Cabinet in September 2025 and operationalised through guidelines issued in October, Dr. Agnihotri said the scheme deliberately prioritises high-quality recovery from scrap over short-term volume expansion. "Only R3 and R4 category recyclers are eligible. Group A recyclers must process at least 10,000 tonnes per annum, while Group B recyclers must process a minimum of 5,000 tonnes, with defined purity benchmarks. Incentives are capped at Rs 50 crore or 20% of plant and machinery cost, ensuring support is directed toward serious, technology-driven recycling investments," he said.

The scheme combines capital expenditure-linked incentives with phased operational expenditure support over a five- to six-year

horizon, offering stability to recyclers investing in advanced scrap-processing infrastructure. Incentives are restricted to entities engaged in actual extraction and recovery of critical minerals, excluding black-mass-only operations. Placing recycling within a global context, Agnihotri said critical minerals have emerged as a key determinant of geopolitical and economic power. "The green transition, EV manufacturing, Industry 4.0 and defence technologies all depend on reliable access to critical minerals. Recycling and urban mining will increasingly define national competitiveness," he said.

Dr. Agnihotri stated that JNARDDC, an autonomous body under the Ministry of Mines, has been designated as the nodal agency for recycling across aluminium, copper, lead and zinc, with recycling and critical minerals formally added to its mandate. "From funding startups beyond TRL-3 to supporting pilot plants through nine Centres of Excellence with financial backing of up to Rs 20 crore, the institutional ecosystem for scrap-based recovery is now firmly in place," Agnihotri said.

With operational guidelines, eligibility norms and institutional mechanisms now in place under the National Critical Mineral Mission, speakers emphasised that recycling rather than primary mining alone will determine India's ability to secure long-term access to critical minerals amid tightening global supply chains.

Offering an international perspective, Dr Rachana Arora, Director – Climate Change & Circular Economy, GIZ India, said India's recycling-led approach aligns with global supply-chain realities. "Critical raw materials are no longer a single-country issue. India and the European Union are moving toward coordinated approaches on batteries, renewables and electronics, with recycling and urban mining emerging as common priorities," she said, citing India–Germany cooperation across exploration, processing, recycling and technology development.

On the technology front, Dr Alok Ranjan Paital, Principal Scientist, CSIR–CSMCRI, said the policy push coincides with recycling technologies ready for scale-up. "Hydrometallurgy remains central to battery recycling, but advanced processes such as direct cathode-to-cathode regeneration can further reduce energy use and material loss, provided purity challenges are addressed," he said.

From an industry perspective, Vijay Pareek, Executive Director and SBU Head, Gravita India Ltd., said the Critical Mineral Recycling Incentive Scheme brings long-awaited clarity to the recycling sector. "Clear eligibility norms, incentive structures and timelines provide confidence to investors and recyclers, accelerating formalisation and capacity creation in scrap-based recovery," he said.

On the sidelines of the conference, MRAI Battery Recycling Excellence Awards 2026 were conferred to recognise industry leadership, with Ardee Industries Limited named Recycler of the Year (MSME Category) and Gravita India Limited awarded Recycler of the Year (Large-Scale Category).

Organised by the Material Recycling Association of India (MRAI), IMRC 2026 is being held from January 20–22, 2026, at the Novotel Jaipur & Convention Centre, bringing together policymakers, recyclers, manufacturers and global stakeholders. Speakers agreed that developments since September 2025—including notification of scheme guidelines, opening of applications through April 2026, establishment of Centres of Excellence and expanding international cooperation—mark a structural shift in India's mineral strategy, with recycling and scrap recovery firmly positioned at the core of critical mineral security.

SMS group Strengthens India Manufacturing Footprint with New Sanand Facility

WITH THE inauguration of its new state-of-the-art manufacturing facility in Sanand near Ahmedabad, SMS Group has taken a decisive step in strengthening its long-term presence in one of the world's fastest-growing steel and metals markets. Officially opened on January 21, 2026, the facility represents a major strategic investment aligned with India's expanding industrial ambitions and the government's "Make in India" initiative.

The new manufacturing complex underscores SMS group's commitment to serving Indian customers with localized production, faster execution, and globally benchmarked quality standards. At a time when India's steel capacity is poised for significant expansion, the Sanand facility positions SMS group as a deeply embedded partner in the country's industrial growth story.

A Strategic Expansion in a Growth Market

The Sanand facility is SMS group's second manufacturing site in India, complementing its established plant in Bhubaneswar, Odisha, which has been operational since 2014. Spread across an 80,000-square-meter site, the new plant significantly expands the group's manufacturing capabilities in the region and strengthens its ability to respond to growing demand for metallurgical equipment and systems.

The facility is designed to manufacture machinery, components, and complete systems for flat and long product processing, as well as forging technology. With the capability to handle components weighing up to 125 tons and to assemble entire production lines, the Sanand plant marks a major step up in local manufacturing depth and complexity.

Together, the Sanand and Bhubaneswar facilities form a complementary manufacturing ecosystem. While Bhubaneswar focuses on machinery, metallurgical equipment, and service-related activities, Sanand expands the portfolio with heavy fabrication, large assemblies, and integrated line manufacturing. This dual-site approach improves efficiency, broadens product coverage, and enhances supply-chain resilience.

Grand Opening with Industry and Government Presence

The inauguration ceremony reflected the importance of the milestone. More than 250 guests from industry, business, and public institutions attended the event, where the ceremonial red ribbon was cut and a traditional Indian lamp was lit. Representatives from SMS group's German leadership team joined regional leaders to formally mark the opening.

The event symbolized not only the start of operations at a new facility, but also SMS group's long-term commitment to India as a strategic manufacturing and engineering hub. The Sanand plant is staffed by around 160 SMS employees, supported by up to 400 contractors,

forming a key pillar of the company's global quality manufacturing network.

Supporting "Make in India" Through Local Execution

The investment directly supports India's "Make in India" initiative, launched in 2014 to position the country as a global manufacturing powerhouse. By localizing production of complex metallurgical machinery and systems, SMS group is reducing import dependency, shortening delivery timelines, and increasing responsiveness to customer requirements.

Fabíola Fernandez, CFO and Member of the Executive Board of SMS group, highlighted the strategic significance of the investment. She noted that the new facility strengthens the company's production base in India and reinforces its role as a first-class supplier of plants and machinery. With India's steel production currently at around 150 million tons per year and projected to rise to 300 million tons in the coming years, localized manufacturing is critical to supporting this growth with reliable equipment and services.

Embedding Global Quality Standards Locally

According to Marco Asquini, CEO for the APAC & MEA region and Managing Director of SMS India Pvt. Ltd., the Sanand facility reflects SMS group's approach of embedding global engineering standards into local manufacturing. Modern production equipment, disciplined quality processes, and deep engineering expertise form the backbone of the new plant.

SMS group to deliver reliable, punctual execution while minimizing project risks for customers. With India's steelmakers undertaking large-scale capacity expansions and modernization programs, dependable execution and lifecycle support have become decisive differentiators.

This approach enables SMS group to deliver reliable, punctual execution while minimizing project risks for customers. With India's steelmakers undertaking large-scale capacity expansions and modernization programs, dependable execution and lifecycle support have become decisive differentiators.

Why Sanand? Location as a Strategic Advantage

The selection of Sanand near Ahmedabad was driven by several strategic factors. Western India is home to a dense concentration of steel producers, forging companies, and industrial manufacturers-many of them key customers of SMS group. Proximity to this customer base allows faster response times, closer collaboration, and improved on-site support during project execution.

The region also offers strong industrial infrastructure, including reliable power and water supply, access to skilled labor, and well-developed logistics. Connectivity to major seaports further enables efficient shipment of heavy components to national and international markets, reinforcing Sanand's role as a global

supply hub within SMS group's manufacturing network.

Designed for Growth and Future Expansion

The Sanand facility has been designed with scalability in mind. The site is earmarked for future expansion, with additional investments planned in advanced machinery, digital manufacturing tools, and workforce development. As demand grows, SMS group intends to further strengthen local capabilities while maintaining alignment with global engineering standards.

This long-term outlook reflects confidence in India's industrial trajectory-not only in steel production but also in downstream sectors such as automotive, infrastructure, energy, and heavy engineering.

SMS group's Longstanding Presence in India

SMS group's roots in India extend back several decades. Its predecessor companies established an early presence with Indomag Steel Technology Ltd. in Delhi in 1989, followed by SMS Schloemann-Siemag in Mumbai in 1994. The merger of Mannesmann Demag and SMS Schloemann-Siemag in 1999 led to the consolidation of their Indian operations, laying the foundation for today's SMS India organization.

This long-term outlook reflects confidence in India's industrial trajectory not only in steel production but also in downstream sectors such as automotive, infrastructure, energy, and heavy engineering.

Since then, SMS group has expanded steadily across the country. Today, it operates offices and facilities in Gurgaon, Kolkata, Pune, Bhubaneswar, and Sanand, employing around 1,700 people in India. SMS India's headquarters are located in Gurgaon near New Delhi, with teams covering sales, engineering, project management, automation, electrical systems, and service.

These teams support the full spectrum of SMS technologies-from raw material handling and metallurgical processing to blast furnaces, flat product lines, strip treatment plants, and forging systems-serving both greenfield projects and modernization initiatives.

A Long-Term Commitment to India's Industrial Future

The Sanand manufacturing facility represents more than an infrastructure investment. It signals SMS group's intention to be a long-term partner in India's industrial transformation-combining global technology leadership with local execution, skills development, and value creation.

As India moves toward higher steel capacities, more advanced metallurgical processes, and greater self-reliance in manufacturing, localized production of complex plants and machinery will play a critical role. With its expanded manufacturing footprint, SMS group is positioning itself to support this journey—delivering dependable execution, world-class technology, and sustained value to India's metals industry.

Aurubis Enhances Circular Metals Capacity

AURUBIS HAS intensified its focus on circular economy strategies with new steps aimed at expanding its multi-metal recycling and recovery capabilities. The company confirmed that investments are being directed toward technologies that enable higher yields from complex scrap streams, electronic waste, and industrial residues.

The initiative reflects a structural shift in the copper industry. As demand accelerates from electrification, renewable energy systems, digital infrastructure, and mobility applications, secondary raw materials are becoming increasingly important in balancing global supply. Recycling offers the dual advantage of lowering carbon intensity while also reducing exposure to primary mining disruptions.

Aurubis is working to integrate advanced sampling, sorting, and metallurgical treatment methods to recover not only copper, but also precious and specialty metals contained in secondary feeds. These improvements are expected to enhance profitability while strengthening supply chain resilience.

Customers across Europe and Asia are now placing greater emphasis on documented sustainability performance. By expanding circular capacity, Aurubis aims to position itself as a preferred partner for manufacturers seeking reliable, responsibly sourced material.

Market analysts see the strategy as part of a broader industry movement in which smelters are evolving into complex materials recovery hubs. The ability to process diverse scrap inputs efficiently is likely to become a key differentiator in the coming years.

Hindustan Copper Pushes Mine Development and Resource Security

HINDUSTAN COPPER has intensified efforts to expand domestic resource availability through faster mine development and improved beneficiation efficiency. The company's current focus includes accelerating project timelines and enhancing ore recovery rates.

Copper's strategic importance continues to rise due to electrification, renewable power infrastructure, and electric mobility. Securing stable domestic supply is therefore becoming a national priority.

Upgrades in geological modelling, equipment deployment, and process management are intended to improve productivity while controlling costs. Enhanced visibility across operations is expected to support better planning and output predictability.

