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Exploring Exports Amid Global Uncertainty

As the global trade landscape reels from one disruption after another—from geopolitical tensions to climate-related crises—India's manufacturing and export ambitions face a critical test. With the National Manufacturing Mission set to be formally launched in June 2025, India has articulated a bold vision: to scale its manufacturing sector to a \$7.5 trillion economy by 2047. The mission rightly focuses on critical enablers such as reducing business costs, skilling the workforce, supporting MSMEs, promoting clean-tech, and addressing regional manufacturing imbalances. But can these aspirations withstand the current global storm?

“The recently signed India-UK Free Trade Agreement (FTA) promises to improve competitiveness in labour-intensive sectors such as textiles, footwear, and automobiles by eliminating current high tariffs.

The past two years have shown just how fragile global supply chains can be. The Red Sea crisis alone, caused by Houthi attacks on commercial vessels, has disrupted \$6 billion in weekly trade, with supply chain lead times increasing by 35 per cent according to UNCTAD. Sectors like automotive and electronics—key to India's export strategy—have been particularly hard-hit. Add to this the Panama Canal drought in 2023, which delayed shipments globally, and ongoing conflicts in Ukraine and the Middle East, and it's clear the world is navigating through trade turbulence.

Moreover, a shift toward localisation is emerging in several key markets, such as Southeast Asia and the Middle East, making market access increasingly difficult. Russia, once seen as a promising trade partner, remains restricted due to sanctions. And India's own geopolitical tensions—such as the recent escalation with Pakistan—have further strained trade corridors.

Yet, within this adversity lies opportunity.

India's domestic economy remains a strong foundation. As the world's fastest-growing major economy, it fuels demand for capital goods, industrial machinery, and critical infrastructure inputs. The government's robust push in sectors like mining, power, petrochemicals, and railways is laying the groundwork for industrial growth. Further, the recently signed India-UK Free Trade Agreement (FTA) promises to improve competitiveness in labour-intensive sectors such as textiles, footwear, and automobiles by eliminating current high tariffs.

India is negotiating preferential trade deals with EU and the US (the two major export destinations for Indian goods). Experts caution that India cannot afford to sign free trade agreements that compromise sensitive sectors or concede regulatory sovereignty. India must push back against one-sided trade demands, particularly those that jeopardise agriculture, pharmaceuticals, and MSMEs. FTAs should deliver “balanced, reciprocal gains”—not token access in exchange for sweeping concessions.

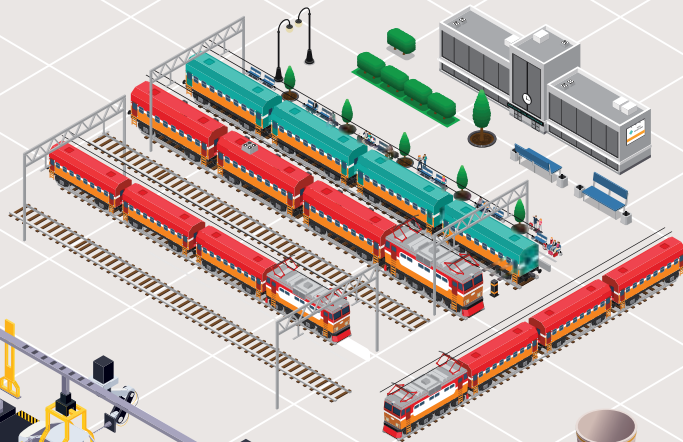
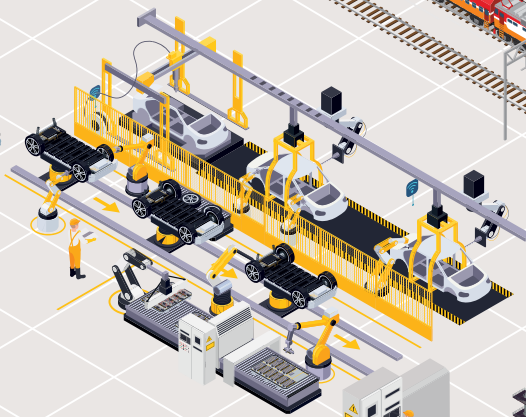
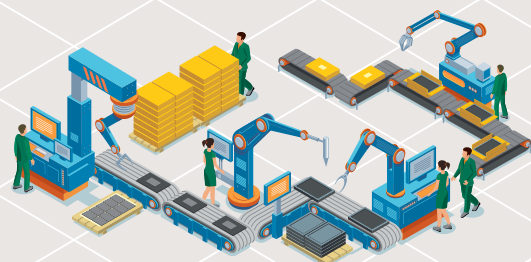
The outlook for India's exports, then, is a cautious mix of optimism and realism. Engineering goods exports, for example, are expected to rise to \$120 billion in FY26 from \$116.7 billion in FY25—a modest but positive trend. To truly take off amid global uncertainty, India must act decisively: by investing in logistics and infrastructure, rationalising tariffs, improving ease of doing business, and ensuring policy predictability. India's long-term competitiveness will depend not on external goodwill but internal reform.

As B V R Subrahmanyam, CEO, NITI Aayog notes, the blueprint for transformation is ready—now it's time for execution. Only with deep structural changes can India anchor itself as a reliable alternative to China and claim a larger share of global trade.



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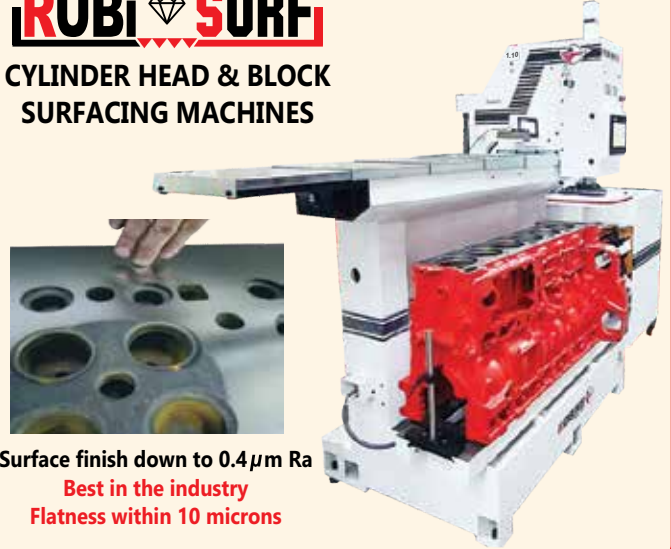
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Machine Tools

DiFACTO Robotics acquires RoboFinish Division from Grind Master

DiFACTO Robotics and Automation Pvt Ltd, a leading provider of manufacturing automation and robotics solutions, has announced the acquisition of the Intellectual Property Rights (IPR) portfolio for RoboFinish operations of Grind Master. The Aurangabad (Maharashtra) based Grind Master, founded by Milind Kelkar and Mohini Kelkar, is a pioneer in metal-finishing solutions for automotive and general engineering industries. Over the past 40 years, their dedication to innovation is evident in their 30+ patents, allowing them to effectively challenge top Japanese & European players. RoboFinish, developed over the last 14 years, includes robotic grinding, finishing, deburring, and machining technologies.

Sameer Kelkar, CEO, Grind Master and the brain behind RoboFinish, commented, “We pioneered breakthrough developments in robotic grinding and



L-R: Sameer Kelkar and Ajay Gopalaswamy

finishing operations, leveraging our profound domain knowledge. We have successfully delivered over 150 RoboFinish solutions worldwide. We are confident that DiFACTO, a specialist in robotics and automation, will develop these technologies further and take them to a wider spectrum of customers.”

Ajay Gopalaswamy, Founder and CEO, DiFACTO, stated, “We are constantly seeking cutting-edge and globally competitive technologies. The RoboFinish portfolio presents significant synergies with our existing offerings, strengthening our position in the market. DiFACTO will continue to support RoboFinish’s existing users through its customer-focused engineering team.”

Founded in 2007 by Ajay Gopalaswamy, Yogesh Kumar and Anil Satapathy, DiFACTO - backed by StakeBoat Capital, has a proven track record of developing advanced robotic systems and automation services for diverse industries.

Chemical Industry

Shivtek Spechemi to set up ₹600-mn specialty chemicals facility at Hazira

Shivtek Spechemi Industries Ltd, a flagship company of the Shiva Group of Industries, will set up a new speciality chemicals manufacturing facility near Hazira, spread across 1 million sq ft, with an investment of Rs 600 million. The new facility, to be operational from 2027, will add to the production capacity of 250,000 metric tonne per annum (MTPA) by 2027-28 and offers cost-effective logistics and seamless connectivity to both domestic and international markets. The location offers easy access to major ports including Hazira, Dahej, Kandla, and Mundra, ensuring seamless connectivity for both imports and exports. Its proximity to the dedicated freight corridor further enhances the efficient and cost-effective movement of raw materials and finished goods. Additionally, being just 70 kilometers from the Dahej plant significantly reduces logistics costs, making it a strategic advantage for streamlined supply chain

operations. The expansion is further supported by a 5000 KL storage facility and a dedicated warehousing space of 150,000 sq ft for export orders and products from the Dahej plant.

Dr Amitt Nenwani, MD, Shivtek Spechemi Industries Ltd, said, “Investment in Hazira aligns with the company’s long-term vision of sustainable innovation in the specialty chemicals sector. The upcoming plant represents a significant strategic expansion for Shivtek, driven by clear logistical, industrial, and market-oriented considerations. By expanding our manufacturing capacities, we are not only investing in our future, but also reinforce our commitment to environmental responsibility, technological advancement, and market leadership.” The new Hazira plant will pioneer the production of oil additives, Proteogenic to Aprotic solvents, and specialty petrochemicals.



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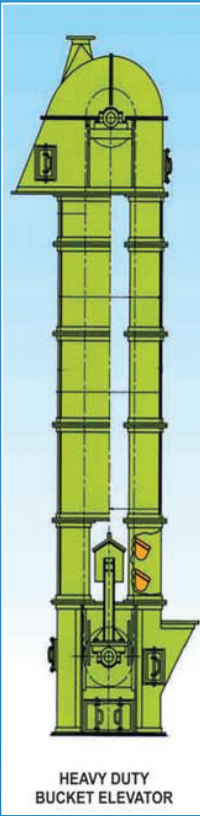
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Aerem Solutions and OMC Power partner to finance solar rooftop adoption by MSMEs

Aerem Solutions and OMC Power have entered into a strategic partnership to unlock ₹2 billion in financing for rooftop solar solutions targeted at India's Micro, Small, and Medium Enterprises (MSMEs) in Uttar Pradesh. The collaboration is designed to scale solar adoption among MSMEs by providing access to affordable finance, supporting India's transition toward a low-carbon economy. Under this agreement, Aerem through its NBFC, will enable credit facilities of ₹2 billion to OMC



Power's customers, enabling MSMEs to invest in energy-efficient solar systems with easy financing solutions. This initiative reflects both companies' shared commitment to advancing sustainable economic growth and promoting clean energy practices, especially in underserved regions such as Uttar Pradesh.

Vikesh Agrawal, Co-founder and COO, Aerem Solutions stated, "At Aerem, we are committed to catalysing India's journey to a greener and low-carbon economy. This ₹2 billion credit partnership is a key step in that direction. MSMEs are central to India's Net Zero ambitions, and by empowering them with easy access to solar financing, we are integrating sustainability into the core of our financing strategy".

Rohit Chandra, MD and CEO, OMC Power said, "This partnership marks a major milestone in enabling MSMEs to embrace clean energy. At OMC, we believe that democratising access to sustainable solutions is essential to India's Net Zero future. Our collaboration with Aerem brings together complementary strengths to create real impact at the grassroots level. This initiative is expected to significantly expand the footprint of distributed solar solutions across MSMEs, supporting energy cost savings, business competitiveness, and environmental stewardship."

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Policy & Economy

India and Chile sign terms of reference for CEPA negotiations

India and Chile signed the Terms of Reference (ToR) for a Comprehensive Economic Partnership Agreement (CEPA) on May 8, 2025, marking a significant advancement in their bilateral trade relations. The mutually agreed ToR were duly signed by H.E. Juan Angulo, Ambassador of Chile in India and Shri Vimal Anand, Joint Secretary, Department of Commerce, Ministry of Commerce & Industry, Government of India, also the Chief Negotiator for India-Chile CEPA from the Indian side.

The CEPA aims to build upon the existing PTA between the two nations and seeks to encompass a broader range of sectors, including digital services, investment promotion and cooperation, MSME, critical minerals etc. thereby enhancing economic integration



and cooperation. India and Chile are strategic partners and close allies, sharing warm and cordial relations. Bilateral ties have steadily strengthened over the years with the exchange of high-level visits. A Framework Agreement on Economic Cooperation

was signed between the two countries in January, 2005, followed by Preferential Trade Agreement (PTA) in March, 2006. Since then economic and commercial relations between India and Chile have remained robust and continue to grow.

An expanded PTA was subsequently signed in September, 2016 and became effective from May 16, 2017. In April, 2019 both countries agreed to pursue a further expansion of the PTA with three rounds of negotiations between the years during 2019-2021.

Power Generators

Cooper's clean energy engines begin global exports to USA & Japan

Cooper Corporation, a manufacturer of engines, engine components and generators, announced the dispatch of its first bulk shipment of gas-powered gensets to the United States. This marks the beginning of Cooper's full-scale export, with the company set to export gensets ranging from 5 kVA to 500 kVA each approved by the US Environmental Protection Agency (EPA).

The flagship 10 kVA and 25 kVA gas genset from Cooper Corporation are the only EPA-compliant engine of its kind in India, showcasing the company's engineering excellence and commitment to environmental compliance. The gensets, particularly the 25 kVA variant, have received encouraging responses from the American market.

Alongside the US, Cooper is also exporting its V-Twin LPG 10 kVA gensets to Japan, in collaboration with its Japanese partner, Sinfonia. This international expansion signifies Cooper's growing footprint in the global power solutions industry.

