



Intellectual capital

Fostering a culture of innovation

Tata Steel aspires to be among the top five innovation driven steel companies in the world. We are building on our capabilities in digital and technology, besides also fostering a culture of innovation to maintain our industry leadership position and cost competitiveness.

Over the past decades, we have built a strong culture of continuous improvement by leveraging best practices in TQM. Our Shikhar25 programme, which is targeted towards improvement in operational efficiency, has enabled us to generate significant savings.

Impact on SDGs



FY 2019-20 Highlights

₹259 cr.
R&D spend

₹4,298 cr.
Savings through Shikhar25

58
Patents granted

155
New products launched
New product is defined as a product developed at Tata Steel through new processes and technology and then commercialised

Strategic linkage

- S01
- S02
- S03
- S04

Material issues addressed

- Business growth
- Product quality, price offerings and delivery
- Technology, product and process innovation
- Focus on innovation, technology, digital and a culture of continuous improvement
- Building a sustainable business portfolio, which is resilient to steel business cyclicality

S01 - Industry leadership in steel S02 - Consolidate position as a global cost leader S03 - Insulate revenues from steel cyclicality S04 - Industry leadership in Corporate Social Responsibility, and Safety, Health and Environment

We believe that building a process and culture of breakthrough innovation in the organisation will enable the Company to further enhance its competitive advantage. A key aspect of this is Technology Leadership and with this objective in mind, Tata Steel has identified Technology Leadership Areas that focus on breakthrough innovation in selected opportunity areas. Technology roadmaps have been planned and work is being done in utilising low-quality raw materials, new and innovative coatings on steel, development of carbon capture and usage technologies, generation and use of hydrogen in the steel making process, materials for mobility of the future and reduction in water consumption. These are designed to significantly increase current competitiveness (e.g. use low-grade raw materials) and to provide long-term sustainability by reducing CO₂ and other environmental footprint.

Focussing on consumer-in innovation, our Innovent team continues to recognise and work on the unarticulated needs of customers. During the year under review, Tata Steel added French Doors to its portfolio in the homemaking space. The doors, with aesthetic look and greater security for areas leading to balconies, gardens and lobbies, are being piloted in Punjab and Kerala. Urban infrastructure is another area of interest for Innovent. Integrated charging infrastructure for Electric Vehicles (EV) offers significant market potential. This has been piloted in Hyderabad where 15 canopy structures have been successfully installed for EV charging stations.

A core enabling team comprising Ventures, Innoventure and Alliance Management has been set up to monetise our intellectual property, leverage the start-up ecosystem and build strategic collaborations with academia and industry bodies.

RESEARCH AND DEVELOPMENT INFRASTRUCTURE

A strong R&D team with specialisation in myriad fields has delivered on several projects in the domain of sustainability, cost reduction and new product development. A pilot plant of the scale of 5 Tonnes per Day (TPD) is being installed at one of our steelmaking plants to capture CO₂ from blast furnace gas. To generate value from waste, R&D has successfully established a process for using water-cooled and air-cooled ferrochrome slag material in applications such as bitumen road, concrete and fly ash slag bricks. An in-house patented technology was implemented in coke ovens whereby some portion of the expensive coking coal can be replaced by non-coking coal aided by adding a cost-effective polymer. R&D has demonstrated (at pilot scale) a process for converting non-coking coal to coke by rapid heating through microwave energy. Tata Steel, along with a leading automotive player, has developed a new design for the tipper body using a new grade of high-strength steel that lowers weight by 200-300 kg without compromising on strength.

KEY DEVELOPMENTS IN ALTERNATE MATERIALS

New Materials Business (NMB): The business was set up to explore opportunities in materials beyond steel and to partially insulate our revenues from steel cyclicality. The business, which has two verticals – Composites and Graphene Business, completed its first full year of business in FY 2019-20.



Fibre Reinforced Polymer (FRP) structure at Jamshedpur Steel Works

OUR CAPITALS — INTELLECTUAL CAPITAL (contd)



Fibre Reinforced Polymer (FRP) based Composite Pressure Vessels

Fibre Reinforced Polymer (FRP): In addition to providing FRP pipes and streetlight poles, NMB launched a wide range of FRP solutions.

- In the infrastructure segment, a wide range of FRP solutions were launched, including FRP street furniture, gazebos, fencing, and a range of decorative and translucent poles. Building on the success of installing India's first FRP foot overbridge in March 2019, NMB completed two more successful FRP bridge projects in FY 2019-20.
- In the industrial segment, FRP pressure vessels for water filtration, FRP tanks and chemical equipment for paper and pulp, textile and iron and steel industries were supplied. These products are best equipped to tackle corrosion and are lightweight, thereby offering a long maintenance-free service life.
- Following the initial success of supplying FRP components to the Indian Railways, NMB has entered into railway coach

interiors and is working closely with key production units of the Railways.