Industry observers believe sustained progress in domestic copper availability could significantly reduce import dependence over the coming decade.

Rio Tinto Advances Low-Carbon Aluminium Technologies

RIO TINTO has continued to accelerate work on low-carbon aluminium production pathways, reinforcing the company's long-term strategy of aligning technological innovation with climate commitments.

The miner is investing in next-generation smelting solutions, renewable energy integration, and process improvements designed to significantly reduce greenhouse gas emissions across the aluminium value chain. These efforts are intended to address growing customer expectations for materials with lower embedded carbon.

Automotive manufacturers, packaging companies, and infrastructure developers are increasingly incorporating sustainability criteria into procurement decisions. As a result, producers that can demonstrate credible decarbonisation progress may gain preferential access to premium markets. Rio Tinto's initiatives also extend to improving energy management within existing facilities. Upgrades in efficiency, data analytics, and operational control are expected to deliver incremental emission reductions while maintaining productivity.

Analysts believe that technology-led differentiation will become more important as regulatory frameworks tighten globally. Companies capable of combining scale with innovation are likely to strengthen their competitive positioning. By advancing low-carbon technologies today, Rio Tinto aims to secure long-term relevance in a market where environmental performance is rapidly becoming a defining commercial parameter.

Gravita India Strengthens Global Scrap Procurement Network

GRAVITA INDIA has expanded its international procurement framework to secure more stable flows of recyclable raw materials. The company aims to improve supply reliability while maintaining compliance with tightening environmental and traceability standards.

With secondary metals becoming central to decarbonisation strategies, recyclers are investing heavily in sourcing infrastructure and supplier partnerships. Reliable feedstock access is now as critical as processing capability.

Gravita's initiatives include stronger overseas relationships, enhanced quality verification systems, and improved logistics planning. These measures are expected to reduce volatility in raw material availability.

The development underscores how recycling companies are scaling operations to meet global expectations of transparency and consistency.

India's Demand for Steel Scrap To Increase Sharply On Capacity Expansion; Shri. Daya Nidhan Pandey, Joint Secretary, Ministry of Steel at IMRC 2026 in Jaipur

MRAI calls for a GST cut to 5% and stronger regulations to formalise the scrap sector and boost sustainable steel production.

SCRAP CURRENTLY contributes nearly 21% of India's crude steel production, compared to a global average of around one-third. While the scrap consumption in the Indian steel sector has been rising, the scrap availability is estimated to rise to nearly 36 million tonnes, which clearly indicates that demand for steel scrap will increase sharply as large-scale capacity expansion continues," said Shri Daya Nidhan Pandey, Joint Secretary, Ministry of Steel, addressing the inaugural session of the 13th International Material Recycling Conference and Exposition (IMRC 2026) at Jaipur today.

Referring to policy measures, Pandey said, "The Government has taken coordinated action through the Steel Scrap Recycling Policy 2019, the Vehicle Scrappage Policy, the rollout of Registered Vehicle Scrapping Facilities, and the integration of scrap management with national circular economy initiatives. Recently notified Extended Producer Responsibility (EPR) mandates for end-of-life vehicles and construction and demolition waste are expected to accelerate formal scrap recycling."

Looking ahead, Pandey said, "India aims to progressively raise the share of scrap in steelmaking towards the global average of 31%. As the country moves towards 300 million tonnes of steel capacity by 2030 and 500 million tonnes by 2047, steel scrap will play a decisive role in conserving raw materials, reducing coal imports, lowering emissions, and supporting India's commitment to achieve net zero by 2070."

Shri. Pandey affirmed India's positioning in scrap – based steel making as a booster to its decarbonisation efforts, as it helps to avoid carbon emission and also substitutes iron ore, coking coal. As India is targeting 300 million tonnes of crude steel capacity by 2030-31, the recycled steel scrap consumption will gain a momentum. "

Highlighting operational challenges, Shri. Sanjay Mehta, President, MRAI, stressed the urgent need for policy rationalisation. "The recycling industry needs GST on scrap to be reduced to 5%, as current high rates are hurting growth and pushing the sector into non-compliance. Further, the import duty on aluminium scrap needs to be fully removed. Extended Producer Responsibility across e-waste, tyres and plastics must also be implemented more effectively, as weak enforcement is undermining the recycling value chain," he said.

Emphasising the social dimension of recycling, Shri. Mehta added that nearly one-third of scrap in India originates from ragpickers, households and small workshops. "Lower GST and routing scrap purchases from the unorganised sector through UPI-based transactions, while discouraging cash at the first level of collection, will help bring these workers into the formal economy with dignity and sustainability," he said.

Speaking on the evolving industry landscape, Shri. Dhawal Shah, Senior Vice President, MRAI, said that recycling in India has decisively transitioned from a CSR-driven activity to a core business strategy. India today had more than 1400 start-ups operating across waste management and sustainability. At this pace, the recycling industry could surpass mining well before 2050, reflecting the scale, confidence and long-term opportunity emerging across the sector."

Shri. Zain Nathani, Vice President of MRAI called India's recycling industry to be a game changer and the Government's duty rationalisation impetus would further help. Shri. Amar Singh, Secretary General of MRAI mentioned that the Indian recycling industry has seen a transition and poised to take further leaps with enhanced contributions in the GDP.

Shri. Rajat Agarwal, Managing Director of Gravita India Limited, while addressing the role of finance and global capital stresses that capital was no longer a constraint for responsible recyclers. He said, "Global green funds and ESG-focused investors are actively backing scalable recycling platforms that deliver both financial returns and environmental impact. Recycling today sits at this powerful intersection." He added that with strong governance, supportive policies such as EPR, and India's circular economy vision, Indian recyclers are now globally competitive climate-solution providers.

Organised by the Material Recycling Association of India (MRAI), the three-day conference is being held from January 20–22, 2026, at the Novotel Jaipur & Convention Centre, Jaipur, and brings together policymakers, industry leaders, and global stakeholders to discuss recycling's role in sustainable industrial growth.

The conference opened with discussions on sustainability, climate change, energy storage and circular economy transitions, while also addressing long-standing industry concerns around regulatory clarity and market stability.

During the inaugural session, Lifetime Achievement Awards were presented to Jinesh Shah, Director, Rajhans Impex Pvt. Ltd.; Purshottam Parolia, CMD, Nihon Ispat Pvt. Ltd.; and Hitesh Shah, Chairman, Mono Steel (India) Limited. The Global Recycler of the Year Award was conferred on Anshul Gupta, Chairman, PAN Gulf IInternational.

NITI Aayog Pegs India's E-waste Potential at Rs 51,000 crore, while the Opportunity Losses at Rs 7,500 crore in Waste Tyres

- Releases Reports on 'End - of - Life Vehicles, E-waste, Li-ion Batteries and Tyres for Enhancing Circular Economy' at IMRC 2026 by MRAI in Jaipur

- Reports highlight rising material flows, dominance of the informal sector and the urgent need for standards-led formalisation

INDIA'S ANNUAL economic value of E-waste stream is Rs. 51,000 crore, of which 60% is extractable while the current recovery systems captures only 18% of this potential. As a result, a major opportunity is lost due to poor processing and inefficiencies in the informal sector. On the other hand, in the waste tyres category, India is loosing Rs 7,500 crore of revenues due to the lack of standards for recycled products, stated the NITI Aayog's Reports on E-waste, Waste Tyres, Li-on Batteries and End – of – Life Vehicles launched at the International Material Recycling Conference – IMRC 2026 – organised by the Material Recycling Association of India (MRAI) in Jaipur today.

Assessing the potential of these promising recycling sectors as part of the circular economy and the existing gaps, these reports have recommended certain measures to the Government. The Reports titled 'Enhancing Circular Economy of End – of – Life Vehicles (ELVs) in India' and 'Advancing Circular Economy of Waste Electronic and Electrical Equipment (E-waste) and Lithium – Ion Batteries in India' and 'Waste Tyres' observed the gaps such as weak formal systems and the absence of quality standards.

The reports underline that India currently generates around 6.2 million metric tonnes (MMT) of e-waste annually, a figure projected to rise sharply to 14 MMT by 2030, even as formal recycling capacity remains limited to about 2 MMT and only 10% of total e-waste is processed through authorised channels. Further, the 'End-of – Life Vehicles' vertical presents a parallel challenge. The Report stated that while India's cumulative ELVs are expected to reach about 50 million by 2030, it equally underscores the urgent need for a robust policy, regulatory framework.

Releasing the assessments, Shri. Priyavrat Bhati, Programme Lead, Green Transition, Climate Environment, NITI Aayog, said, "India is now confronting a widening mismatch between the pace at which waste is generated and the capacity of formal recycling systems to absorb it." This disconnect, he noted, is translating into a direct loss of economic value, industrial inputs and strategic resources at a time when global supply chains are becoming increasingly constrained.

In waste tyres, as per the report, India generates close to 3 million metric tonnes annually, of which around 1.6

MMT comes from domestic end-of-life tyres. The NITI Aayog report proposes banning the pyrolysis of imported end-of-life tyres to prevent environmental damage and encourage higher-value recovery pathways within the domestic recycling ecosystem.

The report also highlighted the rapidly growing significance of lithium-ion batteries. India's Li-ion battery demand is projected to rise from about 29 GWh to nearly 248 GWh, while spent battery volumes are expected to increase almost ninefold to around 332 kilotonnes by 2025 from roughly 36 kilotonnes in 2020. Strengthening recovery of critical battery minerals, the assessments note, will not only reduce import dependence but also mitigate environmental impacts associated with primary mining and significantly lower reliance on China, which currently controls nearly 90% of the global processing capacity for several critical battery materials, observed the report on Li-ion Batteries.

Highlighting the sector's broader strategic relevance, Maj. Gen. K. Narayanan, AVSM, SM (Retd), Programme Director, Security and Law, Niti Aayog, said India's recycling and resource recovery industry has evolved into a nationally relevant economic activity. "India's recycling and resource recovery sector has decisively emerged as a core contributor to national development," he said, noting that progress is increasingly being driven by industry-led adoption of ethics, transparency and responsibility."

From an industry perspective, Sanjay Mehta, President, Material Recycling Association of India (MRAI), said, "Nearly 90% of metal recycling in India is now organised, demonstrating that formalisation delivers scale, compliance and efficiency. The Reports by NITI Aayog will set clear pathways for policy upheaval to drive further growth in the sectors."

The India Material Recycling Conference (IMRC) 2026 brings policymakers, industry leaders and recyclers together at a moment when the data is unequivocal. Waste in India is no longer a peripheral environmental issue,it is a strategic economic resource. Whether the country captures its full Rs 51,000 crore potential will depend on how quickly systems are built to match its scale.

Hindalco announces ₹21,000-crore smelter expansion; commissions FRP and battery foil facilities in Odisha

- Part of Hindalco's ongoing growth capex programme, with around ₹37,000 crore planned for Odisha
- FRP expansion to halve India's flat-rolled aluminium import dependence
- Projects expected to generate over 15,000 additional jobs, supporting EV, defence & advanced manufacturing

HINDALCO INDUSTRIES Ltd, the metals flagship of the Aditya Birla Group, today announced a major expansion of its aluminium operations in Odisha. The company flagged a ₹21,000-crore, 3.6 lakh-tonne-per-annum smelter expansion at its Aditya Aluminium complex in Sambalpur and commissioned a 1.7 lakh-tonne-per-annum Flat Rolled Products (FRP) and battery-grade aluminium foil manufacturing facility with an investment of ₹4,500 crore. The projects were inaugurated by the Hon'ble Chief Minister of Odisha, Shri Mohan Charan Majhi.