Sharing his thoughts on this proud occasion, Farrokh N Cooper, Chairman and Managing Director of Cooper



Corporation, said, "Today marks a historic and proud milestone for Cooper Corporation as we commence large-scale exports of EPA-certified gensets to the United States, a testament to our unwavering commitment to innovation, quality, and compliance with global environmental standards. As pioneers in the industry and the only Indian manufacturer of EPA-compliant 25 kVA gas gensets, we are proud to dispatch our first of many bulk shipments of 22 kW gensets to the U.S., while also expanding our global footprint with exports of V-Twin LPG 10 kVA gensets to Japan in partnership with Sinfonia."



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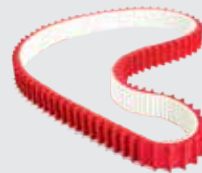
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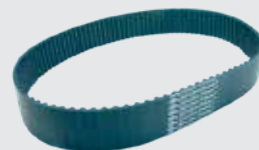
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Electrical & Electronics

LG Electronics India begins construction 3rd manufacturing plant in India

LG Electronics India Ltd commenced the construction of its new manufacturing facility in Sri City, Andhra Pradesh. The new plant is expected to commence operations by the end of 2026. Strategically located in Sri City's industrial area, the new manufacturing facility will enhance LGEIL's production capacity and also enable local employment in the region. The new facility will be LG Electronics' third plant in India. The other two plants are located in Greater Noida, Uttar Pradesh and Pune, Maharashtra. This investment underscores India's potential as a critical hub within LG Electronics' global supply chain.

The government of Andhra Pradesh has approved 247 acres of land in Sri City for LGEIL's new manufacturing facility, which is expected to generate around 1495 direct jobs. LGEIL plans to invest approximately \$600 million over the next four years, with the potential to attract ancillary businesses to the region, thereby creating an ecosystem for white good manufacturing in the state of Andhra Pradesh.



The new plant at Sri City is expected to localize production further and meet the growing demand for LG products throughout India. It will also strengthen LGEIL's supply chain in South India, while helping expedite access to LG products for consumers in the region. The facility

will manufacture a diverse range of products, including AC compressors, refrigerators, washing machines and air conditioners.

Sharing his best wishes, N Chandrababu Naidu, Chief Minister of Andhra Pradesh, said, "We wholeheartedly welcome LG Electronics to Sri City, Andhra Pradesh. The announcement of LG Electronics' new manufacturing plant in Andhra Pradesh is a testament to Andhra Pradesh's progressive policies with regards to being industry friendly, ease-of-doing-business, fostering innovation and being home to world-class manufacturing hubs. A well-developed industrial ecosystem, great connectivity and pro-business environment makes Sri City the best location for the new plant."

Renewable Energy

BC Jindal Group's JIRE bags 300 MW solar-BESS order from SJVN

BC Jindal Group's, one of India's leading business conglomerates with over 180 billion turnover, renewable energy arm, Jindal India Renewable Energy (JIRE) has won a 300 MW solar plus storage project from state-owned, SJVN. The project is part of SJVN's 1200 MW inter-state transmission system-connected solar power projects tender with 600 MW/2400 MW of battery energy storage systems (BESS).

JIRE won the bid for 300 MW of solar capacity at a tariff of 3.32/kWh. According to the terms, the project will be developed on a build-own-operate basis. The greenfield project must be completed within 24 months from the signing of the power purchase agreement (PPA).

The spokesperson of Jindal India Renewable Energy, said, "Winning this project reaffirms JIRE's ability to



deliver scalable and clean energy solutions. It strengthens the growing trust in our capabilities and reinforces our commitment to delivering firm, clean power that supports India's

energy transition. We remain focused on expanding our capacity to 5 GW in the coming years across solar, wind, hybrid, RTC, and FDRE platforms."

SJVN will enter into an agreement with JIRE for a period of 25 years. The Navratna Company will purchase solar power from JIRE and sell it to state utilities and others. As part of the contract, JIRE will have to deploy an ESS of at least 0.5 MW/ 2MWh capacity for 1 MW contracted capacity. Recently, JIRE also received a Letter of Acceptance (LoA) for a 300 MW solar plus storage project from state-owned enterprise NHPC, signalling its expertise in large-scale renewable projects.



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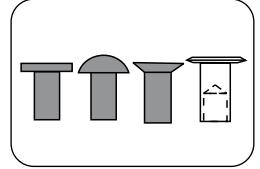
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Aerospace and Defence

Andhra Pradesh sees surge in aerospace & defence investment proposals

Andhra Pradesh is emerging as a promising hub for aerospace and defence manufacturing, with several OEMs—primarily MSMEs producing niche technologies—submitting proposals to set up facilities in the state. The state's recent appointments of G Satheesh Reddy Former Chairman, DRDO and former S Somanath, Chairman, ISRO as advisors have played a crucial role in boosting investor confidence.

A notable proposal includes a Taiwanese firm's interest in setting up a semiconductor plant in Kurnool under the India Semiconductor Mission. Domestic defence technology firms like Avantel Ltd and Astra Microwave Products Ltd are also exploring opportunities. Avantel, known for its communication systems for the Indian Navy, has sought land near

Nuzvid in Eluru district.

Public sector firm Bharat Dynamics Ltd is looking to expand its Visakhapatnam SEZ unit, while Goa Shipyard and other defence PSUs are actively exploring investment options in the state.

To support these developments, the Andhra government is finalising its Aerospace & Defence Policy 4.0 (2025–29), which includes tailor-made incentives and plans for four industrial clusters focusing on naval shipbuilding, MRO, missile and ammunition production, and defence electronics. Inspired by France's OEM-led cluster model, the policy aims to attract investments in Jaggaiahpet (due to its proximity to Hyderabad) and the Orvakal and Koppaarth clusters located in key industrial corridors.

Auto Components

Sterling Tools partners with UK's AEM to make magnet-free motors in India

Sterling Tools Limited, one of the leading automotive component manufacturers in India and the market leader in Motor Control Units (MCUs), has, through its Sterling Gtake (SGEM) subsidiary, forayed into the development, manufacturing and marketing of Rare Earth Magnet-Free traction motors for electric vehicles. The

company has signed a Technology Licensing Agreement with Advanced Electric Machines (AEM) Ltd, UK to manufacture these motors at its plant in Faridabad. The patented AEM technology will enable SGEM to offer customers magnet-free motors that offer market-leading performance without any weight or size penalty.

By introducing a mature and commercially viable rare earth magnet-free technology, SGEM will offer its customers an alternative to the China dependent permanent magnet supply chain. Through this technology licensing agreement, SGEM will serve all segments of the traction motors market that is expected to grow to approximately Rs 150 billion by 2030. The business plan also calls for the joint development of



integrated motor and controller solutions.

By producing these motors domestically, Sterling Tools aims to drive import substitution and reduce reliance on permanent magnets, aligning with the Atmanirbhar Bharat vision and supporting the Make in India initiative. The development will empower Indian companies and other suppliers to access advanced

technology locally, building a self-reliant ecosystem for the auto industry. Anil Aggarwal, Chairman, Sterling Tools, said, "Sterling's foray into rare earth magnet-free motors demonstrates the Group's commitment to being a technology leader and an industry pioneer. We are expanding beyond MCUs to being a complete solution provider and meeting the EV Industry's growing demand for advanced technology. EV sub-systems are being increasingly consolidated into multifunction units and Sterling will also offer our customers integrated motor and controller solutions. The Group will continue to extend excellent technical and application support to its customers to help drive greater adoption of EVs in India."



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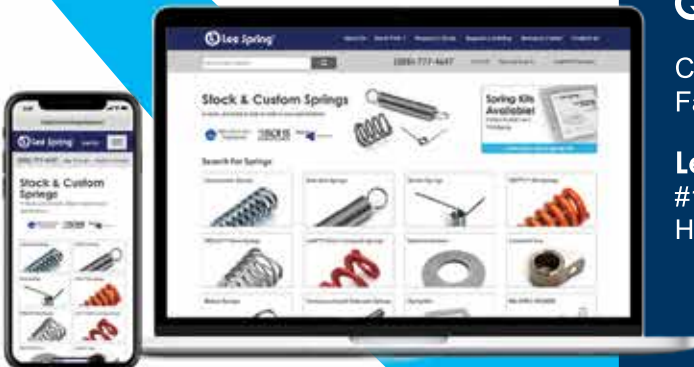
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Industrial Supplies

Vedanta Aluminium gets patent for graphite recovery from aluminium waste

On National Technology Day 2025, Vedanta Aluminium, has been granted a patent for its breakthrough technology that enables the recovery of high-purity graphite (>99%) from aluminium industry waste. This achievement exemplifies the spirit of this year's theme: 'YANTRA - Yugantar for Advancing New Technology, Research & Acceleration' - by transforming industrial waste into a strategic national resource. Vedanta Aluminium's patent is a testament to Indian industry's capacity for deep-tech innovation, aligned with national missions like Atmanirbhar Bharat, National Critical Minerals Mission, and Net Zero goals.

The patented process is developed by Vedanta Aluminium's in-house Research & Development (R&D)



team in collaboration with the CSIR - Institute of Minerals and Materials Technology (IMMT), Bhubaneswar. It recovers battery-grade graphite from Spent Pot Lining (SPL) and Shot Blast Dust, the two waste streams generated during aluminium production. This innovation not only aligns with India's circular economy and sustainability

priorities but also holds the potential to significantly reduce India's dependence on imported graphite, which currently exceeds 70%. The recovered graphite has demonstrated exceptional electrical conductivity and structural properties suitable for lithium-ion battery applications. Its atomic structure makes it highly effective for lithiation and de-lithiation, processes critical to battery performance.

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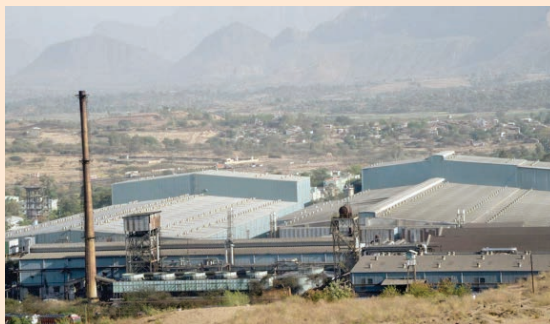
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Packaging

JPFL Films to invest ₹7 billion for setting up of new film lines

JPFL Films Pvt Ltd, a subsidiary of flexible packaging giant Jindal Poly Films Ltd (JPFL), will invest more than ₹7 billion for capacity expansion with new BOPP, PET and CPP lines in Nashik (Maharashtra). The new lines are expected to be commissioned in next 2-3 years' time. This capacity expansion is in addition to its ongoing new BOPP Line (Line 9) which was announced in the month of August, 2024 and is part of the company's strategic play in the flexible packaging segment and in line with the company's aim to increase market share amidst challenging demand-supply imbalances leading to ongoing pricing pressures in the sector. The expansion comes with the YoY growth of around 43 per cent in net revenue from operations in 9 months' period FY 24-25 and to maintain its market leadership despite business headwinds. Flexible packaging, or packaging in general, is regarded as one of the most lucrative industries due to



its wide applicability in the food and beverage, personal care, and pharmaceutical industries.

These new lines will be the most advanced in the market, boasting superior width and output capabilities, along with exceptional reliability, equipment quality, and process efficiency.

Vinod Kumar Gupta, Chief Executive Officer, JPFL Films, said, "With this expansion, we are enhancing our ability to meet and exceed customer expectations with a diverse range of high-performance films with focus of majority of the products made on the line towards sustainability and creation of a greener future. Moreover, this move aligns perfectly with our goals of improving operational efficiency and sets us up well to leverage business upturns as we continue to maintain market leadership. This will further strengthen our capacity to serve our customers with enhanced confidence and commitment."

Policy & Economy

India eyes \$3 trillion industrial opportunity by 2035

India's industrial sector could unlock a \$3 trillion opportunity by 2035, driven by robust manufacturing growth and major infrastructure investments, according to a report by Omniscience Capital. The sector, which currently contributes 27.3 per cent to India's GDP, is projected to exceed a 30 per cent share as the country's GDP expands to a potential \$10 trillion by 2035.

The report marks this as the next major phase of the Amrit Kaal vision, with a focused push toward industrial and services sector development built on strong digital and physical infrastructure foundations. While the past five years saw construction-led growth, manufacturing is expected to dominate the industrial sector by 2035, contributing over 20 per cent to GDP and accounting for two-thirds of the sector's value.

Omniscience Capital emphasised that higher domestic consumption—fuelled by rising per capita income—and India's target of \$1 trillion in merchandise exports by 2030

will be major growth drivers. Achieving this will require a 12 per cent annual growth in exports, up from the current \$450 billion.

Ashwini Shami, EVP and Portfolio Manager, OmniScience Capital, "India is poised to continue emerging as a preferred destination for manufacturing investments due to the availability of raw materials, low labour costs, a favourable corporate tax rate for manufacturing, and proactive government support through incentives. The first two phases of India's transformation through the Amrit Kaal vision focused on building the digital and the physical infrastructure. Phase 1 created a nationwide marketplace with GST, ONDC, UPI, Jan-Dhan accounts, Aadhaar, and affordable telecom. Phase 2, still ongoing, focuses on physical infra through the Gati Shakti initiative to enhance logistics efficiency and future readiness. The third phase of Amrit Kaal will focus on growth of Industrial and Services sectors."

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Warehousing & Logistics

CCI Group invests ₹2.27 billion in Grade-A Gurugram logistics park

CCI Group, India's leading integrated logistics service provider, invests ₹2.27 billion in the development of a Grade-A warehouse facility in Sohan-Silani, Gurugram. Spanning approximately 950,000 square feet, this flagship development is aimed at addressing the growing demand for high-quality industrial and warehousing spaces in the region, while reinforcing CCI Group's position as a key player in India's logistics sector.

Haryana's location along key national trade corridors has positioned it as a critical node in India's logistics network, and the Sohan-Silani site lies just a few kilometers from some of the country's most vital expressways. These include the Delhi-Noida-Direct (DND) Flyway, Mumbai-Delhi Expressway, Kundli-



Manesar-Palwal (KMP) Expressway, Western Peripheral Expressway (WPE), and Kundli-Ghaziabad-Palwal (KGP) Expressway. This connectivity enables seamless access to major consumption centers across Delhi NCR, Gurgaon, Noida, Faridabad, and even parts of Western Uttar Pradesh and Rajasthan.

