

SECTOR

Mining and Metallurgy



“ The world will need more metals and minerals to support infrastructure, manufacturing and the energy transition. Our focus is on helping clients meet this demand through efficient processes, responsible resource utilisation and engineering solutions that create lasting value.

Biswajit Bhattacharyya
Business Head, MMBU

The metals and mining industry is entering a new phase of growth shaped by infrastructure development, energy transition and the rising importance of critical minerals. Demand for steel, aluminium, copper and other essential materials continues to increase as economies invest in manufacturing, renewable energy, electric mobility and digital infrastructure. At the same time, producers are under pressure to improve resource efficiency, reduce emissions and adopt more sustainable operating models. These shifts are changing how mines, beneficiation facilities, smelters and metal plants are planned, designed and operated.

Tata Consulting Engineers' Mining and Metallurgy Business Unit (MMBU) works across the ferrous and non-ferrous value chains, helping clients improve productivity, optimise resources and reduce environmental impact. Its capabilities span mining, beneficiation, metals production, recycling and asset modernisation, supported by deep domain expertise and an integrated approach to engineering and project delivery. Through this combination, MMBU helps clients create reliable, sustainable and intelligent assets that support long-term industrial growth.

Industry Trends and Market Outlook

The metals and mining sector remains central to economic development, manufacturing growth and the global energy transition. Demand for steel, aluminium, copper and other critical materials continues to be supported by investments in infrastructure, urbanisation, renewable energy, electric mobility and digital technologies. At the same time, sustainability, resource security and supply chain resilience are increasingly influencing investment decisions across the sector.

A growing focus on critical minerals is creating new opportunities across mining, beneficiation, processing and recycling. Producers are also accelerating the adoption of lower-carbon production routes, including electric arc furnaces, hydrogen-based steelmaking and energy-efficient metallurgical processes. Alongside decarbonisation, improving resource utilisation has become a key priority, driving greater emphasis on beneficiation of low-grade ores, recovery of valuable materials and circular production models. Digital technologies are also becoming more deeply embedded across mining and metallurgical operations. Advanced modelling, simulation and data-driven decision-making are helping improve productivity, strengthen operational control and enhance project execution. In India, the sector continues to benefit from strong domestic demand, capacity expansion and policy support aimed at strengthening manufacturing competitiveness and resource security. As industries pursue growth while balancing sustainability and efficiency objectives, demand for integrated engineering solutions that combine technical expertise, operational reliability and responsible resource management is expected to remain strong.

Engineering Excellence Across the Metals and Mining Value Chain

MMBU provides integrated engineering solutions across the ferrous and non-ferrous value chains, supporting clients from resource development and beneficiation through to metals production, downstream processing and asset modernisation. Its experience spans both established metallurgical processes and emerging technologies, enabling clients to balance operational performance, environmental responsibility and long-term competitiveness.

Within the ferrous sector, the Business has developed capabilities across major steelmaking routes, including blast furnace and basic oxygen furnace operations, direct reduced iron and electric arc furnace configurations, as well as emerging hydrogen and natural gas-based DRI technologies. The team also supports speciality steel facilities, helping clients improve energy efficiency, reduce emissions and enhance operational reliability.

Across the non-ferrous segment, MMBU delivers engineering solutions covering aluminium, copper, zinc and lead value chains. Its expertise spans refining, smelting, downstream processing, utilities and material handling systems, enabling integrated solutions across complex industrial facilities. The Business has also strengthened its capabilities in aluminium and copper recycling, supporting circular production models that improve resource utilisation while reducing energy consumption and emissions.

Beneficiation and mineral processing remain important areas of expertise. MMBU supports the development of solutions that improve recovery from low-grade ores, optimise resource utilisation and enhance plant performance. Its capabilities in tailings management, water conservation and silica sand beneficiation further strengthen its ability to support emerging industries while promoting responsible resource development.

A distinguishing feature of MMBU's approach is the integration of engineering, project governance, digital tools and operational insight within a unified delivery framework. This enables clients to improve decision-making, manage risk and create long-term value across the metals and mining lifecycle.

Enabling sustainable industrial growth through advanced metallurgy, responsible mining and intelligent engineering across global metals value chains.

8%
Share in
total revenue

18%
Share in total
acquisition

726
Workforce on
31st March 2026

₹360 cr
Worth value engineering
for customer

Delivering Reliable, Sustainable and Intelligent Assets

FY26 was a year of strong growth and expanding international engagement for MMBU. The Business delivered a balanced portfolio of assignments across both domestic and overseas markets, reflecting continued confidence in its technical capabilities, delivery approach and sector expertise. Within India, MMBU supported major developments across the aluminium, copper and steel sectors, contributing to capacity expansion, operational improvement and new asset creation. It also strengthened its presence in specialised areas such as silica sand beneficiation, supporting industries linked to renewable energy and advanced manufacturing. These assignments demonstrate the Business's ability to apply its metallurgical and mineral processing expertise across both established and emerging sectors.

International markets continued to contribute significantly to growth, with projects across North America, Europe and Asia Pacific. The Business expanded its involvement in large-scale steel and metals projects, including developments focused on lower carbon production routes and sustainability improvements. These engagements reflect growing demand for engineering partners capable of combining process expertise, project delivery capability and sustainability considerations within a single framework.

Reliability remains central to the way MMBU delivers projects. Quality is embedded throughout the project lifecycle through structured engineering processes, design reviews and rigorous quality assurance systems. Extensive use of digital engineering tools and multidisciplinary collaboration helps ensure consistency, accuracy and dependable project outcomes. This disciplined approach has helped build long-standing relationships with clients and continues to generate repeat business across multiple sectors and geographies.