These projects are a major step in indigenising critical raw materials for lithium-ion batteries in India, supporting the electric mobility and energy storage ecosystem, while enhancing domestic capabilities in high-grade aluminium products. The battery-grade aluminium foil facility—India's first of its kind—draws input directly from the FRP complex and is designed to support up to 100 GWh of lithium-ion cell manufacturing capacity.

These projects form part of Hindalco's broader growth capital expenditure programme, with around ₹37,000 crore planned for Odisha across upstream and downstream aluminium operations. The Odisha investments are a significant component of the company's overall growth capex of ₹55,000 crore across India.

Hindalco is India's largest flat rolled products player, accounting for over 50% of the domestic market. With nearly 40% of flat-rolled aluminium currently imported into India, the expanded FRP capacity is expected to reduce import dependence by nearly half, supporting domestic manufacturing and improving India's competitiveness in high-grade aluminium products. The smelter expansion at Aditya Aluminium will also mark a step forward in energy transition, with a portion of its power requirement planned to be met through round-the-clock renewable energy (RE-RTC), integrating sustainability considerations into large-scale industrial growth.

Commenting on the development, Mr. Kumar Mangalam Birla, Chairman, Aditya Birla Group, said, "India's manufacturing growth depends on integration, value addition and sustainability. Through Hindalco, we are building a fully integrated aluminium ecosystem that spans from upstream resources to high-value downstream products. Our long-standing partnership with Odisha continues to play an important role in this journey. This strategy strengthens India's self-reliance, supports critical sectors, and accelerates the nation's transition towards advanced, sustainable manufacturing."

Mr. Satish Pai, Managing Director, Hindalco Industries Ltd, said, "The FRP expansion and smelter growth at Sambalpur exemplify our integrated upstream–downstream growth strategy. This enables Hindalco to deliver high-quality aluminium solutions across packaging, defence, electric mobility, renewable energy and advanced manufacturing, positioning us strongly to support India's industrial ambitions while creating long-term value."

Hindalco's presence in Odisha spans over 15 years of strong partnership with the State, during which it has already invested more than ₹25,000 crore across bauxite mining, alumina refining, primary aluminium smelting, and downstream manufacturing. The company's operations link upstream resources bauxite, alumina, and primary aluminium with high-value downstream products like FRP and battery foil, creating a fully integrated aluminium ecosystem.

Hindalco's integrated operations currently provide employment to nearly 23,000 people, with the next phase expected to generate over 15,000 additional direct and indirect jobs. The broader investment pipeline includes the FRP and battery foil manufacturing facilities, the primary aluminium smelter expansion, Kansariguda alumina refinery, Meenakshi coal mine, specialised materials such as white fused alumina, and ancillary manufacturing units further consolidating Odisha's status as a national hub for aluminium excellence.

Sustainability underpins Hindalco's growth strategy, with downstream manufacturing delivering lower carbon intensity per tonne, supported by renewable energy integration, advanced technologies and responsible resource management. Through CSR initiatives in education, healthcare, skill development and women's empowerment, the company ensures its industrial growth translates into shared, inclusive and sustainable development across India.

National Aluminium Company Prioritises Efficiency Upgrades Across Smelting Assets

NATIONAL ALUMINIUM Company has outlined a program of efficiency enhancements aimed at improving energy performance and operational reliability across its smelting facilities. The initiative includes modernisation of potlines, enhanced monitoring systems, and process optimisation measures.

Energy remains one of the most significant cost components in aluminium production. By targeting improved consumption metrics, the company aims to protect margins while supporting national decarbonisation objectives.

Executives highlighted that incremental improvements in heat balance, current efficiency, and maintenance practices can deliver substantial cumulative gains. Digital tools are expected to play a larger role in predictive diagnostics and performance benchmarking.

Analysts view the program as part of a broader trend among producers who are prioritising internal optimisation rather than aggressive capacity expansion. In an environment of fluctuating prices and stricter environmental scrutiny, operational discipline has become a central pillar of competitiveness.

FOUNDRY-MASTER Smart 2: Bringing Lab-Grade Precision to the Foundry Floor

IN AN environment where material consistency, compliance, and process stability are becoming decisive factors for competitiveness, the role of reliable, high-precision metal analysis has never been more critical. Foundries today operate under increasing pressure—from tighter customer specifications and sustainability expectations to rising costs and skilled manpower constraints. Against this backdrop, advances in analytical instrumentation that combine accuracy, robustness, and ease of use are gaining renewed importance.

Addressing these evolving needs, Hitachi High-Tech has launched the FOUNDRY-MASTER Smart 2, a next-generation stationary optical emission spectrometer (OES) designed specifically for Quality Assurance and Quality Control (QA/QC) in ferrous and non-ferrous metal applications. The instrument represents a focused evolution of the widely adopted FOUNDRY-MASTER Smart platform, combining trusted reliability with targeted technological upgrades-without increasing the total cost of ownership.

Built on a Proven Installed Base

Over the past decade, thousands of FOUNDRY-MASTER Smart units have been installed globally across aluminium foundries, iron and steel foundries, metal fabrication shops, and recycling facilities. The system earned a reputation for dependable performance in demanding industrial environments, where instruments must operate consistently despite dust, temperature variations, and high production pressures.

The Smart 2 builds directly on this foundation. Rather than reinventing the platform, the design philosophy has focused on strengthening what users value most: measurement stability, analytical confidence, operational simplicity, and long-term reliability. This approach reflects a broader industry shift toward practical innovation—incremental but meaningful improvements that deliver measurable value on the shop floor.

Lab-Level Precision, On Site

At the heart of the FOUNDRY-MASTER Smart 2 is a significant enhancement in detection and signal stability. The instrument incorporates a scientific CMOS (Complementary Metal Oxide Semiconductor) sensor, a technology traditionally reserved for high-end laboratory spectrometers. This sensor is capable of capturing very faint emission lines with lower background noise, improving sensitivity and accuracy for trace and alloying elements.

Complementing the sensor is an ultra-stable spark source, previously available only in flagship laboratory systems. By ensuring identical excitation conditions from measurement to measurement, the spark source minimizes signal variation and improves repeatability. Together, these upgrades deliver tighter detection limits and more consistent results-particularly important for aluminium, zinc, and lead alloys, where small

compositional deviations can significantly affect mechanical properties, corrosion resistance, and downstream process performance.

For foundries and recyclers, this translates into greater confidence in on-site analysis, reduced dependency on external laboratories, and faster decision-making in production and material acceptance.

Designed for Industrial Environments

Analytical performance alone is not sufficient in real-world foundry settings. Instruments must be robust, easy to maintain, and intuitive to operate-often by personnel who are not spectroscopy specialists.

The FOUNDRY-MASTER Smart 2 retains its compact benchtop footprint, allowing it to fit easily into on-site laboratories and QA/QC stations where space is at a premium. At the same time, the updated housing introduces a more modern design with improved internal integration. This enhances durability while making routine access and servicing more straightforward, reducing downtime over the instrument's lifecycle.

Attention has also been given to long-term measurement stability. An optimized readout design minimizes electromagnetic interference (EMI), a common challenge in industrial environments filled with furnaces, motors, and heavy electrical equipment. By reducing interference and signal drift, the system maintains calibration integrity over time, supporting consistent performance even under noisy operating conditions.

Ease of Use for Everyday QA/QC

Ease of operation remains a defining feature of the FOUNDRY-MASTER Smart 2. Paired with Hitachi High-Tech Analytical Science's SpArcfire software, the system offers an intuitive user interface designed for fast, routine analysis. Clear workflows, guided measurement steps, and straightforward result interpretation make it suitable for daily QA/QC tasks without extensive specialist training.

This is particularly relevant as foundries face growing skill shortages and higher workforce turnover. Instruments that reduce operator dependency and minimize the risk of measurement errors play a key role in maintaining consistency across shifts and sites.

Supporting Digitalised Manufacturing

Beyond its role as a standalone analytical instrument, the FOUNDRY-MASTER Smart 2 reflects Hitachi High-Tech's broader vision of analytical systems as digitalised assets. The instrument is positioned as part of Hitachi's Lumada framework, which focuses on combining installed-base data, domain expertise, and advanced digital technologies to deliver value-added services.

Within Hitachi Ltd.'s Connective Industries Sector, this approach contributes to the concept of "Integrated Industry Automation," where data generated at the operational level can be leveraged for improved process control, asset

management, and decision-making. For foundries, this signals a gradual shift from isolated measurement tools toward connected systems that support digital quality management and traceability.

While the immediate benefits are seen in improved analytical performance, the longer-term implication is the potential integration of material data into broader digital workflows-supporting initiatives such as process optimisation, energy efficiency, and compliance reporting.

Application-Driven Support and Global Reach

Instrumentation performance is only as effective as the support structure behind it. The FOUNDRY-MASTER Smart 2 is backed by Hitachi High-Tech Analytical Science's application-driven support model, which includes expert guidance, custom calibrations, and hands-on training tailored to specific materials and processes.

With assembly, sales, and service centers across Asia, the Americas, and EMEA, the company maintains a strong global service footprint. This is particularly important for stationary OES users, where rapid technical support and calibration assistance can directly impact production continuity.

The combination of a broad installed base and responsive after-sales support has been a key factor in the platform's adoption across diverse foundry segments, from automotive casting suppliers to recycling operations handling mixed metal streams.

A Practical Evolution, Not a Radical Shift

Speaking about the launch, Michael Molderings, Product Manager for OES at Hitachi High-Tech Analytical Science, emphasized the pragmatic intent behind the update. The focus, he noted, was on strengthening dependable performance, maintaining a compact footprint, and delivering strong value for money—rather than introducing unnecessary complexity.

This positioning aligns well with current industry realities. Foundries today are cautious in capital spending, prioritizing investments that deliver clear operational benefits and long-term reliability. By offering measurable performance improvements without increasing price, the FOUNDRY-MASTER Smart 2 addresses this requirement directly.

Relevance for Foundries and Recyclers

For ferrous and non-ferrous foundries, the implications of improved on-site OES performance are significant. Faster, more reliable material verification supports tighter process control, reduces rework and scrap, and enhances customer confidence. In recycling environments, where material variability is high, accurate and repeatable analysis is essential for effective sorting and alloy control.

As customer expectations continue to rise- driven by quality standards, sustainability requirements, and global supply-chain scrutiny-analytical tools that combine precision, robustness, and usability will remain central to foundry operations.

With the launch of the FOUNDRY-MASTER Smart 2, Hitachi High-Tech reinforces its commitment to supporting these needs through practical innovation, helping foundries transform high-precision analysis into a dependable, everyday production asset.

From Local to Global: Reimagining the Indian Foundry Sector Through Technology, Sustainability and Skills

- An Exclusive Webinar Report

This webinar was conducted on 8 December 2025 as part of the 14th Asian Metallurgy Webinar Series and was hosted on a digital platform, bringing together industry experts to deliberate on key developments shaping the Indian foundry sector.The event reinforced Asian Metallurgy's ongoing effort to create knowledge platforms that help the metals and casting community navigate structural change while identifying new growth opportunities.