Leveraging its strategic location, CCI Group's Sohan-Silani logistics park will be serving a diverse range of industries, including e-commerce, retail, FMCG, automotive, manufacturing, and third-party logistics, ensuring faster turnaround times, lower operating costs, and improved last-mile efficiency.

In addition to the core infrastructure, the facility emphasises sustainability and safety in its design and operations.

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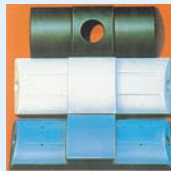
BEML to build rail coach plant in MP

BEML Limited, a public sector firm under the Ministry of Defence, will set up a new manufacturing unit in Umeria, Raipur district, Madhya Pradesh, to produce rolling stock and metro coaches. The state government has allotted 60.063 hectares (about 148 acres) of land for the project, which aims to meet the rising demand in India's rail and urban transit sectors.

The facility supports the 'Make in India' initiative by bolstering domestic production and reducing import dependence. Once operational, it is expected to play a key role in advancing national rail infrastructure.

This announcement follows BEML's recent acquisition of 100 acres in Chhattisgarh's Janjgir-Champa district, where it plans to build a facility for heavy earth-moving machinery. Together, the two developments underscore BEML's strategic expansion in support of India's defence, rail, metro, and construction equipment needs.

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Will Exports Takeoff Amid Turmoil?

India's merchandise exports are navigating a complex global landscape marked by economic and geopolitical turbulence, including trade wars. India needs to take multiple measures to build a resilient, competitive manufacturing sector capable of capturing a larger share of global trade in an uncertain world, says Rakesh Rao.

In the past two years, the Indian manufacturers have witnessed a convergence of disruptive forces impacting their supply chains. A confluence of geopolitical issues, trade policies, environmental factors, and infrastructure challenges has led to significant uncertainty in the supply chain network. "We are witnessing a few key shifts due to recent global events, especially when it comes to supply chains and overall uncertainty. For instance, on the shipping front, the transportation time and cost have gone up, adding another layer of complexity to our planning. Then there is the impact on raw material costs and availability and with disruptions in different parts of the world, material sourcing options have narrowed," says Sanjay Gulati, Manufacturing Head and Whole time Director, Isgec Heavy Engineering Ltd.

From the sales perspective, it feels like the global landscape is shifting. He adds, "We are noticing a

shift towards localisation in many countries where we hoped to expand, like the Middle East and some parts of Southeast Asia. And then there are markets like Russia, that hold a lot of potential, but certain sanctions unfortunately make them difficult for now."

Working in volatility

The Red Sea crisis, triggered by Houthi rebel attacks on commercial



When you look at countries like Vietnam and Thailand, who are ahead of us, it suggests that there is still room to make India better and more attractive for businesses.

Sanjay Gulati, Manufacturing Head and Whole time Director, Isgec Heavy Engineering Ltd

vessels, has severely disrupted global supply chains. To avoid danger, many ships are bypassing the Suez Canal and taking the longer route around Africa's Cape of Good Hope. This detour has resulted in delays and higher shipping and insurance expenses. The impact has been especially pronounced on trade between Asia and Europe, causing inventory restocking delays and driving up business costs. Mukul Goyal, Co-founder, Stratefix Consulting, explains, "The Red Sea Crisis, which escalated in late 2023 and persisted into 2024, stands out as a pivotal event. Geopolitical tensions in this region led to blockades along the Red Sea and Suez Canal-arteries responsible for approximately 15 per cent of global trade-causing shipping delays averaging 10-14 days and rerouting vessels via longer, costlier paths such as the Cape of Good Hope. The International Chamber of Shipping estimated that this crisis alone disrupted \$6 billion in weekly

trade flows, while the United Nations Conference on Trade and Development (UNCTAD) reported a 35 per cent increase in supply chain lead times, severely affecting sectors like automotive and electronics that depend on just-in-time manufacturing.”

Sharing the perspective of the auto components industry, **Vinnie Mehta, Director General of Automotive Component Manufacturers Association of India (ACMA)**, says, “While the first half of FY25 was indeed good with the industry recording 11.3 per cent growth, the second half did not sustain the same momentum, especially in commercial vehicles. Exports too faced headwinds due to geopolitical tensions and logistics disruptions around the Red Sea. Despite these challenges, the industry has performed reasonably well.”



“UNCTAD reported a 35 per cent increase in supply chain lead times (due to the Red Sea Crisis), severely affecting sectors like auto and electronics that depend on just-in-time manufacturing.”

Mukul Goyal, Co-founder, Stratifix Consulting

Beyond the Red Sea, the 2024–25 period has been marked by persistent geopolitical instability, including the ongoing Russia-Ukraine conflict and tensions in the Middle East, which have compounded supply chain unpredictability. “The Russia-Ukraine conflict has significantly reduced the export of essential commodities like grain, fertilisers, and energy products from both countries, leading to shortages and price increases. Sanctions on Russia have complicated logistics and

transportation routes, affecting various industries, including semiconductors, energy and automotive. These disruptions have forced businesses to find alternative sources and adapt to new trade dynamics, further straining global supply chains,” says **Hardik Shah, Director, CareEdge Ratings**.

The 2025 J.S. Held Global Risk Report underscores the growing severity of risks linked to climate change, natural disasters, cyberattacks, and evolving regulations. One notable example is the 2023 drought that affected the Panama Canal, causing major delivery delays and driving up costs for goods transported between the US, Asia, and other global markets. Goyal explains, “Cybersecurity breaches and fraud have also emerged as critical threats, with the interconnectedness of global supply chains making them more susceptible to systemic shocks. Regulatory scrutiny has tightened, especially in the European Union, where new legislation enforces greater transparency and compliance in sourcing and manufacturing practices. These factors collectively underscore the fragility of global supply networks and the urgent need for Indian manufacturers to invest in resilience, digitalisation, and alternative sourcing strategies.”

The recent conflict between India and Pakistan also added to trade and supply chains disruption. “Both countries have imposed mutual restrictions on direct trade, bans on transshipment, port restrictions, and the closure of airspace to each other’s aircraft effectively shutting down vital trade corridors. Geopolitical instability in sensitive areas can disrupt supply chains, affecting both domestic production and international trade. Nations like China, Turkey, Azerbaijan and Iran, which have shown diplomatic and military support for Pakistan, are facing increased scrutiny and

pressure from the international community,” says Shah.

US tariff disruption

In a major policy shift, US President Donald Trump signed executive orders imposing reciprocal tariffs on around 60 countries, disrupting global trade and supply chains. Aimed at correcting trade imbalances, these tariffs have raised the cost of imported goods and strained ties with key trading partners. Several affected nations have responded with retaliatory measures, further complicating global trade dynamics. While the direct impact on India may be limited, the broader indirect effects could be more pronounced, as rising uncertainty and slower global growth weigh on international markets.



“Our Tier 1 suppliers may face less impact due to a 3.75 per cent rebate vehicle manufacturers receive, but Tier 2 and aftermarket players could face challenges.”

Vinnie Mehta, Director General, ACMA

The US government’s imposition of 25% tariff on steel and aluminium and their products, effective March 12, 2025, has put in jeopardy exports of engineering goods from India. “In the first ten months of FY25, engineering exports performed strongly, registering growth close to 8.9 per cent—placing us well on track to meet our internal target of 10 per cent. This growth was driven by broad-based performance across most sectors. Notably, exports of iron and steel products, auto components, industrial and electrical machinery, and pipes all witnessed robust demand. However, in February and March 2025, there was

Table1: India's top merchandise export destinations (2023-24)

Countries	Share in exports
USA	17.90%
UAE	8.23%
Netherlands	5.16%
China	3.85%
Singapore	3.33%
UK	3.00%
Saudi Arabia	2.67%
Bangladesh	2.55%
Germany	2.27%
Italy	2.02%

Source: PIB

a noticeable dip owing to the imposition of new tariffs by the US, particularly on steel and related products. This led to uncertainty in the global market and a slowdown in shipments, ultimately impacting our ability to meet our target of \$ 118 billion. Despite this, the industry achieved a record-high export figure of \$ 116.7 billion, which remains the highest ever recorded,” states **Pankaj Chadha, Chairman, EEPIC India.**

The new US tariff policy poses significant challenges for Indian exporters. “Key sectors like textiles, engineering goods, and electronics will be hit hard, as price-sensitive buyers may switch to domestic or alternate sources. This blanket hike violates the US’ WTO commitments and signals a retreat from rules-based trade, injecting uncertainty into long-term export planning. Adding to the challenge is the unpredictability of future trade actions—President Trump has a track record of abruptly introducing new tariffs. This policy instability discourages new investments and contracts from Indian firms targeting the US market,” observes **Ajay Srivastava, Founder, Global Trade Research Initiative (GTTRI).**

On March 26, 2025, the US announced a 25 per cent tariff on critical imported automobile components—including engines,

transmissions, powertrains, and electrical parts—with enforcement beginning May 3, 2025. Earlier, these parts exported from India were subject to a 2.5 per cent import duty. It is estimated that approximately 65 per cent of India’s auto component exports to the US now fall under this higher tariff bracket.

According to ICRA, revenue growth for the Indian auto component industry—based on a sample of 46 companies accounting for over ₹3 trillion in FY2024 revenues and approximately half of the sector—will moderate to 6–8 per cent in FY2026, down from the earlier estimate of 8–10 per cent. This downward revision is primarily due to an anticipated mid to high single-digit decline in exports to the US, driven by tariff-related pressures. The recent surge in US import tariffs is expected to impose around ₹90 billion in additional costs across the supply chain, which will be borne collectively by US consumers, importers, and Indian exporters.

North America (including the US) is one of the most important markets for Indian auto components industry with annual exports of nearly \$7 billion. “The tariffs on auto components became effective from 3 May 2025. These are a concern, particularly because competitiveness in global trade is a relative issue. While Chinese auto parts also face a 25 per cent tariff under this announcement, they are further impacted by an additional 20 per cent under the IEEPA provisions, totalling 45 per cent. In contrast, Mexico continues to benefit from zero tariffs under the USMCA (US-Mexico-Canada Agreement). Our Tier 1 suppliers may face less impact due to a 3.75 per cent rebate vehicle manufacturers receive, but Tier 2 and aftermarket players could face challenges. It is still early to assess the full impact (as the US tariff regime is at this juncture very fluid). We remain hopeful that the Indian

Government’s negotiations on a bilateral trade agreement (BTA) with the US will yield favourable terms, ideally under a o-for-o tariff model,” says Mehta.

The silver lining

India could see opportunities in the medium term owing to its cost advantage over Chinese components, assuming current tariff levels remain unchanged. Several industry players have noted a recent uptick in inquiries from US importers. “India’s direct export loss from higher tariffs could be limited to around \$ 9-13 billion, which is 0.2-0.3 per cent of its GDP. India’s domestically driven economy may offer some resilience. Additionally, India’s lower reciprocal tariffs could offer a competitive advantage over other Asian exporters. Moreover, services exports are so far not directly impacted by the trade war and should continue to support India’s external sector,” explains Shah.



“While the Indian manufacturing sector faces considerable challenges amid global instability, it also stands at a promising inflexion point.”

Tarun Khulbe, CEO, Jindal Stainless Ltd

With global companies looking to diversify their supply chains away from China, India has the opportunity to emerge as a key alternative. “This shift is expected to boost India’s manufacturing sector significantly. India’s trade policies and agreements with other countries will also play a crucial role. Strengthening ties with countries like the US, Japan, and Australia through initiatives like the QUAD will open new markets and

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opportunities,” explains Shah.

So, will the recent US-China tariff truce (i.e. agreement to drop their punitive tariffs for the next 90 days) hurt India's exports? Srivastava answers, “Yes, the temporary tariff truce between the US and China could blunt some of the gains India was expecting under the China Plus One strategy. Over the past few years, punitive US tariffs on Chinese goods—peaking at 245 per cent and averaging 145 per cent—had severely disrupted US-China trade. In response, China imposed retaliatory tariffs of up to 125 per cent, bringing bilateral trade to a standstill and creating space for alternative suppliers like India. The 90-day US-China agreement to sharply lower these tariffs—with the US cutting rates to 30 per cent and China to 10 per cent—signals a de-escalation and a possible revival of direct US-China trade. This reduces India's short-term advantage in sectors where it had begun to fill the supply gap left by China, such as electronics, chemicals, and machinery.”

However, there is a flip side. He explains, “Stable US-China trade can reduce global supply chain disruptions and bring more predictability to global markets, which benefits Indian exporters indirectly. Additionally, deep-rooted trust issues between Washington and Beijing remain, meaning that India still has an opportunity to emerge as a long-term alternative if it strengthens competitiveness, improves ease of doing business, and leverages FTAs.”

The dumping headache

China is one of the largest low-cost manufacturers globally and has a history of high dumping at times in the global economies including India. The imposition of high reciprocal tariffs by the US China could result in flooding (dumping) of low-cost products in Indian and other export markets,

India's top merchandise export items (FY 2023-24)

Items	Value
Engineering goods	\$109.32 bn
Petroleum products	\$84.14 bn
Gems & jewelry	\$32.71 bn
Organic & inorganic chemicals	\$29.38 bn
Electronic goods	\$29.12 bn
Drugs & pharmaceuticals	\$27.85 bn
Textiles & Garments	\$14.53 bn

Source: NIRYAT, Ministry of Commerce, GOI

negatively impacting certain sectors. Trade with China constitutes more than 40 per cent of India's total trade deficit, and the influx of low-cost, often substandard Chinese products continues to dominate the unorganised retail sector, undermining domestic MSMEs. Goyal says, “Despite anti-dumping duties, issues such as misclassification of imports and lax enforcement persist. The Directorate General of Anti-Dumping has been urged to rationalise duties and align them with current domestic production costs, while the Directorate of Revenue Intelligence faces resource constraints in checking illegal imports and smuggling. The persistence of these challenges not only impacts MSMEs but also distorts the competitive landscape, making it imperative for India to strengthen its anti-dumping frameworks and enhance border surveillance.”

Uncertainties anywhere are not good for business everywhere. India's manufacturing sector too faces several pressing challenges amid global uncertainty that threaten both competitiveness and long-term growth. Tarun Khulbe, CEO, Jindal Stainless Limited (JSL), says, “As the Trump administration has announced 10 per cent blanket tariffs on all countries, this has created a level playing field for India in many

sectors including stainless steel, as India will no longer be at a disadvantage compared to other countries. However, this is a double-edged sword for certain sectors, as countries like China will look to dump material into other countries to make up for the deficit.”

