INTELLECTUAL CAPITAL

DEEPENING OUR TECHNOLOGY IMPRINT

Innovation drives our dynamic growth in the cement sector. We have continued to explore clinker substitution and replacement, the use of alternative raw materials and ways to improve the carbon footprint of our products and production processes. Intensive R&D and use of advanced technologies have backed these efforts.

RESEARCH AND DEVELOPMENT

Ensuring product diversity

We rely on innovation to bring new and more sustainable building materials to our customers. Our partnerships with premier research institutes help us improve our product composition.

Important collaborations
▸ With IIT Guwahati: To better concrete mix
▸ IIT Delhi: To develop LC3 Cement technology
▸ IIT Mumbai: To validate durable low-carbon cement
▸ FEhs: Conversion of steel slags to cementitious materials

Important trials
▸ Demo trial for super sulphated cement
▸ Lab trials for LC3 cement
▸ Testing for 53S or rail cement
▸ Experiments for graphene composition in cement or concrete
▸ Development of alternative materials for clinkerisation
▸ Further development of geopolymer cement

1,68,000 tonnes

Of limestone saved due to 2% decrease in clinker factor in FY 2022-23

CASE STORY

PRESERVING THE NATION'S LIMESTONE RESERVES

Currently, nearly 91% of our product portfolio comprises slag-based products, including PSC, composite cement and GGBS. This makes it possible for us to have the distinction of having the lowest average clinker factor in the industry. We remain committed to consistently reducing our average clinker factor, which will lead to further lowering our CO_2 emissions. Owing to our R&D endeavours to source alternative raw materials and employ innovative grinding methods, we have managed to decrease our clinker factor by 2% in FY 2022-23 vis-à-vis the previous year.

Safeguarding quality

Our R&D centre in Vijayanagar helps us maintain the highest standards of quality and consistency. Both the R&D centre and our individual plant quality control laboratories used advanced robotics and are equipped with cutting-edge facilities. State-of-the-art instruments at these facilities help monitor and control the entire process value chain, right from the sourcing of raw materials to the finished product.

Instruments at our plant quality control labs
▸ X-ray fluorescence and diffraction machines
▸ Optical microscope
▸ Compressive strength testing machine
▸ Isothermal calorimetry
▸ Online control systems
▸ Advanced wet classical chemistry instruments

How we maintain desired quality and consistency of end products
▸ Meticulously developed specifications for various input raw materials such as limestone, laterite, red mud, steel slag, flue dust, BF slag, fly ash, gypsum, and more
▸ Regular sampling and chemistry determination techniques to effectively control the quality of raw materials
▸ Detailed assessments done to determine glass content in slag to ensure compliance with BIS standards
▸ Microscopic analysis of different phases in the clinker to assess its quality and quantity
▸ Mineralogical and chemical characterisation, as well as evaluation of final clinker-based OPC and slag cement products for their physical properties, including setting time, normal consistency, expansion, Blaine fineness, and compressive strength to ensure finish product adheres to BIS specifications
▸ SOPS established that govern quality assurance through sampling, traceability assessment, analysis, and calibration of instruments
▸ Periodic checks by third-party and BIS of clinker and finished products

INTELLECTUAL CAPITAL

Key technological achievements and milestones

DEC 2022

Manufacturing

VISION ANALYTICS
- Video analytics at JSW Shiva, Odisha
- Traffic management system with AI-based logic to ease truck moments
- AI-based Vision Analytics for kiln operations at Nandyal plant

DEC 2022

Marketing and Branding

GREEN CRETE LAUNCH
- Design and concept of CO_2 calculator in website
- Graphical representation of product contributing to less emissions

JAN 2023

L&D DigitAll Event

DIGITALL EVENT
- Design awareness and knowledge sharing programme at Nandyal plant for all
- SAP PM/MM module training and workshop

FEB 2023

Dealer Saathi App

NON-TRADE: ORDER PLACEMENT
- Order placement feature for non-trades in Saathi App
- Place order, financial, sales performance, order tracking, product info and many more features

MAR 2023

Manufacturing

PACKER AUTOMATION
- Cement bag count through video analytics at Salboni plant
- Monitor the wagons, printing missing identification and bag damage identification

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Supply Chain

DEPOT ATTENDANCE TRACKING SYSTEM
- App introduced to Depot, Goods Shed, E2Supervisors
- Check in/out capture via App with geo-fencing and facial image
- 260 depot staff are facilitated with app
- Leveraging Apps to energise the value chain

Marketing and Branding

WHATSAPP PUSH NOTIFICATIONS
- Introduced WhatsApp as new communication channels
- Focus on dealers, influencers, JSW employees
- Notifications on products, offers, discounts, greetings, HR Alerts

SAATHI App

ENHANCEMENT
- Communication broadcasting feature
- All media formats can be broadcasted to dealers and SO

Influencers Loyalty

PROGRAM (ILP) AND CONTACT CENTER
- Pragati App to reward influencers
- Points redemption and claims via app
- AP/TG/KA Dealers to be supported
- Access, call centre metrics and FAQs are facilitated to contact centre

Leads

GENERATION TO JSW PAINTS
- Introduced 'Construction Stage' Brickwork/ Plastering in non-trade
- Email notifications to Paints RM
- 299 leads generated in one month out of 828 orders placed

Digitalisation

Digitalisation is a crucial driver that is helping us evolve as a tech-enabled organisation. We are implementing digitalisation across our plant operations while using various digital platforms to provide customers with best experience, facilitating sales and digital payments.