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THE INDIAN foundry industry stands at a critical inflection point. Long regarded as a foundational "mother industry" serving automotive, infrastructure, engineering, energy, and manufacturing sectors, foundries today face an unprecedented combination of challenges and

opportunities. These include tightening environmental regulations, global competition, manpower constraints, rising customer expectations, and rapid technological change. Addressing these realities was the focus of a recent webinar titled "Indian Foundry Sector: Challenges & Opportunities", organised as part of the 14th Asian Metallurgy Webinar Series, held on 9 December 2025.

The session brought together industry experts, technologists, sustainability professionals, and foundry practitioners to examine how Indian foundries can transition from largely local suppliers to globally competitive manufacturing partners.

Foundry Transformation: From 3D to 3C

Setting the context, the webinar emphasised how the foundry industry has evolved from being characterised as dark, dirty and dangerous to becoming increasingly digital, dynamic and delightful. However, this transformation is incomplete and uneven across the sector. Foundries today must navigate what was described as the 3C framework—Challenges, Changes and Competition.

Transformation, as discussed during the session, is not incremental improvement but a fundamental shift in mindset, systems, and operating models. Speakers repeatedly highlighted that the most significant barrier to progress is not technology availability, but the mindset of organisations and leadership. A strong, growth-oriented mindset enables foundries to view disruptions as opportunities rather than threats.

AI and Automation: Turning Data into Decisions

A major theme of the webinar was the role of artificial intelligence (AI) and automation in improving foundry competitiveness. It was emphasised that AI is not a new concept but has become more accessible and practical due to advances in computing power, sensors, and data capture technologies.

Foundries generate vast volumes of data across melting, molding, pouring, fettling, inspection, and dispatch operations. However, much of this data remains underutilised or "dead," recorded post-facto in logbooks or spreadsheets without enabling real-time decision-making. The shift towards real-time data capture-through sensors, IoT devices, shop-floor terminals, and integrated systems—was highlighted as the foundation for effective AI deployment.

Practical AI use cases discussed included dynamic production planning, process deviation detection, automated surface inspection using machine vision, and predictive quality control. These applications not only improve efficiency and yield but also reduce dependency on manual inspection, which is often inconsistent and labour-intensive.

> Real-time dashboards, trend analysis, and exception alerts allow teams to act proactively rather than reactively. Examples discussed included correlating sand properties with casting rejection trends, monitoring furnace efficiency, managing work-in-progress inventory, and improving traceability across the production chain.

Environmental Compliance as a Business Opportunity

Environmental sustainability emerged as one of the most decisive factors shaping the future of the foundry industry. Rather than viewing environmental regulations as a compliance burden, speakers argued for reframing sustainability as a value creation opportunity.

From a people–planet–profit perspective, environmental performance directly impacts business continuity, workforce attraction, and access to global markets. With mechanisms such as ESG reporting and the Carbon Border Adjustment Mechanism (CBAM) gaining prominence, environmental non-compliance can restrict export opportunities and erode competitiveness.

A compelling case was made for waste

valorisation, particularly in sand casting operations. Foundry sand, fines, slag, and dust—traditionally treated as disposal liabilities—can be transformed into revenue-generating resources through appropriate processing and recycling technologies. This not only reduces disposal costs but also creates additional income streams, local employment, and community engagement.

By monetising waste, foundries are incentivised to improve housekeeping, material segregation, and process control, creating a virtuous cycle of environmental and economic benefits.

Data Analytics: Preserving Knowledge and Improving Control

Another critical discussion centred on data analytics as a tool for knowledge retention and process stability, particularly in the context of generational transition within foundries. As experienced professionals retire and younger teams take over, undocumented tacit knowledge risks being lost.

Structured data analytics enables organisations to preserve historical process knowledge, correlate parameters with outcomes, and empower supervisors and operators to take ownership of performance improvement. The webinar stressed that analytics should not be limited to management dashboards but tailored to different organisational levels-operators, supervisors, quality teams, and leadership-each requiring distinct insights.

Surface Finish: A New Competitive Differentiator

Customer expectations around surface finish and aesthetics have increased significantly, driven by global sourcing, premiumisation, and reduced machining allowances. Surface finish was described not as the outcome of a single process but as the result of total system discipline, involving sand quality, additives, molding practices, coatings, metal chemistry, and process control.

The discussion challenged common myths, such as achieving better surface finish solely through finer sand. Instead, grain shape, distribution, refractoriness, and additive control were highlighted as more critical factors. Differences between Indian and European sand characteristics were also discussed, underscoring the need for process adaptation rather than direct imitation of global practices. As casting wall thicknesses reduce and design complexity increases, achieving consistent surface finish becomes even more challenging-requiring closer collaboration between designers, foundries, and suppliers.

Non-Ferrous Foundries: Volatility and Sustainability Pressures

For non-ferrous foundries, additional challenges include raw material price volatility, knowledge gaps, manpower attrition, and the capital intensity of automation. While automation improves consistency, it also intensifies competition, particularly disadvantaging MSME foundries that lack scale.

Sustainability and circular economy principles were identified as essential for survival, especially for export-oriented foundries. Awareness of global mechanisms like CBAM remains limited, creating an urgent need for industry-wide education and preparedness.

> Importantly, technology was described as inherently deflationary-becoming more affordable over time-making advanced digital tools increasingly accessible even to mid-sized foundries.

Conclusion: Collaboration as the Way Forward

The webinar concluded with a clear message: the future of the Indian foundry industry depends on collaborative transformation. Technology, sustainability, skill development, and process discipline must advance together. Foundries that proactively adopt digital tools, valorise waste, invest in people, and align with global expectations will be best positioned to transition from local suppliers to globally competitive manufacturers.

Hindalco Industries Expands Value-Added Product Focus

HINDALCO INDUSTRIES has strengthened its emphasis on value-added aluminium solutions, signalling a continued shift from commodity positioning toward application-driven growth. The company is sharpening its downstream strategy to cater to transportation, packaging, electrical, and specialised engineering markets where customers increasingly seek performance differentiation rather than basic metal supply. The move reflects a broader transformation underway in the non-ferrous sector. As global competition intensifies and buyers demand tighter quality tolerances, traceability, and sustainability credentials, producers are under pressure to offer more than scale. Enhanced finishing capabilities, alloy development, and customer-specific fabrication are therefore becoming central to maintaining margins.

Hindalco is investing in process improvements, equipment upgrades, and advanced quality assurance systems to strengthen its product portfolio. Greater integration between production, R&D, and end-use customers is expected to shorten development cycles and improve responsiveness.

Market participants believe that the strategy aligns well with India's expanding manufacturing ambitions. As automotive light-weighting, renewable energy installations, and packaging demand grow, suppliers capable of delivering engineered solutions rather than standard ingots may gain a clear advantage.

The company's downstream push is also consistent with global trends where aluminium majors are increasingly tying profitability to specialised applications. By moving further along the value chain, Hindalco aims to deepen customer relationships, stabilise revenue streams, and position itself as a solutions partner in evolving industrial ecosystems.

Gujarat Foundry Cluster Development Association Pushes Technology Upgradation Drive

FOUNDRY STAKEHOLDERS across Gujarat have initiated a coordinated technology modernisation effort aimed at improving productivity, energy efficiency, and environmental performance within the region's casting industry. The program is designed to help small and medium enterprises adopt improved melting practices, better sand reclamation methods, and digital monitoring tools.

Cluster leaders indicated that rising customer expectations around quality consistency and compliance require systematic upgrades rather than incremental adjustments. Through shared workshops, demonstration projects, and collective procurement of services, participating units are expected to gain access to expertise that may otherwise remain out of reach. Energy efficiency has emerged as a key priority. By introducing optimised furnace operation, improved charge management, and preventive maintenance routines, the cluster hopes to reduce fuel consumption while enhancing metallurgical outcomes. Waste reduction and emissions management are also integral to the initiative.

Industry observers point out that cluster-based approaches are increasingly seen as practical mechanisms for raising competitiveness at scale. When multiple units move together, adoption costs fall and best practices spread more rapidly. The Gujarat initiative highlights how regional collaboration can accelerate modernization in India's foundry landscape. If successful, it could serve as a template for similar programs in other manufacturing hubs.

NALCO Advances Captive Power Modernisation

NATIONAL ALUMINIUM Company has initiated a fresh round of upgrades across its captive power infrastructure, targeting improved energy efficiency and lower emission intensity. The modernisation program focuses on turbine optimisation, digital monitoring, and enhanced maintenance planning to stabilise energy supply for smelting operations.

Power cost remains one of the most decisive variables in aluminium competitiveness. By improving reliability and heat-rate performance, the company aims to protect margins while supporting broader sustainability commitments. Engineers are integrating advanced control systems to enable real-time diagnostics and faster response to operational variations. The initiative is also expected to reduce unplanned outages and improve overall equipment utilisation.

Industry analysts note that captive power optimisation has become a priority across India's aluminium sector, particularly as environmental expectations tighten and global buyers demand better carbon transparency. NALCO's approach reflects a growing recognition that incremental efficiency gains can deliver substantial long-term benefits without requiring major capacity expansion.

Hindustan Zinc Advances Critical Minerals Recovery to Broaden Portfolio

HINDUSTAN ZINC has initiated a series of process optimisation measures aimed at improving recovery of critical and minor metals alongside its core zinc and lead operations. The company confirmed that ongoing investments in refining upgrades and digital monitoring are designed to enhance extraction efficiency for silver and other high-value by-products.

The move signals a wider industry transition toward maximising value from existing ore bodies rather than relying solely on volume expansion. With global customers increasingly seeking diversified and secure supply chains, the ability to deliver a broader metals basket is becoming an important competitive differentiator. Operational teams are focusing on metallurgical improvements, automation in concentrate handling, and tighter process control to lift yields. These initiatives are expected to strengthen margins while also reducing waste generation per tonne of output.

Market participants view the development as timely. Demand for silver continues to be supported by photovoltaic manufacturing and electronics applications, while investors are rewarding producers who demonstrate efficient resource utilisation. By strengthening recovery across multiple metals, Hindustan Zinc is aligning itself with global expectations that miners must deliver both economic and environmental performance improvements.

Coal India Expands Supply Assurance for Non-Ferrous Producers

COAL INDIA has outlined measures aimed at strengthening fuel supply reliability for energy-intensive industries, including aluminium smelters and copper processors. Improved coordination mechanisms and more predictable dispatch schedules are expected to support stable production planning during 2026. For non-ferrous manufacturers, energy availability remains one of the most decisive determinants of operating cost.

Even minor disruptions can affect output continuity, potline stability, and maintenance cycles. By improving logistics alignment and communication channels with industrial consumers, Coal India seeks to reduce such risks.

The company is enhancing monitoring systems and working with transportation partners to streamline movement from pithead to plant. Greater visibility across deliveries may allow producers to optimise inventory levels and reduce emergency procurement costs. Analysts note that upstream stability plays a critical role in downstream competitiveness. As aluminium and copper producers face tighter environmental scrutiny and margin pressure, predictable energy inputs can provide a valuable buffer.

The initiative also underscores the interconnected nature of India's industrial ecosystem. Reliable coal supply not only supports immediate production requirements but contributes to broader goals of manufacturing growth and export readiness.

Gravita India Enhances Domestic Collection Networks

GRAVITA INDIA has expanded partnerships with local aggregators and dismantlers to strengthen domestic scrap availability. The move aims to reduce vulnerability to international supply fluctuations while improving traceability.

By formalising procurement channels, the company expects to enhance material consistency and compliance with evolving environmental standards. Stronger domestic networks may also support faster turnaround times for customers.

As India pushes toward greater circularity, recyclers are increasingly investing in structured collection ecosystems. Reliable feedstock remains essential for stable plant utilisation. The development highlights the growing professionalisation of the country's recycling sector.