He adds, “In India, this will lead to a surge in low-priced imports, particularly from China and Vietnam, which together account for nearly 70 per cent of India's stainless steel imports as of this moment. Many of these imports are dumped at below-market prices, undermining domestic producers. In some cases, Chinese goods are being rerouted through Vietnam and other ASEAN countries with whom India has free trade agreements to bypass India's protectionist mechanisms. In fact, imports via Vietnam have surged by 176 per cent in FY25 YoY, highlighting how easily trade rules can be circumvented. At a time when global steel and stainless steel markets are already witnessing slow growth, this puts stress on the profitability of manufacturers and limits the sector's ability to reinvest in innovation or scale.”



“While uncertainties remain, we anticipate a modest growth trajectory, with exports of

engineering goods estimated to reach approximately \$ 120 billion in FY26.”

Pankaj Chadha, Chairman, EEPC India

India: A viable alternative to China?

India is a country which has huge potential and despite global headwinds, there are many bright spots for Indian manufacturing.

Gulati opines, “One of the biggest things working in our favor is the growth of the Indian economy itself – being the fastest-growing major economy in the world creates a strong domestic demand. Plus, the government’s push in core sectors like mining, power, petrochemicals, steel, railways, and infrastructure is really laying the groundwork for more industrial activity. We are witnessing the China Plus One strategy play out, which is opening doors for us with companies in the US, Japan, Korea, and Europe, looking for alternative sourcing.”

India has the potential to position itself as a viable alternative to China, but it must address key areas of improvement to fully capitalise on this opportunity. Gulati says, “The ease of doing business is certainly one area that needs to be worked on. As a country, we have made some great strides, improving rankings from 142 to 63 in the last decade. But, when you look



“**India must ensure that any FTA delivers balanced, reciprocal gains. Many deals, including the recent India–UK agreement, reveal an imbalance.**”

Ajay Srivastava, Founder, GTRI

at countries like Vietnam and Thailand, who are ahead of us, it suggests that there is still room to make India better and more attractive for businesses.”

Logistics is another critical factor—shipping costs from India are currently higher than those from China, posing a potential barrier for international buyers.

Despite these headwinds, there’s a silver lining: India is emerging as a trusted, stable manufacturing hub in the global supply chain realignment.

Khulbe says, “As international companies seek to reduce dependence on China, India is gaining traction as an alternative manufacturing base, particularly in electronics, pharmaceuticals, textiles, and speciality chemicals. The Indian government has responded proactively with a suite of incentives. The Production-Linked Incentive (PLI) schemes introduced across 14 strategic sectors offer financial incentives to boost domestic production, attract foreign investment, and spur positive growth for related sectors.”

Potential of India-UK FTA

The India-UK Free Trade Agreement (FTA), signed on May 6, 2025, represents a significant milestone in boosting Indian exports. Srivastava says, “The India-UK FTA offers targeted export gains rather than broad-based benefits. Currently, around 55 per cent of India’s exports to the UK—such as petroleum products and generic pharmaceuticals—already enter duty-free under MFN terms, so they won’t benefit from the agreement. However, the real opportunity lies in labour-intensive sectors like textiles, garments, footwear, and automobiles, which currently face UK tariffs ranging from 4 per cent to 16 per cent. These tariffs will now be phased out or significantly reduced, improving India’s price competitiveness and potentially unlocking billions in new export orders.”

Khulbe comments, “With Brexit altering UK-EU trade dynamics, British buyers are actively diversifying supply chains. An FTA would position India as a preferred, cost-effective alternative to EU-based suppliers and alternatively would also give India inroads into the European market. With improved export prospects, domestic players are likely to invest more in technology and R&D,

China+1: The missed opportunity?

While global buyers are actively seeking to diversify supply chains away from China (a trend accelerated by US-China trade disputes, higher tariffs, and pandemic-induced vulnerabilities) many experts believe that India has not fully capitalised on the China Plus One opportunity. India’s share of global manufacturing relocation remains modest, with ASEAN countries capturing a larger proportion of new investments. According to Goyal, several factors contribute to this underperformance, such as:

- **Policy uncertainty and regulatory complexity:** India’s business environment is often perceived as unpredictable, with frequent policy changes and cumbersome land and labour laws deterring long-term investment.
- **Ease of doing business:** Despite improvements, India still lags competitors like Vietnam, Thailand, and Malaysia in terms of streamlined regulations, lower tariffs, and efficient customs procedures.
- **Infrastructure gaps:** Logistics costs in India remain high (about 14 per cent of GDP), and the lack of world-class industrial clusters, plug-and-play factories, and reliable utilities (power, water, waste management) limits scalability.
- **Skill shortages:** The manufacturing sector faces a significant deficit of skilled labour, with nearly 60 per cent of manufacturers citing talent acquisition and retention as a top challenge.
- **Inconsistent incentive structures:** While schemes like PLI have helped, their reach and implementation vary, and many MSMEs struggle to access benefits.

leading to more innovation and sector. This will lead to a more robust and resilient manufacturing sector that is also future-ready.”

By eliminating tariffs on 90 per cent of tariff lines—including textiles, leather, processed foods, gems, jewellery, and auto parts—the FTA reduces export costs for over 1.7 lakh MSME exporters. Goyal adds, “For instance, textile MSMEs, which account for 25 per cent of India’s \$44 billion textile exports, now gain duty-free access to the UK’s £4 billion market. Additionally, the FTA introduces streamlined customs procedures, digital trade commitments, and social security exemptions for Indian workers in the UK, collectively enhancing competitiveness and profitability.”

However, it is important to acknowledge the asymmetry in gains. Srivastava explains, “The UK government’s own projections suggest that UK exports to India will grow faster than Indian exports to the UK. This is plausible—while UK tariff reductions affect goods already entering at low duties, India is committing to slash high import

tariffs in sensitive sectors like wines, spirits, and automobiles, giving UK firms deeper market access. To fully realise the agreement’s potential, India must support its exporters through better logistics, faster compliance systems, and trade finance, or risk being outpaced by a more prepared UK export push into the Indian market.”

As the negotiations are currently ongoing to finalise details of the deal (such as product quotas, tariff concessions, and product classifications), the India-UK FTA is unlikely to take effect before FY 2026–27, observes Chadha.

Upcoming trade negotiations

To boost exports, India is negotiating preferential trade deals with the US and Europe. While the India-UK FTA maybe not be perfect, it establishes a framework to help promote global integration which is beneficial for the manufacturing sector. But every FTA must be evaluated on its unique strengths and opportunities. “While the India-US deal is a bilateral trade agreement

(BTA) and not a full FTA, the India-UK FTA may serve as a useful framework for talks with the EU. However, each agreement is unique and shaped by the priorities of the counterpart. For instance, the UK has shown particular interest in auto and liquor, whereas the EU has been focused on items like steel, auto components, etc,” says Chadha.



Hardik Shah, Director, CareEdge Ratings

In the ongoing discussion for the FTA, India has flagged EU’s Carbon Border Adjustment Mechanism (CBAM) as a non-tariff barrier. Meanwhile, the EU has extended steel safeguard duty until June 30, 2026 which has a major implication on Indian exports. Chadha says, “These duties, applied beyond certain country-specific quotas, impose a 25 per cent tariff on steel and related products after the quota is exhausted. The safeguard measure affects 28 steel-related items. Since quotas are based on historical trade volumes (set around seven years ago), India’s allocation is limited and gets exhausted on the first day of each quarter in some categories. This restriction significantly limits India’s ability to expand exports to the EU, which constitutes about 19 per cent of India’s total engineering goods exports.”

For India to secure effective and equitable trade agreements with major partners like the EU and the US, it must adopt a calibrated, interest-driven approach. Srivastava explains, “The top priority should be to safeguard sensitive sectors—

The outlier sectors

Despite the challenging global environment, according to Goyal, several Indian industrial sectors are well-positioned to increase their export share as they benefit from strong domestic ecosystems, rising global demand, and favourable policy support. These sectors are:

- **Electronic goods:** Exports have surged, with electrical transformers and components growing from \$1.08 billion in 2014 to \$2.85 billion in 2023. The US remains a key market for smartphones and telecom equipment.
- **Pharmaceuticals and biologicals:** Pharmaceutical exports continue to expand, driven by cost competitiveness and regulatory compliance.
- **Engineering goods:** States like Tamil Nadu, Maharashtra, and Gujarat are leading in engineering exports, supported by robust MSME ecosystems and government incentives.
- **Hand and power tools:** As highlighted by the NITI Aayog’s 2025 report, this sector has the potential to scale exports from \$1 billion to over \$25 billion by 2035, leveraging India’s labour cost advantage and strategic geographic positioning.
- **Agrochemicals and processed foods:** India’s global market share in agrochemicals reached 10.85 per cent in 2023, up from 5.89 per cent in 2014. India’s success in insecticides and processed foods offers further export potential, especially as global buyers diversify sources.

notably agriculture, dairy, and automobiles—which support large sections of the population and are not yet globally competitive. Reckless tariff cuts in these areas could harm livelihoods and derail domestic manufacturing goals.”

The larger issue, according to Srivastava, lies in the broader trade environment and the structural asymmetries in the ongoing bilateral negotiations. “India’s primary concern is to safeguard its sensitive sectors, notably agriculture, automobiles, and pharmaceuticals, which are vulnerable to aggressive US market access demands. The US has also been pressing India to dilute its domestic regulations on intellectual property, data protection, and government procurement—areas where concessions could undermine public interest and policy sovereignty. A major hurdle is the lack of reciprocity. While the US continues to demand tariff cuts and regulatory relaxations, it shows little willingness to offer meaningful concessions in return—especially on visa liberalisation, services trade, or tariff reductions for key Indian exports like textiles, leather, and gems,” he elaborates.

Equally important is resisting pressure to make concessions on non-trade issues, such as government procurement, digital trade rules, and labour or environmental conditionalities, especially when these could hurt MSMEs or limit policy space. Srivastava explains, “India should also firmly protect its intellectual property regime, particularly the flexibilities in patent laws that ensure affordable medicines and technological access. Most critically, India must ensure that any FTA delivers balanced, reciprocal gains. Many deals, including the recent India-UK agreement, reveal an imbalance. Such outcomes must be avoided.”

India will have to adopt a strategic approach that balances economic opportunity with domestic

Risk mitigation strategies

In response to market uncertainty, companies are implementing several strategies to manage and reduce associated risks:

- **Diversifying the supply chain:** Businesses are expanding their supplier networks to avoid dependence on a single source. This involves partnering with multiple suppliers across various regions to minimise the impact of potential disruptions.
- **Increasing inventory levels:** By maintaining higher stock levels, companies create a buffer to sustain operations during supply chain interruptions. Although this approach incurs additional storage costs, it ensures continued production, especially in critical industries.
- **Shifting to local sourcing:** Some organisations are relocating parts of their supply chain closer to manufacturing sites or key markets. This move shortens supply routes, reduces reliance on long-distance logistics, and enhances operational control.
- **Investing in technology:** The adoption of digital tools for supply chain monitoring and management is on the rise. These technologies enable real-time tracking and more accurate forecasting, leading to improved planning and faster responses to potential disruptions.

development priorities. Khulbe says, “As a developing country with its aspirations and goals, mechanisms like the EU’s CBAM, which could unfairly penalise Indian exporters, must be negotiated carefully to allow for equitable climate action. Finally, India should ensure that all trade agreements support its long-term sustainable development goals. This includes demanding fair treatment for developing countries, pushing for climate finance and green technology access, and advocating for the protection of MSMEs and domestic players. This way, India can secure agreements that support its aspirations as both a global economic player and a developing nation.”

Hard reforms for better performance

While experts see a lot of potential for growth in the Indian manufacturing sector by capitalising on domestic demand and the China Plus One, the global environment continues to be challenging. Chadha says, “We are cautiously optimistic. While uncertainties remain, especially around global tariffs and protectionism, we anticipate a modest

growth trajectory, with exports of engineering goods estimated to reach approximately \$ 120 billion in FY26, compared to \$ 116.7 billion in FY25.”

Khulbe adds, “While the Indian manufacturing sector faces considerable challenges amid global instability, it also stands at a promising inflexion point. With continued policy support, strategic investments in infrastructure and technology, and a focus on upskilling the workforce, India has the potential to become a global manufacturing powerhouse.”

In short, India needs to take multiple measures to build a resilient, competitive manufacturing sector capable of capturing a larger share of global trade and driving sustainable economic growth in an uncertain world. Srivastava concludes, “India’s path to becoming a credible alternative to China lies not in policy slogans but in hard reforms—rationalising tariffs, investing in infrastructure, enabling scale, and ensuring regulatory certainty. Only then will India be able to anchor global value chains and attract sustained, high-value investments.”

SME



Why AI Still Needs Humans to Make Machines Smarter

As AI models become more complex, their true potential can only be unlocked through human insight, ethics, and creativity—ensuring decisions are context-aware, fair, and empathetic, writes **Srikumar Kumar, President, GTT Data Solutions Ltd.**



Perhaps the most uniquely human contribution to AI systems is the ability to think laterally, synthesise disparate concepts, and respond with genuine empathy.

AI's journey from theoretical curiosity to transformative force has been marked by remarkable milestones, and yet, its greatest advances are often propelled by a quality no algorithm can replicate: human insight. In *Giant Brains, or Machines That Think* (1949), Edmund Callis Berkeley foresaw thinking machines that would reshape our world; today, AI indeed permeates industries from healthcare to finance, manufacturing to retail. But as models grow increasingly complex, businesses are discovering that purely data-driven decision-making can falter without human context. This article explores why machines need a “human touch” to make smarter, more ethical, and ultimately more valuable decisions, highlighting key principles, real-world implementations, and a roadmap for embedding human judgment at every stage of the AI lifecycle.