Safety is treated as an integral part of engineering rather than a standalone compliance activity.

Strong emphasis is placed on hazard identification, risk mitigation and safe design principles from the earliest stages of project development. These practices are reinforced through site audits, contractor engagement and adherence to international health, safety and environmental standards, helping create assets that are reliable in operation while protecting people and the environment. Sustainability is increasingly shaping the future of the metals and mining industry, and MMBU continues to support clients in improving resource efficiency and reducing carbon intensity. The Business has strengthened its capabilities in hydrogen-ready steelmaking, electric arc furnace-based production routes, recycling and circular economy solutions. Across steel, aluminium and copper value chains, these approaches help lower energy consumption, reduce emissions and improve utilisation of valuable resources.

The Business is also helping clients maximise value from available resources through beneficiation and mineral processing solutions that improve recovery rates and support responsible resource development. Engineering approaches focused on tailings management, water conservation and waste minimisation further contribute to long-term environmental performance and operational sustainability.

Digital technologies continue to play an important role in improving project outcomes and operational performance. MMBU is increasingly integrating advanced modelling, simulation tools, digital twins and intelligent engineering platforms across project lifecycles. These technologies improve design accuracy, strengthen collaboration and enable faster decision-making. Investments in capability building, knowledge sharing and digital competencies are ensuring that the Business remains equipped to support evolving client requirements while maintaining high standards of technical excellence and project delivery.

Future Outlook and Priorities

The metals and mining sector is expected to remain a key beneficiary of infrastructure development, manufacturing growth and the global energy transition.

Demand for steel, aluminium, copper and critical minerals will continue to create opportunities across both established and emerging value chains. Increasing emphasis on decarbonisation, resource efficiency and supply chain resilience is expected to accelerate investments in low-carbon metallurgy, recycling and advanced mineral processing technologies.

MMBU will continue to strengthen its capabilities in hydrogen-based direct-reduced iron technologies, electric arc furnace routes, beneficiation of low-grade ores and recycling solutions across steel, aluminium and copper value chains. The Business also sees growing opportunities in critical minerals and emerging materials that support renewable energy systems, electric mobility and advanced manufacturing.

Beyond the U.S., international markets continue to anchor growth, with a significant share of the order book originating from Europe, the Middle East, and Asia. In Europe, MMBU is actively engaged in projects related to hydrogen-based ironmaking and EAF transitions, while in the Middle East and Southeast Asia, including Vietnam, opportunities are driven by large-scale integrated steel plant projects and increasing investments in non-ferrous and downstream value chains. During the year, MMBU further strengthened its evolution into a global Business Unit, enhancing its presence in key international markets, particularly North America. This development supports closer engagement with clients through a combination of local presence and global delivery capability, while leveraging TCE's established engineering expertise across the metals and mining value chain. The integration enables more effective collaboration across geographies, strengthens the Business's ability to deliver complex projects and reinforces its position as a trusted global engineering partner.

Through continued investments in technology, capability development and sustainability-led engineering, MMBU will support clients in creating reliable, sustainable and intelligent assets while contributing to a more resource-efficient and responsible metals and mining ecosystem.

CASE STUDY

Engineering the Next Generation of Low-Carbon Steelmaking

Hydrogen-Based Direct Reduced Iron Plant, Raahe, Finland

A leading Nordic steelmaker is developing one of the world's first commercial-scale plants using hydrogen-based direct reduction of iron ore, as part of its programme to eliminate carbon from primary steelmaking. The greenfield facility in northern Finland is designed to produce 1.35 million tonnes per annum of fossil-free sponge iron, with water vapour as the only by-product, representing a fundamental departure from conventional coal-based ironmaking. The project stands among the earliest commercial-scale hydrogen direct reduction plants in Europe and is a flagship initiative under a broader fossil-free steel programme.

TCE's Role

TCE was engaged as engineering partner during the Front-End Loading Phase 2, supporting investment decision readiness for this greenfield facility. Working across delivery teams in India, the United States, and Europe, TCE provided multi-disciplinary engineering covering plant layout, civil and structural design, piping, electrical and instrumentation, utilities, and balance-of-plant integration. The scope included engineering for hydrogen handling systems, electric process gas heating, and cold Direct Reduced Iron logistics, all presenting novel technical challenges given the first-of-its-kind nature of the process.

TCE prepared the full suite of technical documentation to support a plus or minus 30% capital cost estimate, equipping the client with the clarity and confidence required to take a transformative investment decision forward. Both the scope and the delivery model, spanning three continents, reflect the complexity and significance of this project.



Impact

Sustainable: The facility enables up to 90% reduction in CO₂ emissions from ironmaking, supporting the transition to fossil-free steel production at scale and setting a benchmark for low-carbon primary metals production.

Reliable: Engineering was structured for high-availability operations, with strong integration across hydrogen supply, electric process gas heating, and materials handling systems.

Intelligent: Structured front-end loading execution and digital engineering workflows, delivered collaboratively across three continents, provided sound and decision-ready outputs for a breakthrough technology at a scale not previously attempted. The project demonstrates TCE's capability to lead complex, multi-geography engineering programmes on the world's most consequential industrial decarbonisation projects.

1.35

MTPA fossil-free sponge iron production capacity

90%

Reduction in CO₂ emissions from ironmaking

3

Continents of engineering collaboration

First-of-its-kind

Commercial-scale hydrogen direct reduction plant in Europe