National Mineral Development Corporation Moves Ahead with Critical Minerals Planning

NATIONAL MINERAL Development Corporation has advanced preparatory work related to future participation in critical minerals development, reflecting India's broader strategy of strengthening supply chains for high-technology sectors.

Although traditionally associated with iron ore, diversification into minerals essential for batteries, electronics, and renewable energy is now under evaluation. Early-stage studies are examining geological potential and processing requirements.

Analysts view the initiative as part of India's long-term effort to secure materials necessary for industrial transformation and energy independence.

Aluminium Producers Tighten Supply Discipline as Energy Markets Remain Uncertain

GLOBAL ALUMINIUM markets have entered 2026 with producers maintaining cautious output strategies amid persistent uncertainty in energy pricing and demand recovery patterns. While downstream sectors such as transportation, packaging, and renewable infrastructure continue to generate steady orders, smelters remain wary of committing to aggressive restarts or expansions.

Electricity remains the single most decisive factor shaping operating decisions. Volatile tariffs and evolving subsidy frameworks in several regions have prompted companies to prioritise margin protection over volume growth. Incremental efficiency improvements, optimisation of existing lines, and careful inventory management are therefore dominating boardroom discussions. At the same time, customers are requesting greater delivery reliability and more transparent carbon disclosures. Producers able to align stable output with documented environmental performance are likely to secure longer-term supply arrangements.

Analysts suggest that the market is witnessing a shift from cyclical production behaviour toward structurally disciplined management. Rather than chasing short-lived price rallies, companies are focusing on sustainability, cost predictability, and operational resilience. The early signals from January indicate that aluminium supply growth in 2026 may remain measured, potentially supporting price stability if demand continues its gradual recovery.

Copper Industry Faces Balancing Act Between Growth Ambitions and Project Complexity

COPPER ENTERS the new year under intense scrutiny as governments and manufacturers look to secure reliable supply for electrification, grid expansion, and clean energy systems. Long-term demand projections remain robust, yet bringing new capacity online is proving increasingly challenging.

Producers worldwide are navigating a complex mix of permitting requirements, infrastructure constraints, community engagement expectations, and environmental standards. These factors are extending development timelines and raising capital intensity. As a result, companies are placing greater emphasis on brownfield expansions, process optimisation, and improved recovery from existing assets. Technology adoption—ranging from digital mine planning to advanced ore-sorting—continues to gain traction as a way to extract more value without launching entirely new operations.

Market observers believe that copper's strategic importance will keep investment momentum alive, but supply responses may remain gradual. This could contribute to sustained tightness in certain segments of the market. In January, sentiment suggests that reliability and incremental growth are likely to define the industry's approach more than headline-grabbing megaprojects

Zinc Producers Emphasise Stability as Infrastructure Demand Moderates

GLOBAL ZINC markets are starting 2026 in a relatively balanced position, with demand supported by ongoing galvanising requirements but tempered by slower construction growth in some economies. Producers are responding by focusing on operational steadiness and cost management. Rather than pursuing rapid capacity additions, many operators are directing resources toward maintenance efficiency, energy optimisation, and environmental compliance. The objective is to maintain dependable output while preserving financial flexibility.

Zinc's fundamental role in corrosion protection continues to anchor long-term consumption. Infrastructure renewal, transport networks, and industrial fabrication remain important demand pillars even if expansion rates fluctuate. Industry participants indicate that predictable performance is increasingly valued by customers who seek supply continuity amid broader economic uncertainty. Stable production environments also enable smelters to refine sustainability reporting and strengthen relationships with downstream partners.

The tone at the beginning of the year suggests cautious confidence: growth may be moderate, but the underlying market base remains solid.

Recycling Sector Gains Strategic Importance in Global Metal Supply Chains

METAL RECYCLING continues to strengthen its position as a core pillar of global supply as manufacturers intensify efforts to lower emissions and secure raw material access. Aluminium, copper, and other non-ferrous scrap streams are becoming central to procurement strategies across multiple industries.

Governments are encouraging higher recovery rates through regulatory frameworks and investment incentives, while producers are upgrading sorting, refining, and certification capabilities. Improved technology is enabling recyclers to deliver more consistent quality, allowing secondary materials to substitute for primary production in demanding applications. However, competition for scrap is increasing. Regions with well-developed collection systems are emerging as critical suppliers, and trade patterns are adjusting accordingly.

Market observers believe recycling will play an even larger role in balancing supply-demand dynamics over the coming decade. At the start of 2026, momentum clearly favours companies that can integrate circularity into mainstream industrial operations.

First Quantum Minerals Updates Copper Shipment Outlook

FIRST QUANTUM Minerals has provided revised expectations for copper shipments following operational adjustments across its portfolio. While production remains broadly aligned with plans, logistics optimisation is expected to improve delivery timing to customers. Copper markets remain highly sensitive to supply signals due to strong demand from electrification and grid development projects. Even minor adjustments in shipment patterns can influence near-term sentiment.

The company emphasised that maintaining consistency of deliveries is a priority as downstream users seek predictability. Observers believe clearer logistics visibility may help moderate speculative reactions in commodity markets.

Nickel Market Adjusts to Changing Battery Technology Priorities

THE NICKEL industry is entering 2026 amid evolving expectations from battery manufacturers and stainless steel consumers. While electrification continues to support long-term prospects, shifts in battery chemistry and cost considerations are influencing short-term procurement patterns.

Producers are responding by reassessing investment timelines and product strategies. Flexibility has become essential, with operations seeking to adapt output between battery-grade materials and traditional applications. Environmental performance and traceability are also gaining prominence. Buyers are paying closer attention to sourcing credentials, prompting upstream suppliers to enhance reporting frameworks and transparency mechanisms.

Market analysts highlight that adaptability will be crucial in navigating the current phase. Companies capable of responding quickly to technological and regulatory developments are more likely to maintain competitiveness. Early-year trading activity indicates that the industry is settling into a more nuanced demand environment, where diversification of end uses provides resilience.

Norsk Hydro Expands Low-Carbon Aluminium Deliveries

NORSK HYDRO has reported higher deliveries of low-carbon aluminium products at the start of 2026, reflecting continued customer preference for materials with documented environmental performance. Demand is particularly strong from automotive and building sectors, where lifecycle assessments are increasingly embedded into procurement frameworks.

The company noted that improved traceability systems and better segregation of recycled inputs are enabling more reliable certification of carbon footprints. Buyers are seeking not only supply security but also credible documentation that supports their own sustainability commitments

Market participants observe that differentiated products are steadily gaining share within aluminium trade flows. Producers able to maintain consistent quality while offering emissions transparency may achieve stronger long-term customer retention. The trend also underscores how sustainability has moved from a branding element to a core commercial requirement in many markets.

Emirates Global Aluminium Increases Focus on Value-Added Exports

EMIRATES GLOBAL Aluminium has indicated that shipments of higher value-added products are rising as customers prioritise specialised alloys and performance-oriented materials. The company has adjusted production planning to support demand from transport, packaging, and industrial users.

Global buyers are increasingly looking for suppliers that can deliver tighter specifications and application support. This shift is encouraging producers to optimise casting formats and strengthen finishing capabilities. Industry analysts suggest that emphasis on value-added exports may help stabilise revenues even if benchmark prices fluctuate during the year. The development illustrates how aluminium trade is evolving toward differentiated supply rather than pure volume movement.

Indian Foundries Prepare for Tighter Emission Accountability

Foundries across several Indian manufacturing belts are entering 2026 with heightened focus on environmental accountability as state pollution authorities intensify monitoring and reporting expectations. Units in clusters across western and southern India report more frequent inspections, stricter documentation requirements, and closer scrutiny of particulate control systems.

Operators are responding by upgrading bag filters, improving housekeeping practices, and digitising logbooks to ensure faster retrieval of compliance records. Environmental preparedness is increasingly viewed not only as a regulatory necessity but also as a commercial safeguard. Export customers and large OEMs are requesting clearer proof that suppliers meet statutory norms, particularly in relation to air quality and waste handling.

Consultants working with foundries indicate that proactive measures are proving less disruptive than emergency responses to notices or temporary closures. Investments in preventive maintenance of pollution-control equipment, along with routine calibration of monitoring instruments, are becoming standard practice. At the same time, industry associations are stepping up awareness initiatives to help smaller units understand evolving requirements. Shared technical guidance and collective training programs are helping reduce uncertainty.

The early weeks of the year suggest that environmental compliance will remain a defining management priority. Foundries that establish disciplined systems now may gain smoother approvals and stronger customer confidence over the longer term.

Capacity Utilisation Holds Steady Amid Selective Demand Recovery

Indian foundries are reporting relatively stable operating levels at the start of 2026, supported by consistent offtake from automotive replacement markets, tractors, pumps, and general engineering segments. While new project activity remains cautious, regular demand is helping maintain workable utilisation rates in many plants. Export enquiries have shown gradual improvement, although currency movements and freight costs continue to influence order finalisation. Foundries with diversified customer portfolios appear better positioned to manage variability across sectors.

Production managers indicate that careful scheduling and tighter inventory management are helping maintain cash discipline. Rather than pursuing aggressive output increases, many units are prioritising timely deliveries and cost control. Raw material pricing remains a watch point. Scrap availability is adequate in most regions, but fluctuations in quality are encouraging stricter incoming inspection procedures.

Industry observers describe the situation as one of guarded optimism. While a sharp upswing is not yet visible, the underlying demand base remains intact, giving operators confidence to plan incremental improvements in productivity and quality. For January, stability itself is being viewed as a positive indicator after several years of volatility.

Predictive Maintenance Moves from Concept to Daily Practice

Predictive maintenance is becoming a practical operating tool across foundries worldwide rather than a future ambition. Plants are increasingly using sensor data, thermal imaging, and vibration monitoring to anticipate failures in furnaces, moulding lines, and finishing equipment before they lead to costly downtime.

The shift is particularly visible in facilities supplying automotive and aerospace customers, where delivery interruptions can disrupt complex value chains. Early fault detection allows maintenance teams to plan interventions during scheduled stoppages, improving plant availability and reducing emergency repair costs.

Digital dashboards now provide supervisors with real-time visibility into equipment health. Instead of relying solely on fixed maintenance intervals, operators can make decisions based on actual performance conditions. This approach is improving spare parts planning and extending component life. Industry experts note that predictive frameworks also enhance safety. Identifying abnormal conditions early reduces exposure to sudden breakdowns in high-temperature environments.

As implementation costs fall and software platforms become more user-friendly, adoption is spreading beyond large enterprises. Many mid-sized foundries are beginning with critical assets such as melting furnaces or compressors and expanding gradually. The beginning of 2026 suggests that predictive maintenance is moving firmly into mainstream operational strategy.

Simulation Tools Improve First-Time-Right Casting Outcomes

Foundries are increasingly relying on casting simulation software to improve process design and reduce trial-and-error development. Virtual modelling of filling behaviour, solidification patterns, and thermal gradients is helping engineers anticipate defects before production begins. The demand for shorter development cycles from OEM customers has accelerated adoption. Simulation enables optimisation of gating systems, riser placement, and cooling strategies without repeated physical trials, saving both time and material.

Producers report noticeable improvements in yield and reduction in rework rates after integrating simulation into early design phases. Better predictability also supports faster approvals from customers who require evidence of process robustness.