The legacy of human-machine synergy

Berkeley presciently noted that “it is often easier for scientists to create a device than to guide it well afterwards” – a warning that resonates strongly today as AI capabilities accelerate. The scale of today's AI landscape is staggering: we generate approximately 2.5

quintillion bytes of data daily, with the global “datasphere” projected to expand from 33 zettabytes in 2018 to 163 zettabytes by 2025. Model complexity has surged in tandem. In 2019, GPT-2 operated with 1.5 billion parameters; by 2020, GPT-3 leapt to 175 billion parameters, requiring over 350 GB of storage, and setting a new bar for foundation models.

Yet despite this growth, purely data-driven approaches reveal inherent limitations. Bias audits show that up to 38.6% of “facts” in major AI knowledge bases can be skewed without human correction. Research on sentiment analysis reveals that elements like sarcasm and irony can halve a model's accuracy, with automated sentiment detection averaging around 60%, far below human performance on nuanced language tasks.

These numbers underscore a critical reality: even state-of-the-art AI struggles with context. Cultural idioms, evolving slang, and subtle emotional cues often elude purely data-driven systems. Given below are three critical dimensions where human insight elevates AI.

1. Contextual understanding and the “semantic gap”

While AI excels at pattern recognition, it often misses the broader context that humans intuitively grasp. Raw data lacks the nuance of lived experience. A sentiment-analysis tool may flag a sarcastic tweet as positive or misread regional expressions without human validation.

In more hazardous environments, AI-powered robots are revolutionising fields like firefighting and disaster relief, venturing into situations too dangerous for humans. Advanced lunar rovers equipped with AI capabilities are even conducting complex scientific analyses on the moon's surface. Yet human experts remain essential for interpreting results within broader scientific contexts and making strategic decisions about next steps.

In manufacturing environments, predictive maintenance algorithms flag potential equipment failures based on sensor data, but experienced engineers



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interpret these alerts within the context of production schedules, supply chain constraints, and safety protocols to determine optimal intervention timing.

2. Ethical oversight and bias mitigation

AI systems trained on historical data inevitably inherit the biases of that data. Human reviewers serve as essential guardrails by auditing decisions, identifying disparate impacts across demographic groups, and adjusting systems to ensure fair outcomes. In finance, AI-driven fraud-detection platforms have cut false positives by 50% and boosted detection rates by 60%, but human investigators remain indispensable for contextual review, balancing efficiency with customer trust.

This human oversight becomes increasingly important as regulatory frameworks evolve.

Perhaps most critically, human oversight addresses the fundamental question of responsibility. As AI applications expand into transportation, healthcare, and other high-stakes domains, the question of accountability becomes central: Who bears responsibility when an AI system causes harm? As legal experts emphasise, AI systems are tools rather than autonomous entities; the responsibility ultimately lies with developers, service providers, and users. This underscores why keeping humans “in the loop” for critical decisions is not merely good practice but an ethical necessity.

3. Creative synthesis and empathetic response

Perhaps the most uniquely human contribution to AI systems is the ability to think laterally, synthesise disparate concepts, and respond with genuine empathy. While generative AI can produce competent marketing copy or customer service responses, human writers infuse content with emotional resonance and brand authenticity.

Etsy’s “algorithmic curation” exemplifies this blend of algorithmic recommendations with human expertise to create collections that reflect both data patterns and cultural sensibilities. In customer experience applications, AI-powered chatbots efficiently handle routine inquiries, but complex or emotionally charged situations benefit immensely from human engagement, resulting in higher customer satisfaction and resolution rates.

Building effective human-AI partnerships

Organisations seeking to maximise the value of their AI investments should consider these best practices for human-machine collaboration:

- **Design for collaboration from the start:** Rather than treating human oversight as an afterthought, involve domain experts and end users early in the

development process through co-creation workshops and iterative prototyping.

- **Prioritise transparency:** Implement explainable AI tools that assign value to illustrate each feature’s impact on a prediction, enabling human reviewers to validate whether algorithmic reasoning aligns with domain expertise.
- **Establish robust governance:** Cross-functional oversight teams, including legal, compliance, and diverse stakeholder representation, should guide AI deployments to ensure alignment with organisational values and regulatory requirements.
- **Invest in AI literacy:** Employees working alongside AI systems need a sufficient understanding of how these tools work, their capabilities, and their limitations to provide meaningful oversight. Corporate programs, such as the ADR Association’s AI literacy initiatives, foster a new problem-solving mindset, teaching employees how models work and where human judgment is critical.
- **Build multidisciplinary teams:** Blend data scientists, domain experts, psychologists, and UX designers to foster trust, creativity, and high-performing human-AI collaborations.
- **Track collaborative performance:** Go beyond accuracy, monitor KPIs such as resolution time, user satisfaction, and fairness metrics to evaluate the effectiveness of human-machine synergy.
- **Promote a feedback-first culture:** Encourage leadership to model openness to human input on AI outputs, enabling a continuous improvement loop where both technology and human judgment evolve together.

Conclusion

AI’s transformative potential is undeniable, yet it remains, at its core, a set of tools. It is indeed clear that even the most intelligent machines still rely on the nuance, ethical compass, and creativity that only humans can provide. By embedding human oversight, fostering transparency, and investing in people alongside technology, organisations can unlock smarter, fairer, and more resilient AI, ensuring that the promise of “thinking machines” fulfils Berkeley’s vision without losing the human touch.

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About the author:

Srikumar Kumar is President of GTT Data Solutions Ltd and a noted expert in data governance and master data management. With over 23 years of global experience across India, Singapore, and the UK, he has helped leading firms harness the power of data to drive smarter business decisions.

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"Auto components industry expects 8-10% growth."

In 2023-24, Indian auto component industry reported a turnover of Rs 6.14 trillion (\$ 74.1 billion) – a growth of 9.8 per cent over FY23 – with exports accounting for \$ 21.2 billion. While FY25 started on a strong footing, in the second half of FY25 the industry faced headwinds due to multiple factors. In this interaction with Rakesh Rao, **Vinnie Mehta, Director General of Automotive Component Manufacturers Association of India (ACMA)**, presents his views on the industry performance and impact of recent global events on Indian manufacturing sector.

How has the Indian auto component industry performed in FY 2024-25?

The Indian auto component industry has demonstrated resilience despite a challenging year. While some vehicle segments such as passenger and commercial vehicles experienced subdued sales, the two-wheeler and tractor segments performed reasonably well. Based on preliminary assessments, we expect industry growth to be around 8-10 per cent in FY25. Final numbers are yet to be compiled.

The industry recorded 11.3 per cent growth in H1 FY25. Could you comment on that?

Yes, the first half was indeed strong, supported by seasonal factors including the festive season. However, the second half did not sustain the same momentum, especially in commercial vehicles. Exports too faced headwinds due to geopolitical tensions and logistics disruptions around the Red Sea. Despite these challenges, the industry has performed reasonably well.

What impact has the recent US tariff of 25 per cent on auto parts had on the Indian auto component industry?

The tariffs on auto components became effective from 3 May 2025. These are a concern, particularly because competitiveness in global trade is a relative issue. While Chinese auto parts also face a 25 per cent tariff under this announcement, they are further impacted by an additional 20 per cent under the IEEPA provisions, totalling 45 per cent. In contrast, Mexico continues to benefit from zero tariffs under the USMCA (US-Mexico-Canada Agreement).



Vinnie Mehta,
Director General, ACMA

Our Tier 1 suppliers may face less impact due to a 3.75 per cent rebate vehicle manufacturers receive, but Tier 2 and aftermarket players could face challenges. It is still early to assess the full impact (as the US tariff regime is at this juncture very fluid). We remain hopeful that the Indian Government's negotiations on a bilateral trade agreement (BTA) with the US will yield favourable terms, ideally under a o-for-o tariff model.

India exported \$6.79 billion worth of auto components to the US in the last fiscal.

How important is the North American market?

North America, including the US, is a very significant market for us. We export nearly \$7 billion worth of auto components to North America and a similar value to Europe. These are our two most important export regions.

What is your view on the recently concluded India-UK FTA? How will it impact the auto component industry?

We, at ACMA, support FTAs, including those with the UK, EU, and the US. The India-UK FTA is a step in the right direction. Tariffs on Indian exports to the UK currently range from 0-4 per cent, whereas imports into India from the UK face tariffs of 5 per cent, 7.5 per cent, 10 per cent, or 15 per cent. Under the FTA, some of these tariffs will be phased out, giving UK companies better access to the Indian market.

However, we see this FTA more as a platform for technology access and investment than a direct export benefit, since UK tariffs were already relatively low.

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So, the FTA offers the UK greater market access to India than vice versa?

From a purely tariff perspective, yes. But there are other dimensions to FTAs. The FTA can encourage UK companies to invest in India, promote joint ventures, and provide access to advanced technologies.

Can the India-UK FTA serve as a basis for a future agreement with the EU?

Not directly. The UK does not have a very strong auto component base, unlike the EU—particularly Eastern European countries such as Poland, Hungary, and the Czech Republic—which are integral to the German automotive supply chain. Therefore, each FTA must be evaluated on its unique strengths and opportunities. However, establishing such frameworks helps promote global integration and is beneficial for the automotive value chain.

What are the key challenges before Indian auto component industry at present?

Global trade dynamics pose multiple challenges. These include high raw material costs, limited access to rare earth materials, and concerns about dumping of low-cost components from countries like China. Companies must critically analyse their supply chains and address vulnerabilities to remain competitive.



Our Tier 1 suppliers may face less impact due to a 3.75 per cent rebate vehicle manufacturers receive, but Tier 2 and aftermarket players could face challenges. It is still early to assess the full impact.

How dependent is the industry on China for raw materials or components?

In FY24, China accounted for approximately 30 per cent of India's total auto component imports, valued at \$20.9 billion. This is driven by China's immense manufacturing scale and cost competitiveness. However, studies show that within comparable production setups, Indian auto component manufacturing is equally competitive, if not better. Our challenge is scale.

Do you see a risk of dumping from China due to the US-China trade conflict?

The Government of India is alert to this risk.

Customs authorities have been advised to monitor imports, and the Commerce Ministry has urged industry bodies to report unusual surges. So far, there is no evidence of dumping in the auto component sector. India has historically been proactive in imposing safeguard and anti-dumping duties where necessary.



Global trade dynamics pose multiple challenges such as high raw material costs, limited access to rare earth materials, and concerns about dumping of low-cost components from countries like China.

Are the Government's Quality Control Orders (QCOs) causing concerns for the industry?

QCOs are not unjustified; many countries use non-tariff barriers. However, the industry must be given sufficient time to adapt. In several cases, the Government has agreed to defer QCO implementation to allow for localisation or development of alternative sources. The intent is to improve quality, and the industry and the Government must work closely to ensure smooth transitions.

What strategies do you recommend to enhance India's manufacturing competitiveness?

The cost of capital remains a major constraint. While companies in competing countries can borrow at 0–5 per cent, Indian firms pay 8–10 per cent, with SMEs facing even higher rates or no access at all. This restricts investments in R&D and innovation, which are critical for future competitiveness—especially with the global transition towards sustainable mobility and new powertrains.

India must create an ecosystem that encourages investment in R&D and skilling. Our competitiveness will increasingly depend on our ability to develop and deploy cutting-edge technologies. If we do not prioritise innovation now, we risk falling behind.

Overall, the Indian auto component industry is resilient, adaptive, and globally competitive. With appropriate policy support, strategic investments, and global partnerships, it has the potential to become a dominant player in global automotive supply chains.

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Engineering Sustainable Materials with Simulation

Turning the tide on emissions must begin with the materials that we choose. Simulation and materials intelligence allow engineers to ensure sustainability early in the product lifecycle. This approach prevents costly rework and compliance failures later while accelerating innovation, says **Vinay Carpenter, Manager Professional Services, Ansys India**.



In today's era, which is resource-constrained and regulation-driven, climate anxiety is increasingly visible in policymaking and customer choices. The call for sustainable development is becoming stronger, louder, and more crucial than ever before. Both global and Indian industries are under double pressure – achieving economic growth and curtailing environmental harm. With consumer preferences shifting toward eco-friendly products, industries are pressured to reduce their carbon footprints quickly. Therefore, it is imperative to reimagine materials; the onus is now on engineering and material innovation.

The global and Indian sustainability scenario

Much of the world is speaking the same language regarding sustainability - it has become a non-negotiable agenda for consumers, governments, and businesses. Countries are adopting green technologies and promoting the circular economy while working toward net-zero commitments. The transition to a greener economy is also driven by international accords such as the Paris Agreement, net-zero obligations, and increasing ESG (Environmental, Social, and Governance) mandates. The European Green Deal and Japan's Green Growth

Strategy are examples of significant policy shifts worldwide.

India is also aligning quickly with these trends. As one of the signatories to the Paris Climate Accord, the country aims to achieve net-zero carbon emissions by 2070. There is a ramp-up of efforts to boost renewable energy, electric mobility, and sustainable manufacturing in India. Be it the Indian government's initiatives, including 'Make in India', 'Zero Effect Zero Defect', or the more recent push for a circular economy, they are pushing manufacturers to incorporate sustainable practices right from the design stage.

Nevertheless, notwithstanding the aspiring goals, some businesses struggle with the actual execution of sustainability strategies. Many challenges persist.

The current sustainability focus and business challenges involved

The current sustainability focus areas are:

- Selection of materials in early design: Embedding sustainability from the earliest stages of product development can reduce redesign and cost overruns.
- Reducing the environmental footprint through lifecycle thinking involves assessing environmental impact from cradle to grave and shifting toward materials with lower carbon impact, recyclability, and non-toxicity.
- Material circularity: Endorsing reuse, recycling, and designing for disassembly to support a circular economy.
- Data-driven decision making: Material Intelligence can help engineers and designers make informed and more sustainable material choices.
- Industry-specific sustainability goals: Industries are now focusing on applications that deliver on performance, cost, and sustainability – be it lightweighting in automotive or sustainable packaging in FMCG.

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- Regulatory compliance/ risk mitigation: Avoiding hazardous substances and ensuring tightening environmental regulations like REACH, RoHS, EPR, etc., is also necessary.

The sustainability challenge for organisations lies in balancing these competing priorities. Material decisions are regularly made at the beginning of the design process. At that stage, access to data is limited, and design teams may also be unable to analyse trade-offs efficiently.