Our pursuit of growth spans all channels, from partnerships with sub-dealers to direct-to-dealer enterprises. Apart from improving operational efficiency, digitalisation is helping us better engagement and interaction across the value chain and among all our stakeholders.

Digitalisation strategy, execution and impact

Wave 1
- Laying the foundation in key functional areas

Wave 2
- Digitalisation of sales and marketing
- Digitalisation of logistics
- Digitalise customer experience

Wave 3 and Digital Vision 2026
- Expand and scale digital to best-in-class:
- Customer experience
- Excellence in logistics
- Digital in manufacturing
- Digital in RMC
- Sustainability, safety and security
- Finance
- Analytics – Data-driven decision-making

Guiding principles

Strategic Transformation in Key Areas
- Transform end-to-end Customer experience
- Excellence in logistics service and cost
- Industry 4.0/APC in manufacturing
- Transform key finance processes

Value Lens
- ROI is the key to digital investments
- Prioritise focus and investment
- Increase focus on safety and sustainability projects

Democratise Digitalisation
- Low investment and quick ROI projects undertaken at plant level
- Short, well-defined sprints as per 'Angle'
- Fail-fast and learn-fast approach
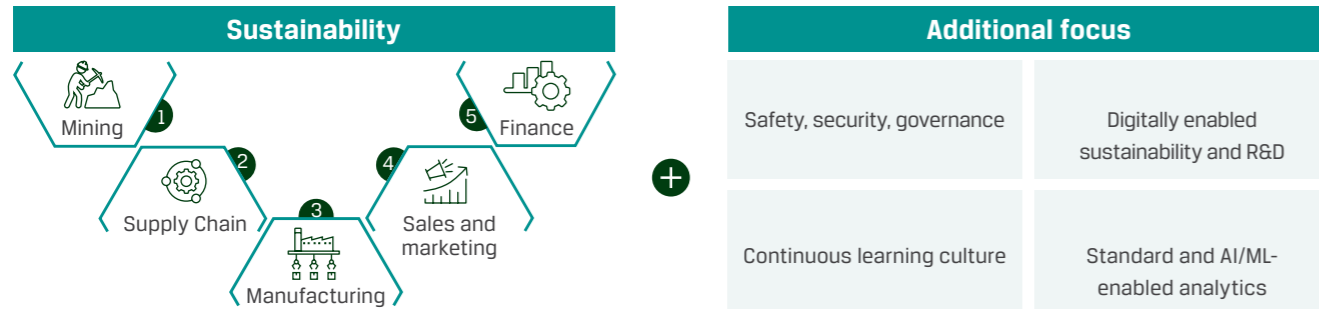- Promote horizontal and vertical deployment

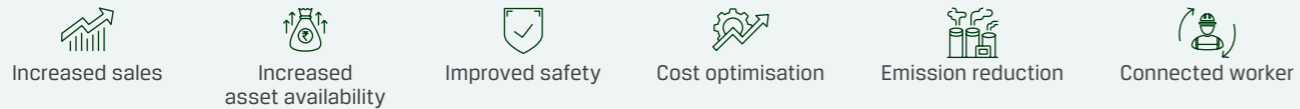**9**
Major digital projects

35+
Digital projects completed

20+
Digital projects planned

INTELLECTUAL CAPITAL

JSW Cement's digital focus areas

Sustainability
- 1 Mining
- 2 Supply Chain
- 3 Manufacturing
- 4 Sales and marketing
- 5 Finance

Additional focus

Safety, security, governance	Digitally enabled sustainability and R&D
Continuous learning culture	Standard and AI/ML-enabled analytics

Anticipated impact

- Increased sales
- Increased asset availability
- Improved safety
- Cost optimisation
- Emission reduction
- Connected worker

Additional focus

Integrated IT+Plant Automation+Digital
- IoT, IT/OT In
- Data sciences, AI/ML
- Intelligent Analytics, BI+OI
- Edge-to-cloud
- Digital depots
- Leveraging startup ecosystem

Horizontal + Vertical Deployment
ENABLED BY:
- Digital depots
- Digital learning
- One Digital team

People Upskilling
- 2-tier training
  - Mass awareness
  - Specialised deep-dive
- Digital Central (Group)
- Digital Confluence (Group)
- Digital Exchange (Group)