Advances in computing power and user interfaces have made these tools more accessible. Even medium-sized foundries are now able to collaborate with technology partners or operate simplified systems in-house. Observers believe simulation capability will soon be a baseline expectation for suppliers engaged in complex casting programs. As product geometries become more demanding, virtual validation is proving essential.

Base Metals in 2025 : A Year of Volatility, Transition and Strategic Realignment

Annual Base Metals Review – 2025

Metalworld
Research Team

THE YEAR 2025 marked an important transition phase for global base metals markets. After multiple years of disruption driven by inflationary pressures, geopolitical uncertainty, and uneven post-pandemic recovery, base metals entered 2025 navigating a complex mix of macroeconomic headwinds and long-term structural demand drivers.

While short-term price movements remained volatile, the year reinforced a broader shift in how base metals are viewed-not merely as cyclical commodities, but as strategic materials central to decarbonisation, electrification, and infrastructure development. This annual review consolidates the performance of key base metals-aluminium, copper, zinc, lead, and nickel-through 2025, examining price behaviour and market signals across global, Chinese, and Indian benchmarks.

Macro Backdrop: The Forces Shaping Base Metals in 2025

Four major factors defined base metals markets during the year.

- First, global monetary conditions remained tight for much of 2025. Although expectations of interest rate easing emerged toward the latter half of the year, elevated borrowing costs continued to influence speculative activity and capital-intensive sectors.

- Second, China's economic performance remained uneven. Infrastructure and manufacturing activity provided intermittent support, but continued weakness in the real estate sector limited broad-based metals demand. This divergence was clearly reflected in domestic Chinese pricing trends.

- Third, energy transition demand continued to provide structural support. Investments in electric vehicles, renewable energy, grid expansion, and lightweighting applications ensured that metals such as copper, aluminium, and nickel remained strategically important despite short-term corrections.

- Finally, inventory behaviour-particularly in exchange-monitored warehouses—played a significant role in shaping sentiment, often amplifying price movements beyond physical demand fundamentals.

Metal-wise Performance Review: What Drove Prices in 2025

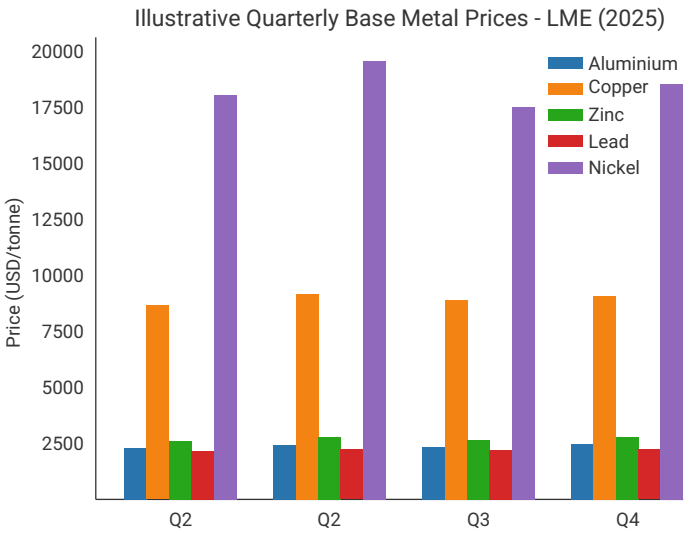
Aluminium: Cost Pressures Meet Structural Demand

Aluminium prices in 2025 reflected a balance between rising structural demand and persistent cost-side pressures. Energy prices, production discipline, and environmental controls-particularly in China-continued to influence supply behaviour. Despite periodic volatility, aluminium maintained relative stability compared to other base metals, supported by demand from packaging, automotive, construction, and energy transition applications.

Copper: The Bellwether Metal

Copper once again served as the

Quarterly Base Metal Prices - Global Benchmark (LME, 2025)



Quarterly LME prices in 2025 highlight how macro sentiment, inventory movements, and supply discipline shaped global base metals markets, with copper and nickel showing highest volatility.

market's primary economic barometer. Prices reacted sharply to shifts in macro sentiment, inventory movements, and speculation around future supply constraints. While short-term fluctuations were pronounced, long-term fundamentals linked to electrification, grid expansion, and EV adoption remained firmly supportive.

Zinc: Infrastructure-Led Demand Under Pressure

Zinc's performance in 2025 was closely tied to construction and galvanising demand. While infrastructure spending provided some support, the absence of a strong global construction upcycle limited price momentum. Zinc remained sensitive to smelter output discipline and regional demand signals.

Lead: Stability Anchored in Recycling

Lead remained the most stable among the base metals during the year. Strong recycling rates and consistent battery demand helped maintain a relatively balanced market. For many participants, lead continued to function as a defensive metal within the base metals complex.

Nickel: Strategic Metal with Managed Volatility

Nickel retained its strategic relevance in 2025, driven by stainless steel production and its growing role in battery chemistry. While volatility moderated compared to previous years, nickel prices remained sensitive to supply discipline and evolving EV technology pathways.

China Lens: Reading the Market Through Domestic Pricing

China continued to exert a decisive influence on base metals markets in 2025. Domestic pricing trends offered critical insight into real economy demand conditions, particularly for aluminium, copper, and nickel. While infrastructure-linked demand provided periodic support, property sector weakness and cautious industrial sentiment limited sustained upside.

Metal-wise Performance Review (China Market – SMM): Demand Signals from the Real Economy

Unlike global benchmarks, pricing on the Shanghai Metals Market in 2025 reflected domestic Chinese demand conditions more directly. SMM prices were shaped less by fund positioning and more by industrial activity, policy interventions, and cost-side dynamics within China.

- Aluminium prices on SMM closely tracked power costs, production curbs, and environmental controls. Regional electricity pricing and seasonal restrictions on smelter output played a significant role, making aluminium one of the most policy-sensitive metals in China during 2025.

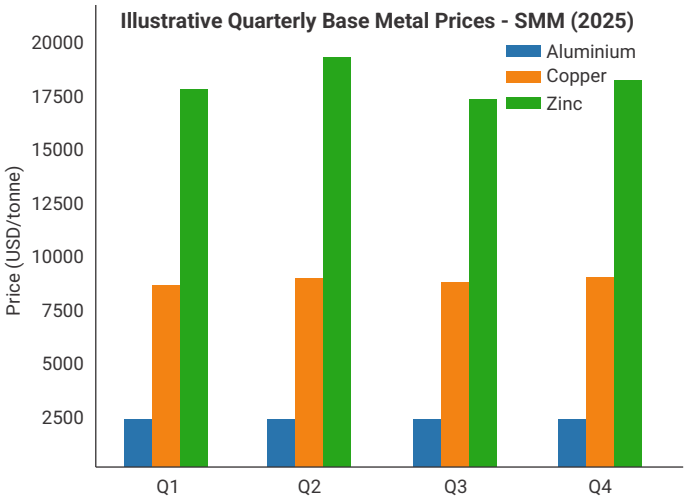
- Copper pricing reflected a mixed demand environment. While infrastructure projects, grid investments, and EV-related manufacturing supported consumption, ongoing weakness in the real estate sector constrained broader demand growth. As a result, SMM copper prices often diverged from LME trends during the year.

- Nickel remained highly responsive to

Base Metals Snapshot: Key Market Drivers in 2025

Metal	Key Demand Driver	Supply Sensitivity	Volatility Profile
Aluminium	Automotive, Packaging, Ev's	Energy costs	Medium
Copper	Electrification, Renewables	Mining supply constraints	High
Zinc	Galvanising, Infrastructure	Smelter discipline	Medium
Lead	Batteries, Recycling	Secondary supply	Low
Nickel	Stainless Steel, EV's	Policy & supply controls	Medium-High

Quarterly Base Metal Prices - China Market Indicator (SMM, 2025)



SMM quarterly pricing reflects China's domestic demand conditions more closely than global benchmarks, highlighting the impact of policy signals, power costs, and industrial activity.
Note: SMM and MCX charts focus on metals most relevant to domestic demand and trading activity to highlight market-specific signals.

developments in China's stainless steel sector and battery materials supply chain. Pricing was influenced by policy signals, raw material availability, and evolving battery chemistry preferences, making nickel one of the more volatile metals on SMM.

Overall, SMM pricing in 2025 provided a clearer view of China's underlying industrial momentum, often acting as a leading indicator for shifts in global base metals sentiment.

India Perspective: Cost Management Over Speculation

For Indian producers and consumers, 2025 was less about chasing price highs and more about managing cost volatility. Global price swings, currency movements, and logistics pressures reinforced the importance of structured procurement strategies and disciplined hedging.

Domestic demand from infrastructure, automotive, electrical equipment, and renewable energy projects supported steady consumption, even as global uncertainty persisted. Indian participants increasingly relied on local benchmarks to align procurement and risk management decisions with domestic realities.

Metal-wise Performance Review (Indian Market – MCX): Domestic Demand and Cost Dynamics

On the Multi Commodity Exchange of India, base metals pricing in 2025 broadly followed global trends, but with important domestic overlays. Currency movements, logistics costs, import parity pricing, and local demand conditions all influenced MCX price behaviour.

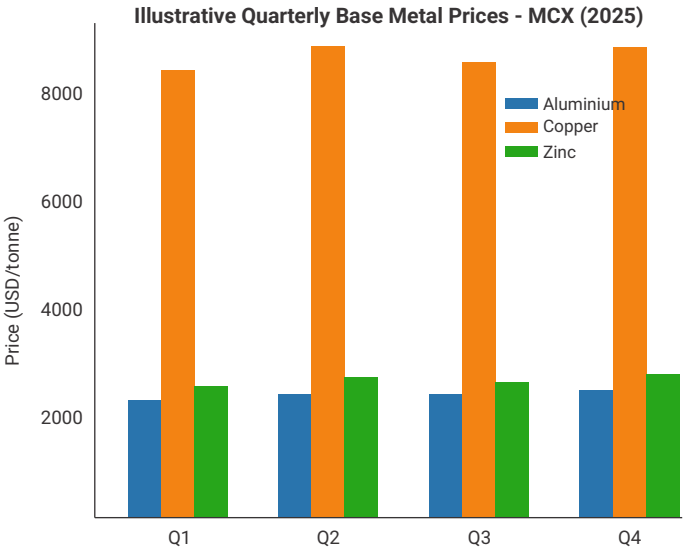
- Aluminium prices on MCX were supported by steady demand from packaging, construction, and automotive sectors. While global cues remained dominant, domestic consumption and freight costs occasionally led to divergence from international benchmarks.

- Copper remained one of the most actively tracked metals on MCX. Demand from electrical equipment, renewable energy projects, and infrastructure development supported pricing, while volatility reflected global sentiment filtered through exchange rates and import dependence.

- Zinc pricing was closely linked to domestic galvanising demand and infrastructure activity. Public-sector projects and steel consumption trends influenced zinc prices more directly than speculative positioning.

MCX pricing in 2025 reinforced the growing importance of domestic benchmarks as a risk management tool for Indian producers and consumers, rather than merely a passive reflection of global markets.

Quarterly Base Metal Prices – Indian Market (MCX, 2025)



MCX quarterly prices tracked global trends in 2025, with divergence driven by domestic demand patterns, logistics costs, and currency movements.
Note: SMM and MCX charts focus on metals most relevant to domestic demand and trading activity to highlight market-specific signals.