Here are some key business challenges that are stumbled upon:

- Lack of awareness: Many engineers are still unaware of the tools and methods to assess the impact of their material decisions on environmental performance.
- Siloed data: Disparate material data across departments means suboptimal, non-collaborative decision-making.
- Low adoption of early sustainability assessment tools: Modern tools allow environmental impact assessments during design stage and avoid sustainability risks later in the product's life cycle. The industry adoption of such tools is still nascent.
- Compromises between cost, performance, and sustainability: Balancing technical and economic feasibility with environmental goals is multifaceted and requires specialized tools.
- Integration issues with current CAD/CAE/PLM workflows: There is a lack of seamless integration, pushing sustainability assessments to later in product development, causing revisions and delays.
- Compliance and traceability: Without a proper traceability mechanism, it is nearly impossible to attribute a product problem to the source of the issue, which may involve materials, product design, or manufacturing.
- Data gaps: In-house materials data is often insufficient for product development. High-quality reference data is crucial to maintain product development timelines and cost targets.

This is where simulation and material intelligence tools offer transformative value.

Achieving sustainability goals through simulation and material intelligence

Embedding sustainability at the design stage using simulation tools empowered by material intelligence is the solution to many of these challenges. Simulation tools can help companies choose safer materials, assess environmental impact, reduce material waste, and develop products that meet performance requirements—

all this while aligning with environmental standards.

Simulation and materials intelligence allow engineers to ensure sustainability early in the product lifecycle. This approach prevents costly rework and compliance failures later while accelerating innovation. Materials intelligence solutions empower engineering teams to:

- Execute what-if analyses to gauge the impact of materials, processes, mass, etc.
- Seamlessly integrate with CAD, CAE, and PLM systems.
- Measure environmental footprints from cradle to gate during the design phase itself.
- Deploy modern tools and data that combine technical, economic, and sustainability aspects in materials selection.
- Ensure traceability and consistency through a centralized, unified data and digital thread of materials information.
- Generate and maintain an approved materials list aligned with overall sustainability objectives.

These benefits are game-changing for the automotive, electronics, aerospace, consumer goods, and packaging industries.



Industries are now focusing on applications that deliver on performance, cost, and sustainability – be it lightweighting in automotive or sustainable packaging in FMCG.

Sustainable materials: Applications across industries

Simulation for sustainability spreads across a wide variety of use cases. Here are some key applications of materials intelligence simulations in designing safer and sustainable products:

Packaging: Packaging is a significant contributor to waste and pollution. With simulation, manufacturers can select materials that reduce environmental impact without impacting durability or cost. Identification of biodegradable and recyclable materials that retain structural integrity, barrier properties, and shelf-life characteristics is possible with simulation. What-if studies help identify combinations that reduce packaging weight and carbon footprint. They also allow for the analysis of degradation patterns under real-world conditions.



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Businesses benefit from better alignment between product engineering and corporate sustainability goals.

Lightweighting: This is particularly pertinent for the automotive and aerospace industries. Lightweighting helps reduce fuel consumption and emissions by reducing material weight without any impact on strength and durability. Material intelligence enables precise selection and validation of lightweight composites and alloys. Material intelligence and simulations allow engineers to lightweight their designs, compare materials and processes, balancing cost, strength-to-weight ratios, and environmental metrics.

Durable design: Extending the lifecycle of products is key to sustainability as it cuts the need for recurrent replacements and conserves resources. Simulation tools can predict how products respond to fatigue, stress, and wear. This helps engineers improve durability and decrease the need for repeated replacements. Designers can thus assess materials with longer service life, resistance to wear and tear, and lower the total environmental cost.

Material circularity: Circular economy products are designed to be easily disassembled, reused, and recycled. Simulating material behavior over many lifecycles allows engineers to design for circularity. There is less dependence on virgin resources. Engineers can therefore gauge recycled content and downstream recyclability, compare trade-offs of virgin vs. recycled materials, design for remanufacturing, and simulate multi-life cycles to gauge cost and environmental benefits.

Removal of harmful substances: Government regulations push companies to eradicate toxic materials. Material intelligence helps in finding safer alternatives that conform to environmental standards. Engineers can analyze how these alternative materials affect product

performance and durability with simulation.

Environment friendly material substitution:

Another key aspect of sustainability is sourcing bio-based, biodegradable, or low-carbon materials. Simulation tools deliver data-driven recommendations for substituting conventional materials with better and greener alternatives that are on par in terms of performance, cost, and sustainability metrics.

Material circularity is supported by key capabilities like:

- **BoM analyser for energy and CO₂ footprint:** This enables engineers to evaluate the full bill of materials (BoM) against sustainability criteria like recyclability rate, end-of-life recoverability, presence of hazardous substances, and potential for reuse
- **Material substitution & what-if analysis:** This allows teams to simulate the environmental and performance impact of replacing virgin or toxic materials with recycled or biodegradable alternatives and materials that enable better end-of-life processing (e.g., easier disassembly)
- **Environmental footprint data access** that allows engineers to draw on an extensive material database with circularity and environmental impact indicators, and the integration of in-house and reference datasets for full traceability
- **Preferred material lists** that help standardise environmentally safer and circular materials across the enterprise, reducing variability and increasing compliance with corporate sustainability policies.

Reducing toxicity is also a part of circularity.

Materials that are easy to recycle/reuse are often also free from persistent toxic chemicals and compliant with global regulations, including India's EPR rules. Material intelligence can screen materials early in the design phase to avoid problematic substances, validating alternatives that meet both performance and circularity needs. It guarantees that end-of-life pathways don't pose any environmental risks.

From theory to industry

The 'take-make-dispose' industrial model leads to resource depletion, landfill overflow, and pollution—it is unsustainable. The circular economy focuses on reducing waste and broadening product life cycles. At the heart of this shift is life-cycle thinking.

One example of this can be found in an industrial case study involving recycling discarded toothbrushes. Toothbrushes are typically composed of multiple polymers and pose a challenge for end-of-life management. Rather than relegating them to landfills or incinerators, the materials were reclaimed through

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This process enables to deburr components in a validatable process and is almost independent of the material. Even hidden edges and internal burrs can be deburred in this way. Some sample application pictures is shown.



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shredding and co-injection molding with linear low-density polyethylene (LLDPE), creating a new polymeric multi-material with distinct properties. This multi-material underwent rigorous characterization, including testing properties such as density, yield strength, ultimate tensile strength, Young's modulus, and tan delta. The results showed that the recycled composite was less dense but stiffer and stronger than virgin PE-LLD, the additive polymer. This promising performance allowed researchers to explore new applications using Ashby material property charts.

A systematic comparison against thousands of materials revealed that recycled material could substitute PE-LD, PVC, and even natural materials like leather. Proposed second-life applications included cable coverings, containers, and shoe components. This shows the commercial viability and added value of waste recovery efforts.

Implementation of circular models is intricate. Recycled materials often have unpredictable properties due to contamination/degradation during use and processing. Manufacturers are then cautious about using them in place of other virgin materials. Data tools can help bridge this gap by offering confidence in material performance and guiding substitution decisions.

Simulation supports this by providing indicators on recyclability, biodegradability, and environmental persistence, offering data on secondary processes, like remanufacturing, reshaping, and downcycling, and enabling users to visualize the impact of changes to materials, suppliers, and processes in a closed-loop model.

Companies focusing on circular design can reduce material costs and emissions, improve brand reputation, and maintain regulatory compliance.

Best practices for sustainability

To get the most out of material intelligence tools, companies can embrace certain best practices:

- Accurate Multiphysics simulation to improve the fidelity of complex simulations with enhanced data for thermoelectrics, alloys, polymers, and electromagnetics.
- Seamless Integration and direct access to preferred materials lists from CAD/PLM tools will increase design efficiency.
- Digital thread enablement and integration across design and manufacturing workflows ensures that materials decisions are carried forward consistently, thus reducing rework and compliance risks.
- Maintain a centralised repository of materials enriched with sustainability metrics and ensure data traceability through a single source of truth

for better materials management.

- Conceptual design to evaluate sustainability indicators right at the start of product ideation and use simulation to test material and process combinations quickly.
- Detailed design to assess BoMs at component and system levels and pre-approved materials lists to ensure alignment with sustainability goals.
- Automate the generation of sustainability reports and track progress toward internal goals and external requirements for reporting and compliance.

Future prospects and way forward

A business' choice of materials is not just a technical or cost consideration but a strategic one. With the struggle to meet stricter regulatory standards and deliver on ESG commitments, access to accurate, high-quality material data is the key. With the move towards a future shaped by climate goals, circular economy principles, and growing customer expectations, material intelligence will play a huge role in product design. Simulation-led decisions are no longer optional, but are essential.

Soon, the integration of AI and machine learning will enable predictive sustainability assessments and faster innovation cycles. Cloud-based collaboration also ensures that sustainable design is scalable across teams worldwide. Businesses benefit from better alignment between product engineering and corporate sustainability goals. Cross-functional partnership and implementing sustainability metrics into KPIs also ensure that environmental responsibility is a shared priority.

Conclusion

Turning the tide on emissions must begin with the materials that we choose. Simulation and material intelligence allow engineers to create safer materials and rethink traditional design paradigms to develop innovative and responsible products.

Simulation's wide-ranging suite of tools and data allows industries to make better, safer, and greener decisions right from the initial design stages. The future of engineering is sustainable, and it has to start with better and informed material choices.

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About the author:

Vinay Carpenter is Manager Professional Services at Ansys India. With close to 20 years of experience in nonlinear FEM, he has done significant work in the field of material modeling of high temperature alloys, elastomers and bio-materials. He is also an expert in enterprise-wide digitalization of materials information and using the same for accelerating

product engineering.



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Enhancing Safety in High-Risk Industries

Similarly, it is crucial to invest in the training of the workforce and safety awareness. Safety must commence on the first day of employment, irrespective of the type of job or contract, remarks **Suresh Tanwar, Senior Head- Audit and Consultancy, British Safety Council, India.**

India's aspirations to become a global manufacturing hub have quickly become a reality. With the support of policies like the Production Linked Incentive (PLI) scheme and Make in India, manufacturing investments are rising in the Country. The Economic Survey 2023 supports India as a large and growing economy, the fastest in the world. While India builds new factories, increases industrial production, and becomes part of global supply chains, it cannot ignore one crucial pillar: occupational safety.

Even with impressive economic growth, India's workplace safety record is a cause for serious concern. Each day, an average of three workers lose their lives and about 11 are injured in registered factories, says official data by the Directorate General Factory Advice Service and Labour Institutes (DGFASLI). Between 2018 and 2020 alone, 3,331 people were killed. These statistics

refer only to the formal sector, with millions of laborers working under unsafe conditions in an enormous informal economy left out of the count. In actuality, the extent of accidents and deaths might be much larger.

The current occupational health and safety (OHS) system does not cover about 80 per cent of India's working population. This excludes the majority of workers, largely contract laborers, daily wage earners, and those in unregistered units, from the ambit of any organised safety net. Compared to nations such as the United Kingdom, in which employers have a legal mandate to perform safety risk assessments and in which on-the-job deaths are uncommon, India's safety measures are outdated, weakly enforced, and abysmally inadequate. Estimates indicate that workplace deaths in India could be 20 times greater than in the UK and that there are about 48,000 on-the-job deaths every year.

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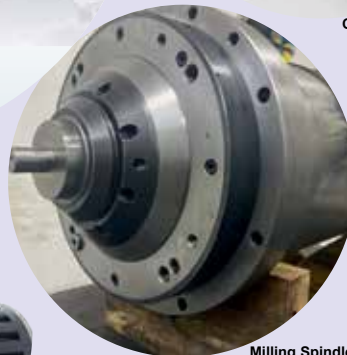
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By their very nature, high-risk sectors include perilous activities and sophisticated equipment. In industries such as construction and mining, employees are regularly exposed to hazards such as falls, electrocution, machinery failure, toxic chemical exposure, and building collapses. In heavy industry and the automotive sector, hazards are crush injuries, burns, repetitive strain injuries, and respiratory disease due to long-term exposure to dust and fumes. Too often, safety failures are not because these hazards are not recognised, but because fundamental procedures are disregarded or poorly executed.

A wake-up call report by an NGO that researched the Indian auto industry provides insights into just how deep-seated the issue is. Most injured workers were untrained assistants, hired without documentation or technical expertise. Almost half admitted to working 12 hours a day frequently without overtime pay. They had no access to fundamental safety equipment, such as gloves, helmets, or goggles. Under such conditions, fatigue, illiteracy, and inadequate supervision become dangerous. A single error or equipment failure is enough to ignite life-altering injuries or worse.

The reach of workplace accidents goes far beyond the accident itself. For corporations, these happenings interrupt production, lower output, raise insurance and legal expenditures, and sully the brand name. For workers and their dependents, the stakes are far worse. A serious injury can lead to permanent disability and loss of livelihood. In most instances, workers have no insurance, compensation, or other means to sustain their families. Not only does this lead to individual misery, but it creates cycles of poverty, particularly among those who are already economically disadvantaged.

And yet, occupational safety is not merely a matter of law, it is a business necessity. Many industry-based studies have established that organisations that emphasise safety generally perform better. A safe working environment discourages absenteeism, improves employee morale, and promotes operational effectiveness. Employees who feel safeguarded and respected are more likely to be productive, loyal, and committed. In addition, with Environmental, Social, and Governance (ESG) considerations taking center stage in investment decisions across the world, firms that neglect labor safety can risk being left out of profitable international collaborations.

Enhancing occupational safety standards in India, especially in high-risk industries, calls for systemic change, cultural transformation, and persistent effort at all levels. The point of departure has to be more effective legislation and strict enforcement. India's Occupational Safety, Health and Working Conditions Code (OSH Code), which has been around for a long time, is a

welcome move. However, its implementation is weak and sporadic across the industry and states. There needs to be a strong push to extend it to the unorganised sector so that even contract and informal workers are covered under legal safeguards. Punishment for non-compliance has to be strict enough to act as a real deterrent.

Similarly, it is crucial to invest in the training of the workforce and safety awareness. Safety must commence on the first day of employment, irrespective of the type of job or contract. The workers must have proper induction training sessions in areas of workplace risks, emergencies, protective equipment, and legal rights. Certifications related to industry-specific risky tasks—e.g., welding, scaffolding, handling chemicals, or crane operation—must be obligatory. Periodic refresher training should also be scheduled to update knowledge of safety.