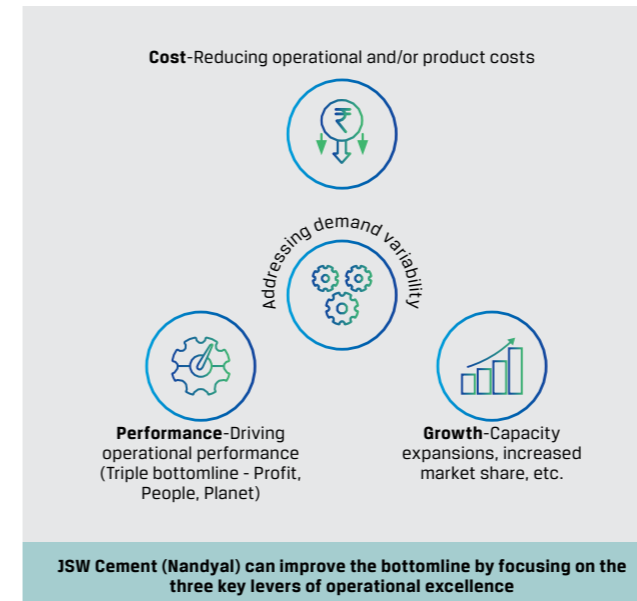### Key objectives of digitalisation and how we are meeting them

Objective	How and why
Operational efficiency	Leveraging IoT sensors and automation for real-time process monitoring, optimising production, reducing downtime and enhancing resource utilisation
Data-driven decision-making	Collecting and analysing data from production stages for informed decisions, predictive maintenance, and process refinement
Predictive maintenance	Utilising AI and machine learning to detect equipment issues early, and minimise downtime and maintenance costs
Quality control	Real-time monitoring and parameter adjustment to ensure consistent product quality and reduce human error
Energy efficiency	Monitoring and optimising energy consumption to improve cost efficiency and reduce environmental impact
Supply chain optimisation	Implementing blockchain for supply chain transparency, efficient sourcing and reduced fraud risks
Inventory management	Automating inventory tracking for cost savings and improved order fulfilment
Remote monitoring	Enabling remote monitoring and control of critical processes, especially during emergencies
Customer engagement	Enhancing communication with clients through digital tools, improving satisfaction and understanding of customer needs
Sustainability	Using digital tech for emissions monitoring, waste management, and compliance with environmental regulations
Innovation	Supporting R&D of innovative cement products and processes through digitalisation and simulation tools

Digitalising our operations

Digitalisation is crucial for us to drive greater efficiencies in the production process. Our implementation of digital initiatives are helping us improve plant productivity, reduce our environmental footprint, increase capacity utilisation, improve quality and reduce consumption of resources.

Digital technology as a catalyst

We have the potential to elevate EBITDA per tonne by 8-10% by giving prominence to the three pivotal pillars of cost, performance and growth to achieve operational excellence.


Cost-Reducing operational and/or product costs

Addressing demand variability

Performance-Driving operational performance (Triple bottomline - Profit, People, Planet)

Growth-Capacity expansions, increased market share, etc.

JSW Cement (Nandyal) can improve the bottomline by focusing on the three key levers of operational excellence

Objective 1
Operations improvement with advanced operations

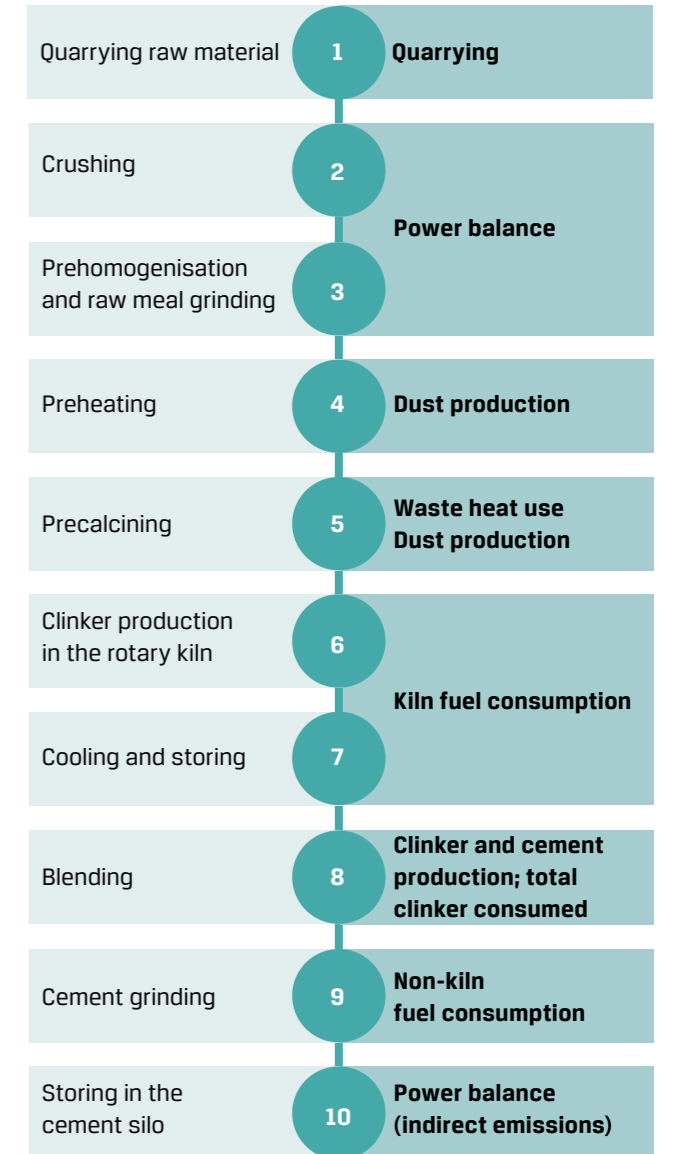**Objective 2**
Operations intelligence using AI-ML

