

Smarter, faster, stronger: how Artificial Intelligence is transforming the manufacturing landscape

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Step inside a modern factory and you might find something quietly extraordinary. Machines no longer wait to fail; they signal in advance. Robots don't just repeat tasks; they adapt and respond. And decisions once made on instinct are now driven by real-time data.

This is the new face of manufacturing, where artificial intelligence (AI) is not just an upgrade but a fundamental shift in how things are made, moved and managed.

Across India, from long-established facilities to newly-built plants, AI is being integrated into every layer of production. It is helping manufacturers increase output, reduce waste, adapt to shifting demands and even design more intelligently. Backed by national policy and rising enterprise ambition, India's factories are becoming more agile, more precise and more globally competitive.

Sector on move

The global AI-in-manufacturing market is projected to grow from \$4.1 billion in 2024 to \$5.8 billion in 2025, and is expected to surpass \$25 billion by 2029, according to The Business Research Company.

A survey found 44% of manufacturing leaders were cautious about scaling generative AI

In India, adoption is accelerating. TeamLease data shows AI use across industries stood at 48% in FY2024, with manufacturing alone rising from 8% to 22% in just one year. This is supported by policy initiatives like the Government of India's ₹10,372-crore AI Mission, which is investing in infrastructure, talent and indigenous models.

"From predictive maintenance to intelligent automation, AI and GenAI are turning manufacturing industries into self-optimising systems. Real-time data is being leveraged to drive smarter decisions, higher throughput and more sustainable, customer-centric outcomes. When combined with responsible AI frameworks, this shift drives both operational excellence and enhanced customer value," says Sanjay Mittal, senior partner and industrial sector leader, IBM Consulting India & South Asia.

Intelligence across floor
AI is powering improvements across every layer of the factory. On the shop



Vaulting to the future: Artificial Intelligence will be central to India's ambition of becoming a \$5 trillion economy.

floor, predictive maintenance uses sensor data to anticipate equipment failures, reducing downtime by up to 30%, according to McKinsey. AI vision systems identify micro-level defects in real time, improving quality assurance.

Cobots—collaborative robots guided by AI—support workers in physically demanding or repetitive tasks. These machines respond to human cues, enabling safer, more efficient man-machine collaboration.

"Today, CPCL generates about 1 TB of data daily. AI-powered CCTVs are help-

ing ensure SOP compliance, while machine learning supports predictive maintenance and smart procurement. Digital twins and centralised safety monitoring are our focus to steadily transform our operations," says H. Shankar, managing director, Chennai Petroleum Corporation Limited.

Further upstream, generative AI accelerates product development.

Digital twins simulate layouts, energy use and asset health, helping engineers optimise operations virtually. In planning and logistics, AI enhances fore-

casting and enables more agile scheduling. IBM estimates that AI-led planning improves responsiveness by over 20%.

"At ZF Group in India, we're integrating smart manufacturing technologies like AI, robotics, and automation to transform our operations.

"AI is helping us redesign workflows by reducing task complexity and enhancing labour flexibility, empowering shop-floor teams to manage more intricate processes.

"AI-powered vision systems are also improving quality control by eliminat-

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ing fatigue-related errors and increasing inspection efficiency," says Akash Passey, president, ZF Group India

Digital backbone

AI draws strength from a wider digital ecosystem that enables speed, scale, and integration.

At the edge, IoT sensors capture real-time data from machines, materials, and the environment. Edge computing allows instant responses for tasks like robotic actuation and safety control.

Cloud platforms provide the scale to train models, run digital twins, and coordinate cross-site operations.

These platforms allow AI to be deployed flexibly and integrated into existing enterprise systems.

Emerging technologies such as autonomous control systems and agentic AI

offer even more adaptability. These systems learn, plan and optimise processes with minimal human input. Crucially, these layers are connected through APIs and integration hubs that link AI with ERP, supply chain, and production systems. This ensures insights are shared across the organisation to enable better decision-making.

More than efficiency

AI creates value at two levels. First, through operational hygiene.

Predictive maintenance, automated inspections, and real-time stock tracking are fast becoming industry norms. These improvements lower costs and improve compliance, but are no longer enough to differentiate.

"We are now exploring AI-driven process optimisation to improve yields and reduce energy use, de-

ploying drones for safer inspections, and planning AI-driven logistics.

"As AI and automation evolve, the opportunity to unlock smarter, safer, and more efficient operations continues to grow," adds Mr. Shankar of CPCL.

Second, AI is unlocking innovation. Generative tools speed up design.

AI-driven customisation enables personalisation at scale. Companies that embed AI across their value chain—from R&D to delivery—are more agile, responsive, and future-ready.

Looking ahead

Challenges persist. Integration costs, talent shortages and concerns over data governance and model transparency are slowing broader adoption.

Note of caution

A 2024 Reuters/Ipsos survey found that 44% of manufacturing leaders remain cautious about scaling generative AI due to concerns around hallucinations and explainability.

Still, the direction is clear. AI will be central to India's ambition of becoming a \$5 trillion economy. With the right mix of strategy, skills, and Indian manufacturers are well positioned to lead the next wave of global industrial transformation.