Enhancing occupational safety standards in India, especially in high-risk industries, calls for systemic change, cultural transformation, and persistent effort at all levels.

However, safety is not just a function of technical knowledge. It has to be part of the organisational culture. Senior leadership is important in terms of pushing this change through. When CEOs and plant heads approach safety as a strategic priority, versus a box to be ticked, the message sticks with the workforce. Recurring safety briefings, transparent accident or near-miss reporting lines, and safety committees composed of workers can all contribute to a shared responsibility culture. When workers are psychologically safe to report risks or decline risky work, it produces improved safety outcomes.

Establishing psychological safety where workers feel respected, heard, and shielded from retaliation is as critical as physical safety. Employees need to believe that their concerns will be heard, not ignored. Firms should foster open communication about hazards, permit anonymous reporting of unsafe conditions, and honor safety gains as team successes. Reward programs that recognise departments or shifts for safe periods can create healthy competition and consciousness.

Technology can also greatly enhance workplace safety. Intelligent manufacturing equipment, AI-based

predictive maintenance, real-time monitoring equipment, and wearable safety equipment are already showing the difference in next-generation factories. For example, helmets equipped with IoT can send signals to supervisors if an employee goes into a prohibited area or experiences a fall. AI platforms can process machine data to foresee equipment failures and reduce unplanned downtime and accidents. Though the initial investment could be high, such technologies save costs in the long run by reducing accidents and enhancing productivity.

Industry associations and public-private partnerships may also have an important role. By cooperating on safety standards, collaborating on research into workplace hazards, and sharing best practices, stakeholders can go more quickly and easily. For instance, industry-wide joint training, benchmark studies, and safety audits can assist in leveling the playing field and raising overall standards. The government can help make this possible by providing grants, incentives, and awards for safety excellence.

India has many success stories of companies integrating safety into their operations. Some automakers have achieved zero-accident records through automation, training, and enforcement. In sectors like oil

and gas, multinationals have introduced global safety standards that local partners now follow. These examples prove that with vision, discipline, and leadership, safety is achievable.

As India advances its manufacturing ambitions, it must remember that its greatest asset is its people. The industry's future rests on the well-being and commitment of millions of workers. Without ensuring their safety, industrial growth remains unstable. But with it, India can become a global manufacturing hub rooted in ethical and inclusive development.

Ultimately, it's not just about reducing accidents. It's about protecting lives, upholding dignity, and ensuring that progress doesn't come at the cost of human lives.

SME

**About the author:**

Suresh Tanwar is the Senior Head of Audit and Consultancy at British Safety Council, India. He is a seasoned safety professional and strategist with decades of experience in Safety, Health, and Environment (SH&E). An active member of the CII National Safety Task Force Committee, Tanwar has played a significant role in shaping safety policies and

best practices.

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Best Practice in Low-emission Brake Disk Production

Eurozone's decision to equip new car models with low-emission braking systems from next year represents a technological leap for the manufacturing industry.



EMAG's ELC 450 DUO LMD with two process modules enables increased productivity in the hard coating of brake disks.

In order to significantly reduce particulate matter pollution in the Eurozone's transport sector, new car models are to be equipped with low-emission braking systems from next year. For the manufacturing industry, this represents a technological leap that could only be achieved thanks to innovative materials and processes, new types of tools and machines and digital networking in production. This may ultimately benefit everyone, not just environmental and health protection through fewer fine dust particles in the atmosphere. The hard-coated brake disk favored by European manufacturers is also more effective, corrosion-resistant and lasts the life of the car. This is why it was previously reserved for the luxury car segment.

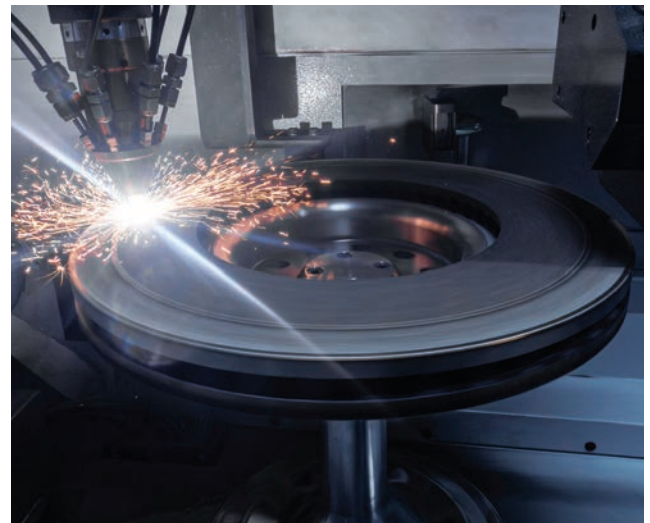
The first production lines for the new brake disks are currently being set up in the automotive industry. In the case of hard-coated brake disks, this means that turned cast brake disks are processed by laser deposition welding or gas dynamic cold spray and subsequent double-sided surface grinding. While the first part of the process chain can still build on tried-and-tested methods, laser deposition welding with the subsequent grinding process differs significantly from previous methods.

Almost as hard as diamond

Modern carbides embedded in a metal matrix, which almost reach the hardness of diamonds, are decisive for this. The Fraunhofer Institute for Ceramic Technologies and Systems (IKTS) in Dresden explains how they are processed. Accordingly, the carbide metal powder is mixed using a customized powder nozzle system and applied to the rotating brake disk using a laser. Decisive cost advantages result from the process, the powder materials used and the low layer thicknesses that can be achieved, explains René Bischoff, Head of Development at IKTS's technology partner C4 Laser Technology, which is also based in Dresden. In other words, a very thin layer can be applied by laser, which is extremely hard. This saves material and is considered extremely resource-efficient. However, the final grinding process is a major challenge.

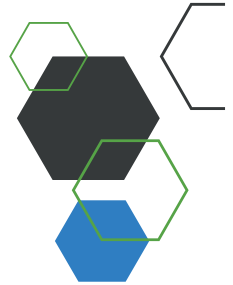
High demands on tools and machines

The challenge became clear at the latest when the first newly coated brake disks were received by the grinding machine manufacturers for test trials: During the first tests, the grinding disks literally "tore apart" in



Laser deposition welding is used to apply a hard coating that protects brake disks from corrosion and wear.

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the machine, it is said. This is because the previously completely unknown material mix of the top layer proved to be quite unimpressed by contact with the abrasive. The good news: The brake disk did what it was supposed to do. It developed a high braking effect without emitting fine dust particles.

"There's nothing worse than not knowing exactly what needs to be ground," emphasizes Mario Preis, Head of Technology & Corporate Development at DVS Technology Group, Dietzenbach (Hesse). As the various subsidiaries of the DVS Group, which specializes in surface processing, have specialists and suitable machine tools for each process step, this was followed by an intensive, cross-technology exchange. The aim was to develop a common understanding of the process and to find out which combination of coating, grinding wheel and motor spindle power would work best to achieve the desired geometry and surface properties of the brake disks.

Documentation for a safety-critical component

The development and careful coordination along the process chain was not made any easier by the fact that there are also different variants and manufacturers of the new coating. In addition: "Even in the early stages of development, our customers wanted everything documented," reports Mario Preis. After all, the brake disk is a safety-critical component for occupant and personal protection, which is subject to high quality standards. What's more, every vehicle manufacturer follows its own philosophy and has clear ideas about how the brake disk should look and how the vehicle should feel when braking. Preis is convinced that without digitalized process chains, it will hardly be possible to implement individual product specifications and changes as well as the constantly increasing documentation requirements economically. This is particularly true with regard to the EU CSRD (Corporate Sustainability Reporting Directive) on comprehensive sustainability reporting.

More flexibility thanks to digital networking

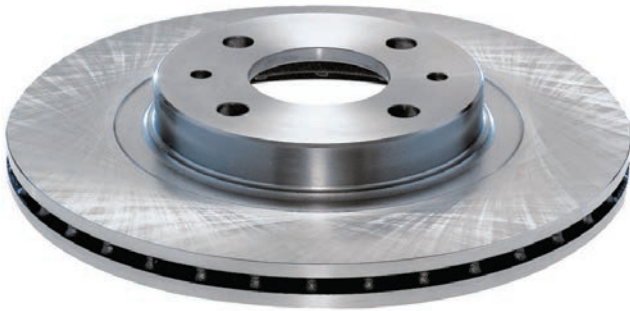
"Machine manufacturers are ahead of the game when it comes to digitalization," says Irina Eisele, Lead IoT Product Development at the EMAG Group, a machine tool manufacturer based in Salach (Baden-Württemberg). Many machine tools are already equipped with extensive sensor and monitoring systems ex works. At the most recent grinding conference in Stuttgart-Fellbach, Eisele spoke about digital networking along the process chain using the example of hard-coated brake disks. The IoT (Internet of Things) specialist presented a



DVS Technology's UGrind 800DD V4 - the new generation of brake disc grinding machine with two workpiece and tool spindles for higher speed and precision.

holistic approach to workpiece-related recording and archiving of process data from various production steps and technologies. Whether production parameters such as laser power and powder feed rate, sensor data such as layer thicknesses and component geometry or process data such as grinding machine wear per workpiece - "Data forms the basis for being able to optimize tools and process parameters in a targeted manner," says Eisele.

Machine manufacturers support customers with hardware and software for data transfer and documentation. With the help of an industrial PC, machine controls and sensors are connected to the company network via suitable interfaces. The software collects the data, assigns it and analyzes it. Workpiece-



Coated and ground brake disks are a key component in meeting the Euro 7 standard.

specific data can be recorded or visualized for documentation purposes, for example to compare good and bad parts. "The clear added value for the user results from transparency," emphasises Irina Eisele. The system view facilitates quality assurance and traceability. This is an invaluable advantage, especially for safety-critical components such as brake disks, where the processing history must be meticulously documented.

AI and Digitalization Area at EMO Hanover

The immense advantages of digital process chains inspire machine manufacturers and scientific institutes alike. This will also be reflected at EMO Hanover, the world's leading trade fair for production technology, which the VDW (German Machine Tool Builders' Association) is organizing in the capital of Lower Saxony from 22 to 26 September. Companies will present best practice examples in a separate AI + Digitalization Area. The spectrum ranges from smart production, Industry 4.0 and machine learning to the Internet of Things (IoT) and AI applications.

"We should rely more on data," demands Irina Eisele. Digitization simply makes it easier to understand which adjusting screws work and how. Users could react more quickly to product changes and new market requirements. In the case of the hard-coated brake disk, this should also prove particularly useful in the future. It is not only at EMAG that brake disks for trucks and rail vehicles are next on the agenda. After all, nobody wants to stand in a fog of brake particles in train stations.

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About the author:

Cornelia Gewiehs is a freelance journalist based at Rotenburg (Wümme), Germany.

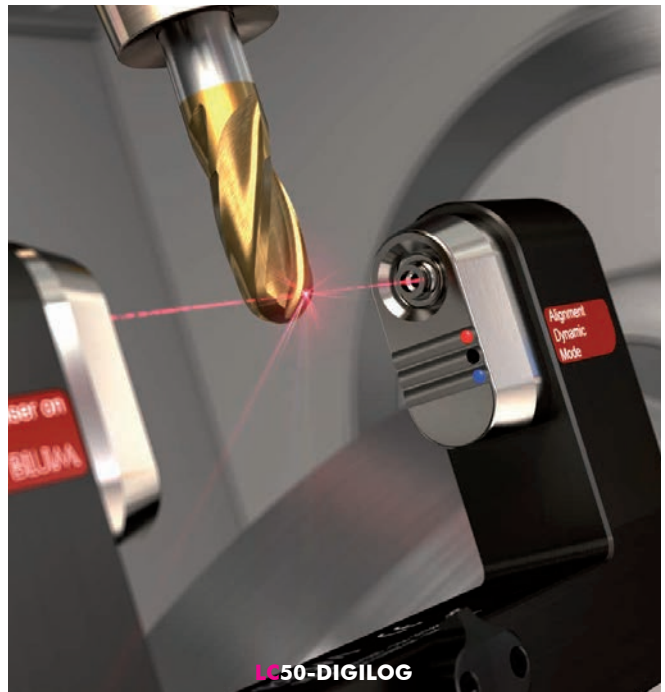
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Schmalz Unveils VacuMaster at Blech India 2025

At Blech India 2025, Schmalz India unveiled the new VacuMaster — a next-gen vacuum lifter designed for safety, energy efficiency, and ergonomics.



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A game-changer in material handling: Schmalz, a leader in vacuum automation and material handling systems, unveiled its next-generation vacuum lifter VacuMaster at Blech India 2025 (a trade fair for sheet metalworking and metal forming industries). The prestigious unveiling of this groundbreaking vacuum lifter was performed by Rakesh Agarwal, Founder of Laser Technologies Pvt Ltd, a prominent figure in the laser cutting industry.

The new VacuMaster is designed with safety, ergonomics, and energy saving, addressing the needs of industries such as sheet metal, woodworking, and plastic sheets. With its innovative features, the VacuMaster promises to significantly reduce energy consumption, making it a smart choice for companies striving for both cost savings and sustainability.

With the new VacuMaster, we are helping our customers reduce operational costs while enhancing productivity and workplace safety, said Mr. Philip Mani, Managing Director, Schmalz India. “This is more than just a vacuum lifter — it’s a smart investment in sustainable and efficient operations, finally leading to more productivity and ergonomics for the employee.”

Constructed with mild steel main and cross beams, the VacuMaster offers a lightweight yet durable structure, providing stability without sacrificing ease of movement. The integrated vacuum reservoir accelerates cycle times and ensures load security in the event of a power failure. Its versatile suction plates provide optimal adaptation for various surfaces. The system includes the Flexo Link, allowing each suction cup to individually adapt to contoured surfaces, ensuring a secure grip on uneven workpieces. In addition, the pad disconnecter enable selective activation of suction cups, making it ideal for different size of workpieces. The quick-connect electrical system allows for fast integration and simplifies maintenance.