Objective 4
Improve sustainability to achieve Net Zero goals

Objective 5
Safe and smart workplace

Automated → Integrated → Intelligent

Prerequisite - Establishing Digital Foundation
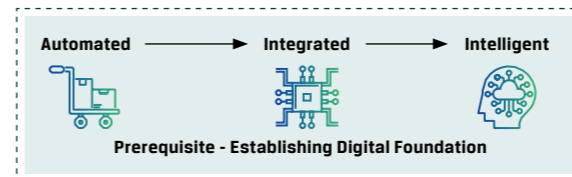
Optimising production rates

We use digitalisation to address hidden sources of inefficiency and production setbacks, aiming to optimise production rates while minimising energy consumption and maximising product quality.

Process step	#	Impact
Quarrying raw material	1	Quarrying
Crushing	2	Power balance
Prehomogenisation and raw meal grinding	3	
Preheating	4	Dust production
Precalcining	5	Waste heat use / Dust production
Clinker production in the rotary kiln	6	Kiln fuel consumption
Cooling and storing	7	
Blending	8	Clinker and cement production; total clinker consumed
Cement grinding	9	Non-kiln fuel consumption
Storing in the cement silo	10	Power balance (indirect emissions)

At our cement plants, we rely on various metrics such as energy consumption, CO_2 emissions, and output quality. These metrics are influenced by multiple factors such as humidity, vibration, and temperature. Our employees manually adjust approximately 50-100 of these variables around every 10 minutes. Through automated root-cause analysis, our process experts can pinpoint the underlying reasons for production losses and receive actionable recommendations to mitigate process inefficiencies, such as energy waste, reduced clinker quality, lower throughput, and kiln feed variations.
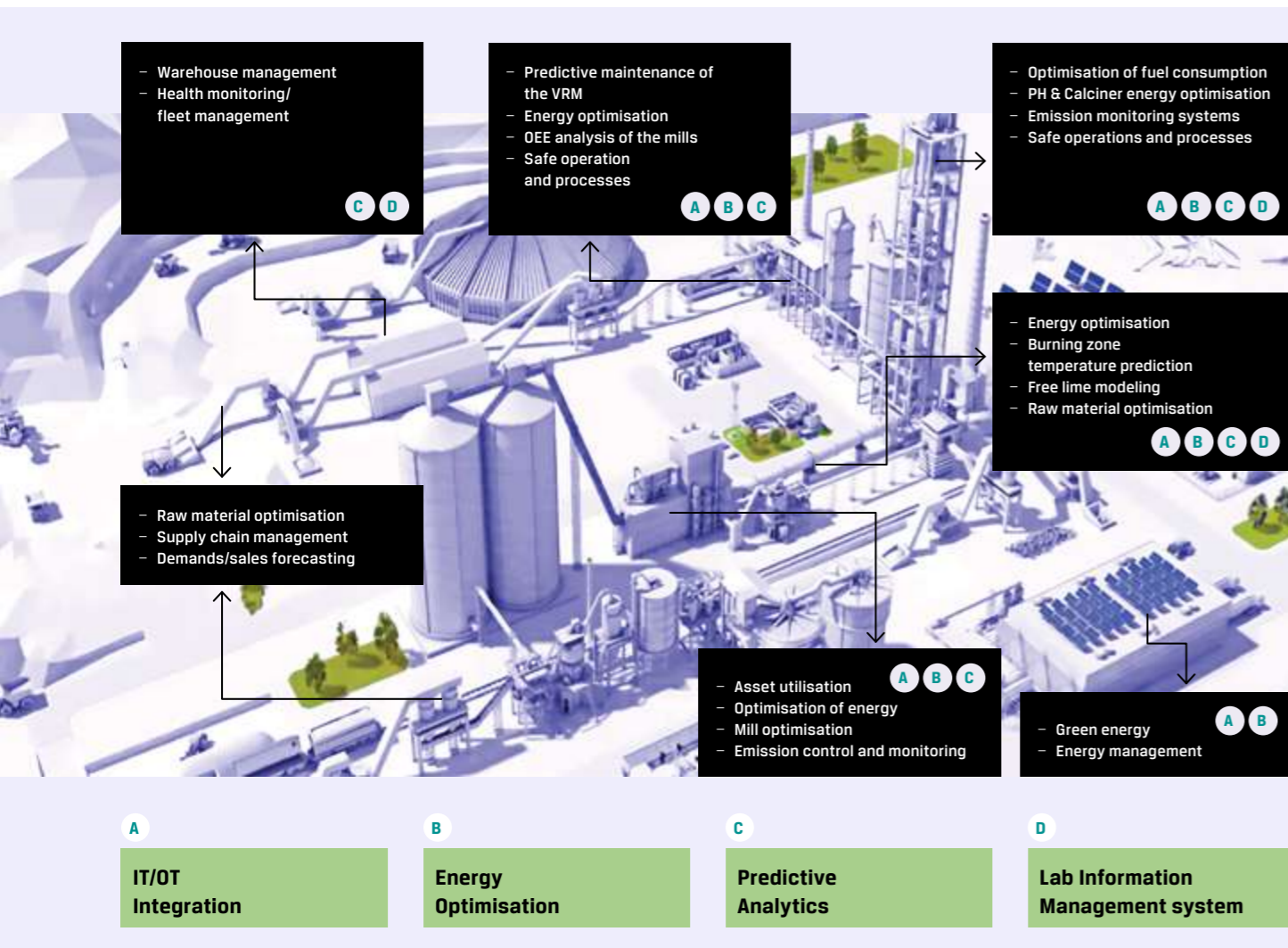
INTELLECTUAL CAPITAL