Exchange-wise Snapshot: Understanding Market Roles

Parameter	LME (Global)	SMM (China)	MCX (India)
Market Role	Global benchmark	Domestic demand indicator	Risk management platform
Key Price Driver	Inventories, macro cues	Policy and industrial demand	Local consumption, FX
Volatility Trigger	Fund flows, warehouse data	Real economy signals	Logistics and currency
Primary Users	Global producers & traders	Chinese industry	Indian producers & consumers

Key Takeaways from 2025

Volatility became structural :

Price movements across base metals in 2025 were driven less by physical supply shocks and more by shifts in macro sentiment, inventory behaviour, and policy signals. Copper and nickel were the most sensitive, while aluminium and zinc showed relatively lower but persistent volatility.

Energy transition demand set a price floor :

Electrification, renewable energy, and lightweighting continued to support aluminium, copper, and nickel prices. However, 2025 demonstrated that energy transition demand alone does not guarantee sustained price rallies without broader economic momentum.

China's influence turned selective :

Rather than acting as a single directional force, China sent mixed signals. Infrastructure and manufacturing supported demand in specific areas, while real estate weakness constrained broader consumption. Domestic pricing indicators reflected this divergence more clearly than global benchmarks.

Inventory signals gained influence :

Warehouse stocks and cancellation data increasingly shaped short-term price movements, sometimes outweighing physical demand fundamentals. This reinforced the need for careful interpretation of exchange data.

Regional benchmarks mattered more :

Divergence between LME, SMM, and MCX prices highlighted the growing importance of regional benchmarks. Currency, logistics, and local demand factors played a larger role in shaping prices, particularly in India.

Recycling supported market stability :

Lead's relatively stable pricing underscored the stabilising role of mature recycling ecosystems. Secondary supply is increasingly influencing balance across several base metals.

Setting the Context for 2026

Policy execution will outweigh expectations :

As markets move toward potential rate easing, actual policy implementation-rather than forward guidance-will play a greater role in shaping base metals demand and investment flows.

China will drive targeted, not broad-based demand :

Support is expected to remain focused on infrastructure, manufacturing, and energy transition sectors, making domestic policy signals and pricing trends critical indicators.

Energy transition demand will evolve :

Demand growth will increasingly be shaped by efficiency gains and material substitution. Copper and aluminium will remain central, while nickel demand will be influenced by battery chemistry developments.

Supply discipline will remain a constraint :

Environmental regulations, energy costs, and sustainability commitments are likely to limit rapid supply expansion, contributing to structurally tighter markets over time.

Risk management will become core practice :

The experience of 2025 reinforced that structured procurement, diversified benchmarks, and disciplined hedging are essential tools-not optional strategies-for navigating price uncertainty.

Base metals are now strategic resources :

Beyond cyclical trading, base metals are increasingly embedded in industrial policy, sustainability frameworks, and resource security planning.

Summary Report: Cumulative Production, Domestic Sales & Exports data for the period of JANUARY - DECEMBER 2025

Report by *SIMA*
Numbers of Vehicles

CATEGORY SEGMENT / SUBSEGMENT	PRODUCTION JANUARY -DECEMBER			DOMESTIC SALE JANUARY -DECEMBER			EXPORTS JANUARY -DECEMBER		
	2024	2025	% Change	2024	2025	% Change	2024	2025	% Change
Passenger Vehicles*									
Passenger Cars	17,77,882	18,24,670	2.6%	13,71,068	13,79,884	0.6%	4,12,148	4,25,396	3.2%
Utility Vehicles	30,59,219	33,88,247	10.8%	27,49,932	29,54,279	7.4%	3,23,624	4,27,219	32.0%
Vans	1,54,312	1,66,182	7.7%	1,53,793	1,55,554	1.1%	8,207	10,618	29.4%
Total Passenger Vehicles	**49,91,413**	**53,79,099**	**7.8%**	**42,74,793**	**44,89,717**	**5.0%**	**7,43,979**	**8,63,233**	**16.0%**
Commercial Vehicles**									
M&HCVs									
Passenger Carrier	63,360	87,339	37.8%	65,132	70,007	7.5%	9,712	16,036	65.1%
Goods Carrier	3,19,712	3,41,175	6.7%	3,05,084	3,28,148	7.6%	10,816	16,538	52.9%
Total M&HCVS	**3,83,072**	**4,28,514**	**11.9%**	**3,70,216**	**3,98,155**	**7.5%**	**20,528**	**32,574**	**58.7%**
LCVS									
Passenger Carrier	66,856	63,954	-4.3%	51,830	59,622	15.0%	4,476	5,363	19.8%
Goods Carrier	5,75,423	6,19,243	7.6%	5,32,005	5,70,100	7.2%	47,168	53,822	14.1%
Total LCVs	**6,42,279**	**6,83,197**	**6.4%**	**5,83,835**	**6,29,722**	**7.9%**	**51,644**	**59,185**	**14.6%**
Total Commercial Vehicles	**10,25,351**	**11,11,711**	**8.4%**	**9,54,051**	**10,27,877**	**7.7%**	**72,172**	**91,759**	**27.1%**
Three Wheelers									
Passenger Carrier	8,81,054	10,73,140	21.8%	5,87,601	6,48,867	10.4%	2,93,775	4,20,879	43.3%
Goods Carrier	1,20,896	1,26,100	4.3%	1,16,602	1,21,498	4.2%	4,426	4,625	4.5%
E-Rickshaw	20,997	11,997	-42.9%	20,122	13,040	-35.2%	34	23	-32.4%
E-Cart	4,459	5,009	12.3%	4,345	5,024	15.6%	-	-	-
Total Three Wheelers	**10,27,406**	**12,16,246**	**18.4%**	**7,28,670**	**7,88,429**	**8.2%**	**2,98,235**	**4,25,527**	**42.7%**
Two Wheelers									
Scooters	72,48,050	81,92,441	13.0%	66,75,231	75,23,678	12.7%	5,73,230	6,20,241	8.2%
Motorcycles	1,57,91,227	1,67,75,153	6.2%	1,23,52,712	1,24,82,990	1.1%	33,97,586	43,01,927	26.6%
Mopeds	5,22,116	5,12,227	-1.9%	5,15,150	4,93,971	-4.1%	6,346	17,538	176.4%
Total Two Wheelers	**2,35,61,393**	**2,54,79,821**	**8.1%**	**1,95,43,093**	**2,05,00,639**	**4.9%**	**39,77,162**	**49,39,706**	**24.2%**
Total Quadricycle	**7,288**	**5,090**	**-30.2%**	**216**	**8**	**-96.3%**	**6,926**	**4,986**	**-28.0%**
Grand Total	**3,06,12,851**	**3,31,91,967**	**8.4%**	**2,55,00,823**	**2,68,06,670**	**5.1%**	**50,98,474**	**63,25,211**	**24.1%**

BMW, Mercedes, JLR and Volvo Auto data are not available
**Daimler data is not available
Society of Indian Automobile Manufacturers ((13/1) / 2026)

Segment & Company wise Production, Domestic Sales & Exports Report for the month of December 2025 and Cumulative for April-December 2025

Report by *SIMA*
Report III
Numbers of Vehicles

CATEGORY SEGMENT / SUBSEGMENT MANUFACTURER	PRODUCTION				DOMESTIC SALES				EXPORTS			
	DECEMBER		APRIL-DECEMBER		DECEMBER		APRIL-DECEMBER		DECEMBER		APRIL-DECEMBER	
	2024	2025	2024-25	2025-26	2024	2025	2024-25	2025-26	2024	2025	2024-25	2025-26
Passenger Vehicles												
A: Passenger Cars												
Honda Cars India Ltd.	4,950	3,179	35,880	36,480	3,455	3,518	29,333	26,996	1,164	1,737	12,381	9,936
Hyundai Motor India Ltd.	23,910	33,200	2,39,257	2,56,968	12,666	12,680	1,41,099	1,25,573	10,644	14,275	1,02,889	1,26,546
Maruti Suzuki India Ltd.	78,553	1,08,462	7,93,084	8,58,926	62,788	92,929	6,44,151	6,75,213	19,123	12,373	1,21,286	1,47,731
Nissan Motor India Pvt. Ltd.	4,217	2,688	41,957	23,472	-	-	-	-	6,988	4,202	41,544	22,887
Renault India Pvt. Ltd.	933	916	10,244	8,899	628	369	6,093	3,966	1,321	989	5,081	5,509
Skoda Auto India Pvt. Ltd.	881	344	10,629	8,137	1,896	711	12,039	9,975	6	-	25	11
Tata Motors Ltd.*	NA	NA	90,678	1,02,819	NA	NA	89,415	99,496	NA	NA	1,184	3,996
Toyota Kirloskar Motor Pvt. Ltd.	107	-	1,128	1,912	3,575	6,651	38,532	44,628	-	-	-	-
Volkswagen India Pvt. Ltd.	2,968	1,855	40,802	41,210	2,257	2,378	15,853	17,265	2,489	212	28,460	22,751
Total A: Passenger Cars	**1,16,519**	**1,50,644**	**12,63,659**	**13,38,823**	**87,265**	**1,19,236**	**9,76,515**	**10,03,112**	**41,735**	**33,788**	**3,12,850**	**3,39,367**
B : Utility Vehicles												
FCA India Automobiles Pvt. Ltd.	352	445	5,040	3,945	286	256	3,048	2,130	209	170	1,874	2,120
Force Motors Ltd.	289	413	1,607	1,801	167	232	1,381	1,636	-	-	10	17
Honda Cars India Ltd.	4,170	1,741	42,667	21,143	2,148	2,289	16,423	15,540	2,693	615	33,506	11,767
Hyundai Motor India Ltd.	34,290	38,207	3,25,888	3,19,111	29,542	29,736	3,04,017	2,92,755	2,226	2,011	22,397	21,882
Isuzu Motors India Pvt. Ltd.	-	-	360	121	49	36	279	250	-	1	61	1
JSW MG Motor India Pvt. Ltd.	2,064	967	19,419	6,026	2,134	1,259	23,091	6,931	-	-	-	-
Kia India Pvt. Ltd.	14,465	23,845	1,97,382	2,29,953	8,957	18,659	1,79,631	2,04,710	2,150	2,324	21,091	21,802
Mahindra & Mahindra Ltd.	37,779	40,868	3,95,679	4,73,858	41,424	50,946	4,02,360	4,76,476	1,534	1,050	9,204	15,410
Maruti Suzuki India Ltd.	64,212	87,451	5,84,899	6,66,282	55,651	73,818	5,28,963	5,41,266	17,319	12,422	1,18,264	1,53,023
Nissan Motor India Pvt. Ltd.	2,975	6,810	33,756	58,394	2,117	1,902	20,665	15,160	2,570	9,268	10,230	42,259
Renault India Pvt. Ltd.	1,902	4,046	25,528	29,725	2,253	3,476	23,505	25,797	1,289	1,367	4,606	7,332
Skoda Auto India Pvt. Ltd.	1,540	2,911	12,194	40,683	2,659	4,856	15,690	45,552	102	86	981	1,326
Stelliantis India Pvt. Ltd.	137	768	5,431	6,191	566	1,190	5,371	6,753	8	151	3,150	4,252
Tata Motors Ltd.*	NA	NA	3,19,248	3,35,045	NA	NA	3,18,043	3,33,148	NA	NA	622	3,579
Toyota Kirloskar Motor Pvt. Ltd.	25,041	22,436	2,75,637	2,90,266	21,278	27,502	1,89,868	2,25,786	4,642	5.176	20,777	30,358
Volkswagen India Pvt. Ltd.	1,953	121	24,954	20,080	2,530	1,878	16,385	11,880	1,604	103	12,097	8,771
Total B : Utility Vehicles	**1,91,169**	**2,31,029**	**22,69,689**	**25,02,624**	**1,71,761**	**2,18,035**	**20,48,720**	**22,05,770**	**36,346**	**34,744**	**2,58,870**	**3,23,899**
C : Van												
Mahindra & Mahindra Ltd.	-	10	115	31	-	-	-	-	-	10	115	40
Maruti Suzuki India Ltd.	12,788	12,678	1,08,724	1,12,229	11,678	11,899	1,02,520	1,04,902	789	693	6,092	7,483
Tata Motors Ltd.*	NA	NA	7,134	13,549	NA	NA	11,533	13,373	NA	NA	164	141
Total C : Vans	**12,788**	**12,688**	**1,15,973**	**1,25,809**	**11,678**	**11,899**	**1,14,053**	**1,18,275**	**789**	**703**	**6,371**	**7,664**
Total Passenger Vehicles	**3,20,476**	**3,94,361**	**36,49,321**	**39,67,256**	**2,70,704**	**3,49,170**	**31,39,288**	**33,27,157**	**78,870**	**69,235**	**5,78,091**	**6,70,930**