Graphene Business: This business focusses on the production of graphene powder, graphene master batches and graphene-enriched products. The business has strengthened its position in coated solutions through its offering of liquid, dry and aerosol-based formulations. In FY 2019-20, around 1,500 tonnes of graphene-coated 'cut and bend' superlinks (GFX Ultima) were sold.

KEY PRODUCT DEVELOPMENTS

During the year under review, we developed 155 new products including grades for high-strength automotive structural applications. Our continuous efforts towards enriching customer experience by delivering innovative products resulted in Tata Steel winning the 'Innovative supplier of the year 2019' award for developing the S460MC grade of steel.

On the long products front, we commercialised high-strength, high-ductility rebar grade – Fe600 HD. We also developed low nitrogen steel grade (WR3M) wire rods through the Electric Arc Furnace (EAF) route for welding electrode wire application.

DIGITAL TRANSFORMATION

Tata Steel has embarked on a multi-year transformation journey to become an agile,

digital and intelligent enterprise and the leader in digital steelmaking by 2025. In the process, we intend to generate EBIDTA improvements of \$2 billion, enhance our digital maturity and improve our work practices to be more insightful as an organisation.

Cloud, data and artificial Intelligence (AI) are the engines driving this transformation. Over the past couple of years, investments made to create a robust IT infrastructure have helped improve our agility. This has also enabled us to respond to the current COVID-19 situation wherein ~8,000 employees are logging into enterprise applications and ~3,500 virtual meetings are being conducted daily as a majority of our workforce continue to operate from home. We are proactively monitoring and managing our network. Our cybersecurity cell can pre-empt a significant amount of ever-increasing intrusion attempts.

Improved IT infrastructure and a disciplined approach to data capturing have led to higher generation, and secured transmission and storage of data. In FY 2019-20, data generation increased to 20 TB/month with volumes growing 2.5 times over the previous year. This enabled us to deploy 100+ data analytics models across processes to drive insight-based decision-making. Parallely, we are developing a Maintenance Technology Roadmap (MTR), which will help identify sensorisation needs and enable predictive maintenance for mission-critical equipment.



Fibre Reinforced Polymer (FRP) bridge at Jamshedpur Steel Works



Control Room, Kalinganagar Steel Works

Through initiatives such as Smart Asset Maintenance, we have achieved higher asset availability at lower maintenance cost. The Asset Monitoring & Diagnostic Centre (AMDC) allows us to remotely monitor critical equipment and initiate preventive maintenance when required. Integrated and remote operations involving high level of automation, sensor and camera density, combined with data analytics, has enabled us to operate remotely.

With a strong IT backbone and streamlined data, we are well poised to integrate AI in our processes. We view AI as a tool that will allow us to be more cognitive as an enterprise

to our internal processes, externalities and stakeholders. In our business-first approach to AI, we have identified user stories where AI will drive tangible benefits.

Our Connected Workforce Platform leverages multiple technologies and systems to pre-empt unsafe incidents. It also enables policy interventions to ensure safety and security of our employees and assets. Our initiatives on demand estimation through satellite imagery and socio-economic data analytics and e-commerce platforms such as Aashiyana, DigECA and COMPASS, provide alternative channels to reach our customers.

Tata Steel Kalinganagar was recognised as Industry 4.0 Lighthouse by the World Economic Forum in 2019. It is the only Indian site to feature in the network of 26 lighthouse factories across the globe for demonstrating leadership in leveraging Industry 4.0 technologies to drive financial and operational improvements.

Going forward, we are looking at Integrated Supply Chain Planning and Logistics, combined with Integrated Margin Monitor, as themes and tools to drive end-to-end cost optimisation. We are re-engineering our procurement process by introducing a digital catalogue-based buying platform, commodity price prediction-aided buying, analytics-powered negotiation tools and end-to-end contract lifecycle management and analytics. The focus is also on technology-enabled BPaaS* for key corporate functions to streamline our existing processes.

*BPaaS - Business Process as a Service

WAY FORWARD

Continue to work on identified projects in areas where we want to build technology leadership in 'first to the world' products and processes

Deepen our collaboration with start-ups, identified academia, research centres, consortium and associations, to accelerate innovation

Strengthen our alternate materials play by collaborating with a network of technology and manufacturing partners to realise the objective of insulating the business from steel cyclicity

Transition from physical to Virtual Command Centres (VCCs) for each business vertical to enable centralised and decentralised interventions seamlessly