CASE STORY

SETTING UP A MODEL DIGITAL PLANT AT NANDYAL

We intend to make the Nandyal plant a model digital plant, with digitalisation woven into every aspect of its operations and product delivery. Nandyal is integrated plant with a state-of-the-art technology for producing clinker and cement situated at Bilakalaguduru village near Kurnool District, Andhra Pradesh.

The plant is situated next to limestone mine to produce clinker and it also uses BF Slag generated by JSW Steel, and is one of the most energy-efficient cement plants in India. It is the first cement plant in India to use the Combi-Comflex technology, which ensures less energy use compared to conventional methods of cement-making.

JSW Nandyal - Model Digital Plant Aspiration

- Warehouse management
- Health monitoring/ fleet management
  C D

- Predictive maintenance of the VRM
- Energy optimisation
- OEE analysis of the mills
- Safe operation and processes
  A B C

- Optimisation of fuel consumption
- PH & Calciner energy optimisation
- Emission monitoring systems
- Safe operations and processes
  A B C D

- Energy optimisation
- Burning zone temperature prediction
- Free lime modeling
- Raw material optimisation
  A B C D

- Raw material optimisation
- Supply chain management
- Demands/sales forecasting

- Asset utilisation
- Optimisation of energy
- Mill optimisation
- Emission control and monitoring
  A B C

- Green energy
- Energy management
  A B

| A	B	C	D
IT/OT Integration	Energy Optimisation	Predictive Analytics	Lab Information Management system

CASE STORY

GROUND-BREAKING DIGITAL INTERVENTION IN LOGISTICS

We have adopted a transformative digital strategy in our logistics operations, aimed at boosting service quality and cost-effectiveness across the supply chain. Our approach is built on three key pillars:
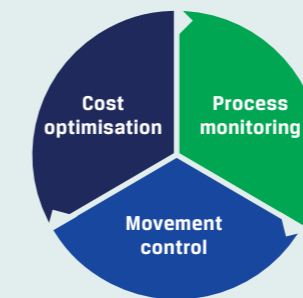
At the core of this strategy is our Logistics Control Tower (LCT), the digital brain overseeing the entire operation, from order receipt to material delivery. Equipped with cutting-edge technologies such as RFID and GPS, the LCT leverages analytics to process vast amounts of data.

Our Yard Management System (YMS) aligns sales orders with available trucks in our parking yard, optimising their sequencing. For internal plant logistics, we employ RFID tags and sensors managed by the Plant Logistics Management System (PLMS). This system ensures efficient truck movement within the plant.

External movement is tracked using GPS, allowing real-time monitoring of truck movement. Any irregularities trigger alerts to the LCT, which acts as the central hub of our Track N Trace system. This system promptly notifies stakeholders, minimising truck stoppages.

We have integrated these processes into a business intelligence platform, continuously optimising routes, fleet sizes, and trip efficiency. This holistic digitalisation effort has revolutionised our logistics, elevating service, reducing costs, and enhancing supply chain efficiency.