Segment & Company wise Production, Domestic Sales & Exports Report for the month of December 2025 and Cumulative for April-December 2025

Report by *SIMA*
Report II
Numbers of Vehicles

CATEGORY SEGMENT / SUBSEGMENT MANUFACTURER	PRODUCTION				DOMESTIC SALES				EXPORTS			
	DECEMBER		APRIL-DECEMBER		DECEMBER		APRIL-DECEMBER		DECEMBER		APRIL-DECEMBER	
	2024	2025	2024-25	2025-26	2024	2025	2024-25	2025-26	2024	2025	2024-25	2025-26
Three Wheelers												
A: Passenger Carrier												
Atul Auto Ltd	1,085	1,639	10,239	12,713	928	1,031	7,804	8,858	60	649	1,918	3,411
Bajaj Auto Ltd	43,999	58.834	4,57,120	5,45,655	29,229	31,140	3,24,948	3,32,890	15,977	21,589	1,34,722	2,10,300
Baxy Ltd	205	48	1,055	1,203	186	-	997	1,059	21	20	36	160
Force Motors Ltd	-	-	672	-	-	48	-	-	-	-	630	28
Mahindra & Mahindra Ltd	3,594	2,124	45,714	65,964	4.555	6,230	45,495	67,693	48	48	372	549
Piaggio Vehicles Pvt Ltd	6,219	6.906	65,083	60,173	4,719	5,550	54,752	47,088	1,068	1,707	9,343	13,384
Pinnacle Mobility Solutions P.L.	-	14	-	299	-	59	-	211	-	-	-	-
TI Clean Mobility Pvt Ltd	729	312	5,756	4,912	553	438	5,662	5,119	-	-	-	2
TVS Motor Company Ltd	7,664	18.930	96,015	1,58,054	2,206	4,989	19,437	43,372	7,409	15,275	78,112	1,15,037
Total A: Passenger Carrier	**63,495**	**88,807**	**6,81,654**	**8,48,973**	**42,376**	**49,485**	**4,59,095**	**5,06,320**	**24,583**	**39,288**	**2,25,133**	**3,42,871**
E-Rickshaw												
Atul Auto Ltd	190	154	4,651	2,622	260	109	4,367	2,647	-	-	-	-
Bajaj Auto Ltd	-	360	-	1,198	-	321	-	1,082	-	-	-	-
Baxy Ltd	199	-	2,229	1,141	199	-	2,277	1,353	-	-	-	22
Mahindra & Mahindra Ltd	42	388	9,701	4,896	639	477	9,012	5,140	-	-	34	-
TI Clean Mobility Pvt Ltd	-	5	-	6	-	-	-	-	-	-	-	1
Total E-Rickshaw	**431**	**907**	**16,581**	**9,863**	**1,098**	**907**	**15,656**	**10,222**	**-**	**-**	**34**	**23**
B: Goods Carrier												
Atul Auto Ltd	1,094	1,370	8,975	10,137	1,241	1,436	8,960	9,883	-	28	82	145
Bajaj Auto Ltd	4,425	5,931	44,164	47,561	4,851	5,684	42,220	45,524	32	152	1,824	2,618
Baxy Ltd	159	46	1,177	639	150	18	1,140	604	-	-	1	12
Mahindra & Mahindra Ltd	567	661	9,452	8,554	494	804	8,937	8,356	-	-	404	183
Piaggio Vehicles Pvt Ltd	2,462	3,396	23,844	25,165	2,328	3,129	23,411	24,377	15	75	403	561
TI Clean Mobility Pvt Ltd	-	78	-	495	-	69	-	445	-	-	-	-
TVS Motor Company Ltd	33	49	477	443	13	16	266	67	57	38	242	323
Total B: Goods Carrier	**8,740**	**11,531**	**88,089**	**92,994**	**9,083**	**11,156**	**84,934**	**89,276**	**104**	**293**	**2,956**	**3,842**
E-Cart												
Atul Auto Ltd	90	378	1,641	2,075	94	349	1,516	2,219	-	-	-	-
Bajaj Auto Ltd.	-	9	-	54	-	-	-	10	-	-	-	-
Baxy Ltd	20	-	683	358	20	-	662	357	-	-	-	-
Mahindra & Mahindra Ltd	47	-	596	1,153	62	27	789	1,257	-	-	-	-
Total E-Cart	**157**	**387**	**2,920**	**3,640**	**176**	**376**	**2,967**	**3,843**	**-**	**-**	**-**	**-**
Total Three Wheelers	**72,823**	**1,01,632**	**7,89,244**	**9,55,470**	**52,733**	**61,924**	**5,62,652**	**6,09,661**	**24,687**	**39,581**	**2,28,123**	**3,46,736**

Segment & Company wise Production, Domestic Sales & Exports Report for the month of December 2025 and Cumulative for April-December 2025

Report by *SIMA*
Report III
Numbers of Vehicles

CATEGORY SEGMENT / SUBSEGMENT MANUFACTURER	PRODUCTION				DOMESTIC SALES				EXPORTS			
	DECEMBER		APRIL-DECEMBER		DECEMBER		APRIL-DECEMBER		DECEMBER		APRIL-DECEMBER	
	2024	2025	2024-25	2025-26	2024	2025	2024-25	2025-26	2024	2025	2024-25	2025-26
Two Wheelers												
A: Scooters												
Ather Energy Pvt. Ltd	10,515	11,468	1,11,318	1,74,137	9,436	17,701	1,07,604	1,77,141	96	40	672	2,384
Bajaj Auto Ltd	21,732	20,724	2,07,510	2,16,310	21,020	20,390	2,05,515	2,14,538	-	208	2	579
Hero MotoCorp Ltd	27,536	57,326	3,00,667	4,38,970	24,546	45,662	2,79,436	4,06,500	1,844	8,443	21,936	33,521
Honda Motorcycle & Scooter I Pvt Ltd	1,55,334	2,60,616	24,53,022	25,80,938	1,35,148	2,00,233	22,53,516	22,90,623	21,030	30,014	2,46,830	2,69,016
India Yamaha Motor Pvt Ltd	25,010	25,296	2,92,741	2,69,028	18,725	19,814	2,37,161	2,29,984	8,193	8,069	53,016	53,904
Okinawa Autotech Pvt. Ltd	1,073	NA	5,662	112	1,016	NA	5,418	73	-	-	-	-
Piaggio Vehicles Pvt Ltd	3,637	4,478	35,062	34,137	2,150	2,611	23,379	23,502	1,921	2,075	12,397	11,108
Suzuki Motorcycle India Pvt Ltd	81,492	1,02,640	7,96,753	9,02,092	78,558	96,761	7,63,456	8,56,535	3,858	6,672	39,379	51,178
TVS Motor Company Ltd	1,41,374	2,06,295	13,84,423	17,26,194	1,28,066	1,91,572	13,30,260	16,77,313	5,853	6,445	71,425	75,115
Total A: Scooters	**4,67,703**	**6,88,843**	**55,87,158**	**63,41,918**	**4,18,665**	**5,94,744**	**52,05,745**	**58,76,209**	**42,795**	**61,966**	**4,45,657**	**4,96,805**
B: Motorcycles												
Bajaj Auto Ltd	2,68,533	2,97,531	28,21,023	29,45,891	1,07,315	1,11,838	16,01,638	15,12,590	1,43,838	1,77,917	12,31,591	14,22,454
Hero-MotoCorp. Ltd..	3,02,860	4,73,460	42,17,315	43,15,869	2,69,606	3,73,581	40,51,492	40,69,867	28,910	28,793	1,65,750	2,44,659
Honda Motorcycle & Scooter I Pvt Ltd	1,51,746	2,15,517	20,29,301	20,91,692	1,35,771	1,92,073	18,84,830	19,16,330	16,134	23,728	1,51,744	2,05,378
India Kawasaki Motors Pvt Ltd	141	247	2,316	1,809	612	366	3,327	3,653	-	-	-	-
India Yamaha Motor Pvt Ltd	35,061	51,392	4,65,199	4,75,336	18,055	35,100	2,99,314	2,73,112	26,345	24,468	1,68,311	2,14,462
Piaggio Vehicles Pvt Ltd	382	407	7,976	6,975	277	271	2,885	2,040	228	98	5,097	4,953
Royal-Enfield (Unit of Eicher Motors)	93,010	1,14,007	7,39,251	9,26,856	67,891	93,177	6,52,856	8,21,908	11,575	10,397	74,220	99,210
Suzuki Motorcycle India Pvt Ltd	17,242	19,779	1,31,861	1,55,164	276	1,062	15,181	11,574	14,112	17,870	1,13,088	1,42,803
Triumph Motorcycles I Pvt Ltd	47	14	361	126	88	34	891	499	-	-	-	-
TVS Motor Company Ltd	1,55,575	2,27,694	16,40,249	19,88,260	53,917	92,657	9,30,223	10,61,749	90,894	1,24,210	7,00,923	9,57,846
Total B: Motorcycles	**10,24,597**	**14,00,048**	**1,20,54,852**	**1,29,07,978**	**6,53,808**	**9,00,159**	**94,42,637**	**96,73,322**	**3,32,036**	**4,07,481**	**26,10,724**	**32,91,765**
C: Mopeds												
TVS Motor Company Ltd	34,829	48,036	3,94,490	3,82,568	33,092	46,133	3,91,188	3,83,346	180	54	5,274	14,388
Total C: Mopeds	**34,829**	**48,036**	**3,94,490**	**3,82,568**	**33,092**	**46,133**	**3,91,188**	**3,83,346**	**180**	**54**	**5,274**	**14,388**
Total Two Wheelers	**15,27,129**	**21,36,927**	**1,80,36,500**	**1,96,32,464**	**11,05,565**	**15,41,036**	**1,50,39,570**	**1,59,32,877**	**3,75,011**	**4,69,501**	**30,61,655**	**38,02,958**
Quadricycle												
Bajaj Auto Ltd	840	586	5,553	4,155	5	-	116	4	858	570	5,456	4,020
Total Quadricycle	840	586	5,553	4,155	5	-	116	4	858	570	5,456	4,020
Grand Total	**19,21,268**	**26,33,506**	**2,24,80,618**	**2,45,59,345**	**14,29,007**	**19,52,130**	**1,87,41,626**	**1,98,69,699**	**4,79,426**	**5,78,887**	**38,73,325**	**48,24,644**

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