Embedding technology to improve process expertise

We aim to prevent process inefficiencies and significantly minimise production losses related to quality, emissions, and energy. Our approach includes predictive recommendations, which determine the optimal process settings, such as cyclone material temperature and kiln oxygen levels, to reduce kiln inefficiencies. We employ an automated/decision-support system that adjusts the burning zone temperature based on fuel characteristics, quality predictions, CaO predictions, emission monitoring, and fuel substitution rates. Proactive alerts are promptly delivered to our production team through an intuitive screen when process inefficiencies arise. Additionally, we provide detailed descriptions of root causes and SOPs to help guide our production teams in addressing issues before losses occur.

**INTELLECTUAL
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Driving greater organisational synergy

Aikyam, a single app for multiple business verticals at JSW Group

Following the successful integration of our retail trade operations in steel and cement into JSW One in the East, we are streamlining the operations of our large project divisions in the steel, cement, and paint sectors through a single group interface. To facilitate this, we have introduced 'Aikyam', a cutting-edge technology platform that grants Managers of large project divisions across these businesses access to crucial information and potential opportunities.

Aikyam's primary goal is to digitalise the end-to-end institutional sales processes within the JSW Group. By seamlessly integrating data from these two business entities, it aims to provide a comprehensive 360-degree view of our large project customers. This holistic perspective will empower our client managers to enhance their interactions with valued clients and identify cross-selling opportunities, ultimately delivering an enriched customer experience.
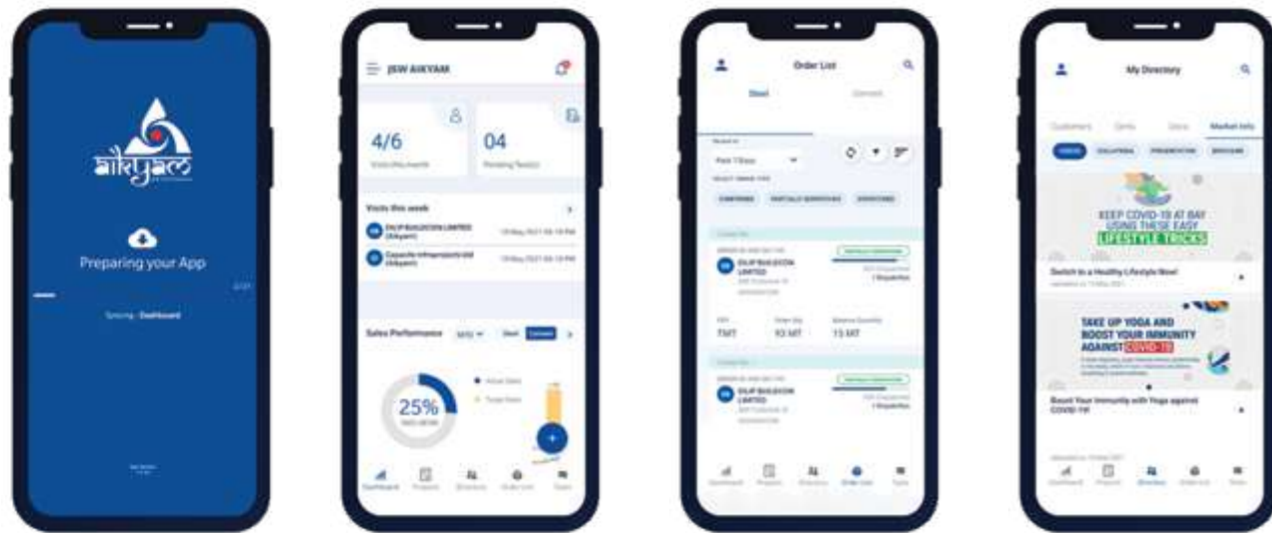
Improving sales and marketing through technological innovation

Leveraging apps to optimise value chain

Our Digital & Analytics team (DnA) introduced new processes for sales planning, pricing visualisation, micro-market mapping, and sales force automation in trade and direct/institutional sales and dealer engagement across various platforms in 2020.

12+
Apps launched

20+
Business process covered via apps

What helps us adapt swiftly to market dynamics

– A deep understanding of suitable products, geographies, and customer value propositions
– Expertise in building responsive, scalable, and profitable direct-to-customer business processes
– A close relationship with sub-dealers and influencers, achieved through digital engagement and the development of the dealer cohort
– Ensuring our markets have the flexibility to customise a centrally developed toolkit of digital technologies and practices to meet local requirements

Personalising engagement and experience through digital

JSW Saathi App

The Smart JSW Saathi App has already proven to be a powerful driver for our non-trade customer preferences and deeper engagement. For instance, our Saathi platform received over 4,000+ downloads across 10 states, and 30,000+ visits within just two weeks of its release to our non-trade customer network. This platform assists customers in placing orders against approved contracts, checking order status, tracking their dispatches in real-time, making online payments, settling outstanding balances, managing their financial records, collaborating with our departments through service requests, and accessing essential documents and materials needed for their daily operations.

Sales Saathi App

Our internal Sales Saathi platforms are pivotal in empowering our sales team, fostering a culture of learning, collaboration, and enabling us to scale our customer management process. The Sales Saathi App helps our field force to execute tasks swiftly and efficiently and serves as their primary tool for all dealer-related interactions. By leveraging such tools, our team promotes best practices by providing visibility into dealer history, orders, financial health, and also in addressing issues, concerns, and complaints. We set objectives for resolution, ultimately enhancing business outcomes and dealer satisfaction through the adoption of new technologies.
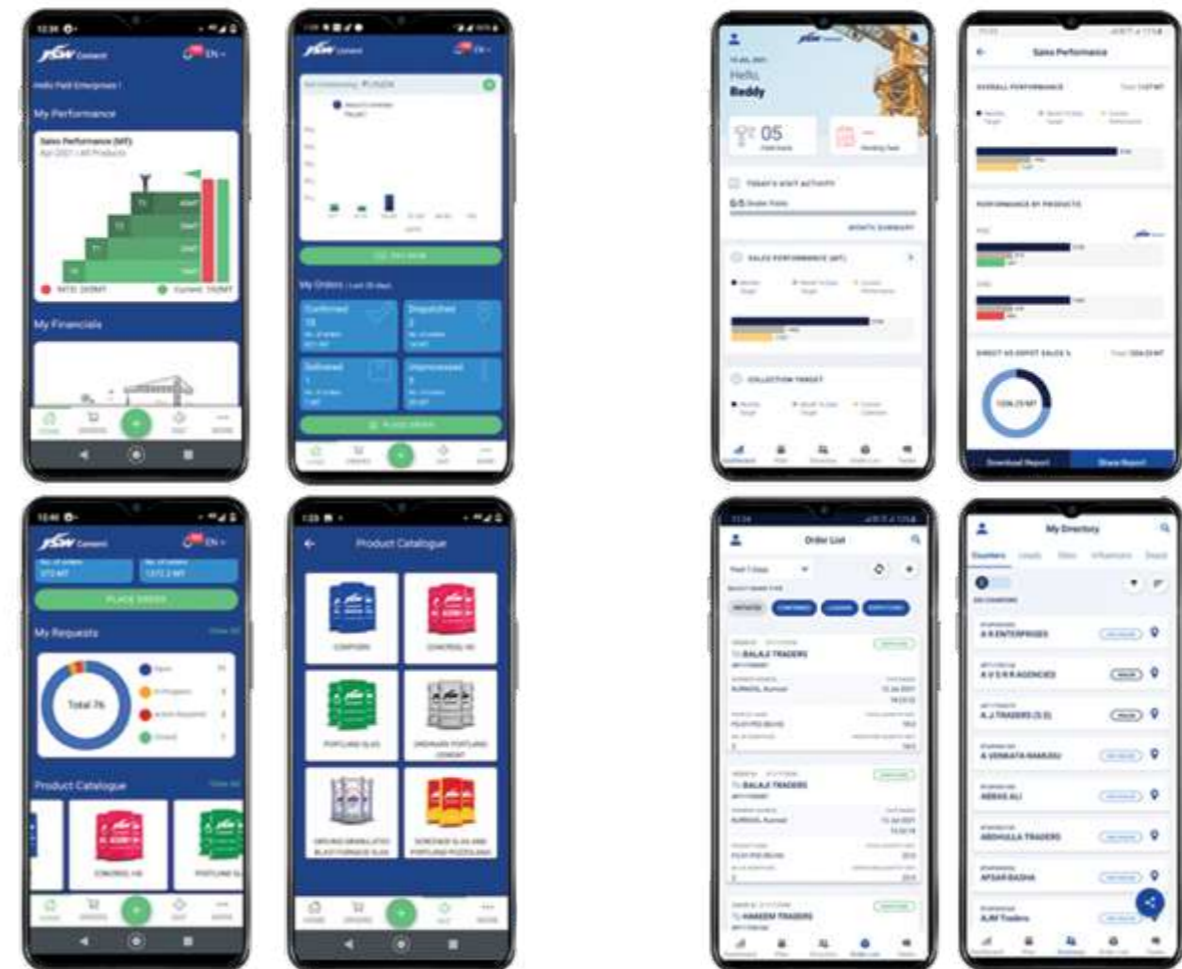
30,000+
Visits on Saathi platform within two weeks of launch
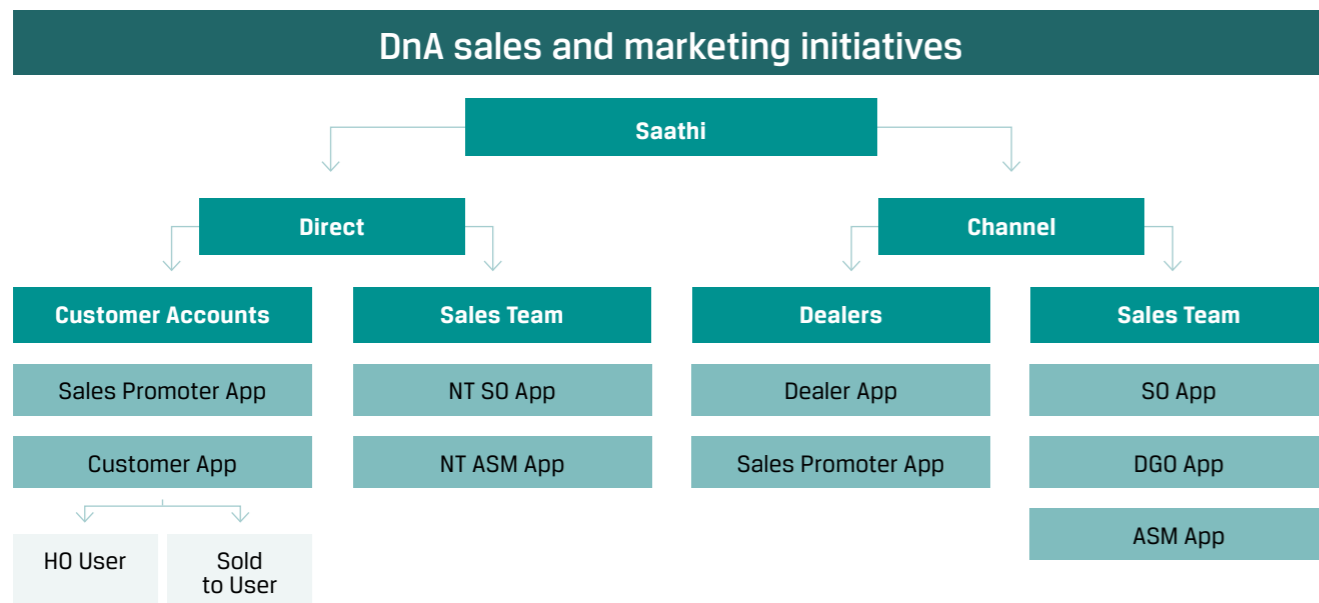
INTELLECTUAL CAPITAL

Technology to help build greater connect with teams and partners

We have further improved our marketing outreach through the use of digital. For example, we have registered a 63% and 117% increase in Instagram and LinkedIn users, respectively. A toll-free number successfully generated leads for new dealerships and product inquiries. SEO strategies and consistent website content updates nearly doubled our website visitors from 14k to 30k.

We have also used the conventional marketing channels to build our brand resonance. For example, we extended our reach with TV and radio campaigns during the Puri Rath Yatra. Alongside the IPL, our Leader's Premier League was a hit, involving dealers, retailers and influencers, with more than 600 winners redeeming their prizes.

A digital film we released on the occasion of Pongal achieved 1 million+ views on social media. We proudly promoted our status as the world's #1 eco-friendly cement company through print media ads.

In 2022-23, we received 429 customer complaints, of which 425 have been closed.

DnA sales and marketing initiatives

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                        Saathi
            ┌─────────────┴─────────────┐
         Direct                       Channel
    ┌───────┴───────┐           ┌───────┴───────┐
Customer          Sales       Dealers          Sales
Accounts          Team                          Team

Sales Promoter    NT SO App   Dealer App       SO App
App

Customer App      NT ASM App  Sales Promoter   DGO App
                               App
 ┌────┴────┐                                    ASM App
HO User  Sold
         to User
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EMPOWERING THE INFLUENCER COMMUNITY

Pragati: Influencer management programme

- We have designed a unique influencer management programme to engage with professionals in the mason, contractor, engineer, and architect segments. This initiative has yielded significant results, including heightened demand for our products and development of loyal brand ambassadors. Our programme is specifically designed to connect with the real influencers, termed 'Decision-Making Influencers' (DMI), with the power to shape the purchasing choices of end consumers.
- Our programme offers a range of valuable benefits, including scholarships for children based on specific eligibility criteria. Additionally, participants can enjoy various other perks such as bonuses on special occasions and festivals, complimentary gifts, exciting tours, and experience-based gifts for the whole family like movie tickets, theatre outings, and access to sporting events.
- Apart from focusing on influencers, the year also saw us engage with dealers through state-wise Local Annual Dealer Conferences. In the span of just one month, we engaged with 2,000+ dealers, contributing substantially to our total trade sales. Over the course of 21 days, our campaign in the eastern markets garnered an impressive 9.2 million views of our TVC, with 5.2 million additional views via full-page newspaper inserts.

4,303
No. of meetings to create awareness

22,000+
Influencers

2,500+
Sites covered through 55 cement care vans and four stationary labs for technical workshops