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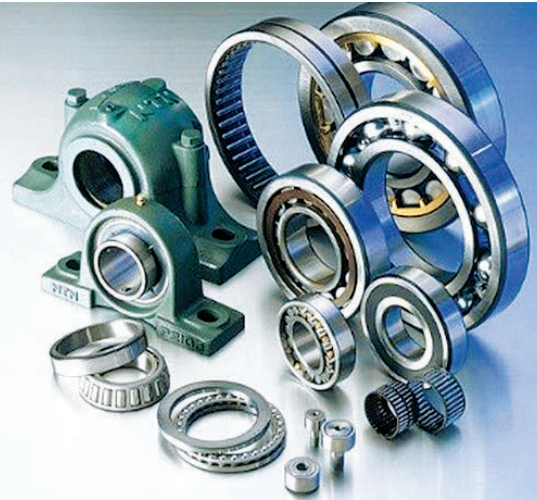
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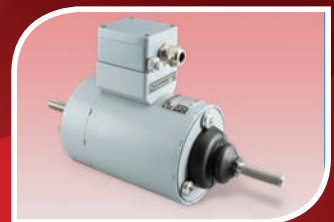
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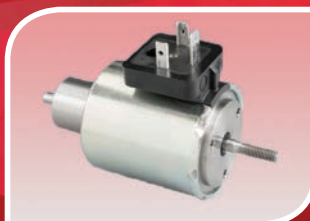
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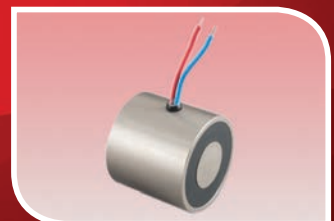
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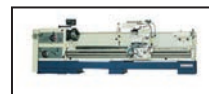
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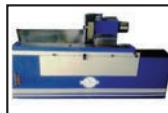


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Efficient Material Handling: The Enabler of Make in India

Indian manufacturers need well-managed warehouses amid global disruptions (like tariff wars and geopolitical tensions) to reduce costs and avoid delays. Hence, efficient material handling systems are critical for ensuring the success of the Make in India initiative, says **Rakesh Rao**.



Since its launch in 2014, the Make in India initiative has remained a cornerstone of the government's agenda. Despite significant efforts, the share of manufacturing in GDP decreased from 15 per cent in 2014 to 13 per cent in 2023, likely due to the dramatic rise of the services sector in the economy. Moreover, rising geopolitical uncertainties involving India, Pakistan, and other regions have disrupted supply chains through regulatory sanctions and currency fluctuations, resulting in cost escalations and delays. "To mitigate these risks, strategies such as supply chain diversification, strong local partnerships, free trade agreements, smart transport solutions, and real-time monitoring of geopolitical developments are essential. As the share of manufacturing declines and trade costs rise amid tariff wars and geopolitical tensions, smart warehousing and logistics solutions are expected to play a pivotal role in ensuring the success of the Make in India initiative," says **Shrinivas Rao, CEO, Vestian Global Workplace Services**.

The manufacturing and warehousing & logistics sectors are intricately connected, and government initiatives like the National Logistics Policy (NLP) and Multi-Modal Logistics Parks (MMLPs) —which aim to reduce logistics costs, improve efficiency, and enhance

India's global competitiveness—have the potential to strengthen the Make in India mission.

Handling volatility stably

In today's fractured global trade environment, an efficient logistics and warehousing ecosystem is not just important—it's absolutely essential to make manufacturing in India more competitive. "Trade tensions and geopolitical shifts are prompting global manufacturers to diversify supply chains, and India has a golden opportunity to emerge as a trusted partner. But we can't unlock this potential without a robust backend. Timely movement of raw materials, seamless connectivity between manufacturing clusters, and



The widespread use of automation and AI has shortened delivery timelines and improved operational efficiency, leading to the emergence of the Q-commerce segment.

Shrinivas Rao,
CEO, Vestian Global Workplace Services

efficient last-mile delivery determine our competitiveness. Logistics is no longer a support function—it's now the strategic backbone of global manufacturing plays. For Make in India to thrive, India must also become the preferred logistics destination," comments **Lancy Barboza, Managing Director, Flomic Global Logistics.**



In today's volatile global trade environment, where container costs spike overnight and shipping lanes shift due to conflict, India cannot afford internal inefficiencies. **Ramesh Madisetty, CEO & Co-Founder, SafeStorage,** explains, "If Make in India is to be more than a slogan, the country needs a logistics engine that doesn't stall. For Indian-made goods to compete globally, we must cut the time between factory floor and global storefront. This is where warehousing becomes more than just storage—it becomes a nerve centre for speed, control, and reliability."

In a world fractured by geopolitical realignments, regional supply chain decoupling, and rising protectionism, India will have to provide a resilient and agile supply chain alternative for global customers to strengthen its position as a manufacturing hub. That is impossible without modern logistics infrastructure. **Pushpank Kaushik, CEO & Head of Business Development (Subcontinent, Middle East and SouthEast Asia), Jassper Shipping,** says, "As global trade dynamics alter, India's export objectives confront increased disruption. Efficient logistics reduces delays, ensures timely delivery of goods, and strengthens supply chain resilience."

An efficient logistics and warehousing ecosystem is no longer a supporting pillar—it is the backbone of the Make in India mission. **Arvind Devaraj, COO, NLDSL,** states, "An efficient logistics and warehousing ecosystem is absolutely vital for the success of the Make in India initiative, especially in the face of global uncertainties. A streamlined supply chain enhances India's global competitiveness by ensuring cost-effective, timely, and reliable movement of goods, crucial for both domestic manufacturing and export-oriented sectors. The ability to optimise logistics processes also supports the ease of doing business, making India more attractive to

investors."

Industry experts believe the ability to manufacture at scale is only meaningful if it is matched by the ability to move, store, and deliver at speed. "Autonomous, intelligent material handling is the only way India can compress its logistics cost—which remains at 13–14 per cent of GDP—closer to global benchmarks. Without this transformation, Make in India risks remaining a slogan rather than a supply chain reality," explains **Robinson Philipose, Co-Founder and CEO, ARAPL RaaS Pvt Ltd.**

Need for modernisation

As India focuses on boosting manufacturing, warehousing ensures safe, timely, and efficient storage of raw materials and finished goods. **Ajay Gupta, Managing Director, Indian Extraction Ltd,** says, "With global disruptions like tariff wars and geopolitical tensions, Indian manufacturers need well-placed, well-managed warehouses to reduce costs and avoid delays. Efficient warehousing helps maintain product quality, improves inventory management, and supports faster market access."

In 2025, India's warehousing industry is growing rapidly due to increasing domestic and export demand. "Modern, large-scale warehouses are replacing small, unorganised units. These facilities, equipped with better infrastructure and safety features, help Indian manufacturers scale up with confidence. To truly become a global manufacturing hub, India needs to ensure warehouses are closer to industrial zones, built to global standards, and supported by advanced technology. This will help manufacturers become more competitive and support the long-term goals of the Make in India programme," he explains.

The lack of standardised Grade A facilities, poor first- and last-mile integration, and regulatory friction still plague the sector. Between April and December 2024, India's ports carried more than 621 million tonnes of cargo, underscoring the importance of public-private partnerships and capacity expansion. "Through efficient logistics, operational barriers are minimised, business

Table 1: Indian material handling equipment market size and forecast (in \$ million)

Year	Market (in \$ Mn)
2022	2,668.74
2023	2,882.24
2024	3,132.63
2025	3,426.42
2026	3,771.54
2027	4,177.71

Courtesy: INDEXTb (A Govt of Gujarat organisation)

Why automate?

As per Invest India, to handle increasing volumes and reduce inefficiencies, automation has been widely adopted in warehouses. Automation has helped to:

- Lower labour costs
- Reduce errors
- Improve inventory control
- Speed up operations
- Improve service levels by up to 50%
- Cut down fulfilment costs by 25-50%

ease is enhanced, and global competitiveness is strengthened. The warehousing sector, supported by greater FDI and PE investment, is emerging as a key growth area. In this context, reliable logistics and warehousing are seen as crucial for sustaining exports, attracting investment, and allowing Indian manufacturers—especially MSMEs—to remain competitive globally,” explains Kaushik.

According to Madisetty, SMEs often struggle not because their products lack quality, but because their supply chains break down. “If India wants to absorb the manufacturing overflow from China or Vietnam, we need plug-and-play logistics: modular warehouses, multimodal hubs, tech-enabled visibility, and faster customs clearance. Logistics must shift from being an afterthought to a strategic enabler. In essence, the Make in India dream can only be delivered if logistics becomes India’s most reliable assembly line,” he states.

Madisetty believes India doesn’t need to follow the West’s playbook step by step. “We can leapfrog using mobile-first tech, modular infrastructure, and private sector innovation. The rise of e-commerce and D2C brands is forcing a rethink—from long-haul bulk movement to micro-fulfillment. This shift opens doors for smart warehousing, dynamic routing, and data-driven operations,” he opines.

He adds, “We are already seeing demand for hybrid models—clients want warehousing that’s both scalable and flexible. The opportunity lies in building Grade-A infrastructure that doesn’t just store but adds value—through sortation, light assembly, and even returns management. The real challenge isn’t building warehouses—it’s building intelligence into them.”

Only 35-40 per cent of warehouses in India adhere to international norms. Road freight accounts for 88 per cent of the industry’s greenhouse gas emissions, demonstrating the need for sustainable transportation solutions. “Green investments are being driven by initiatives such as the Maritime Development Fund and the National Green Hydrogen Mission to promote

sustainability in logistics. Efforts are also being made by the private sector. At Jassper Shipping, 58 EVs have already been deployed, with plans to increase this number to 150 in the next two quarters. A network covering 380 locations—reaching Tier 2 cities and smaller towns—is enabling widespread EV adoption. Strategic partnerships with D-Mart, Big Basket, and other major FMCG and retail brands are helping to strengthen this leadership. In addition, a global carbon tax agreement with 62 countries is contributing to emission reductions in the logistics sector,” says Kaushik.

The sector also suffers from a shortage of skilled labour, particularly in advanced roles such as warehouse automation and supply chain analytics. According to industry estimates, only 4.7 per cent of the 22 million employees in the logistics sector are formally skilled. Additionally, there is a 20 per cent deficit in truck drivers, with only 80,000 available out of the 100,000 needed.

Handling materials efficiently

In today’s environment, where countries are increasingly focused on supply chain resilience, India has a unique opportunity to position itself as a manufacturing alternative. However, competitiveness in global markets requires more than just cost advantages—it demands efficiency across the entire manufacturing and logistics ecosystem. “Material handling equipment (MHE) serves as the connective tissue within this ecosystem, determining how efficiently raw materials, work-in-progress, and finished goods move through production facilities and onward to distribution networks. Efficient material handling systems are absolutely critical to India’s manufacturing competitiveness, especially as global supply chains reconfigure in response to trade shifts and geopolitical challenges,” observes Alok Kumar Tripathi, President, TIL Limited.



“If India wants to absorb the manufacturing overflow from China or Vietnam, we need plug-and-play logistics: modular warehouses, multimodal hubs, tech-enabled visibility, etc.”

Ramesh Madisetty,
CEO & Co-Founder, SafeStorage

According to Madisetty, forklifts, pallet jacks, vertical racking, and conveyor belts aren’t luxuries anymore—they’re essentials. “They improve throughput, reduce

injuries, and enable us to optimise every square foot. For instance, using mezzanine floors and smart stacking, we doubled storage in some of our facilities without adding a single square foot,” he explains.

Advanced material handling systems directly impact key performance indicators that define manufacturing competitiveness: throughput rates, inventory optimisation, space utilisation, energy efficiency, and labour productivity. Tripathi says, “India’s MHE market is undergoing a profound transformation, evolving from a fragmented landscape dominated by basic equipment to a sophisticated ecosystem of advanced, technology-enabled solutions. This evolution is being driven by several interconnected factors. First and foremost, the unprecedented infrastructure development underway across India—with initiatives like PM Gati Shakti, the National Infrastructure Pipeline, Bharatmala, and Sagarmala—is creating substantial demand for advanced material handling equipment. These projects require machines with greater capacity, precision, and versatility than ever before.”



Automation and advanced material handling technologies have significantly improved operating efficiency, safety, and dependability in India’s warehouse and logistics sector.

Pushpank Kaushik,
CEO & Head of Business Development
(Subcontinent, ME and SE Asia), Jassper Shipping

The rapid expansion of India’s logistics sector, particularly the development of multi-modal logistics parks and container terminals, is generating demand for specialised equipment. Simultaneously, the manufacturing sector’s growth, bolstered by production-linked incentive (PLI) schemes and the push toward becoming a global manufacturing hub, is driving demand for efficient material handling solutions that can enhance productivity and reduce operational costs. “We’re also witnessing a significant shift in customer expectations, with increasing emphasis on total lifecycle value rather than just initial acquisition costs. This shift aligns perfectly with TIL’s approach of designing equipment for durability and longevity—our machines typically serve for 15-30 years. Additionally, the growing focus on sustainability is accelerating interest in electric and hybrid solutions that offer reduced emissions and lower operational costs. Finally, the digitalisation wave sweeping across industries is creating demand for smart, connected equipment that can integrate with broader

operational systems and provide actionable insights through data analytics. This evolving landscape presents tremendous opportunities for companies like TIL that can combine deep industry experience with technological innovation,” explains Tripathi.

Automating material movement

Experts believe adoption of automated solutions can have manifold effect on the Indian logistics and warehousing sector. Kaushik comments, “Automation and advanced material handling technologies have significantly improved operating efficiency, safety, and dependability in India’s warehouse and logistics sector. With rising demand driven by e-commerce, manufacturing growth, and changing consumption patterns, warehouses are being upgraded to meet modern needs.”

Automated material handling solutions are making Indian warehouses more efficient and reliable. Gupta observes, “Traditional warehousing relied heavily on manual processes, which often led to slow operations and human errors. Now, tools like conveyor systems, robotic arms, Automated Storage and Retrieval Systems (ASRS), and forklifts are becoming more common in large-scale warehouses. These systems speed up the movement of goods, improve accuracy in inventory management, and reduce workplace injuries by handling repetitive or heavy tasks.”

Automated solutions also allow warehouses to use vertical space more effectively, saving floor area. “In 2025, many warehouses in India, especially those supporting large manufacturers and retailers, have started using barcode scanners, warehouse management software, and real-time monitoring tools. These changes help reduce downtime and ensure better product handling. Although

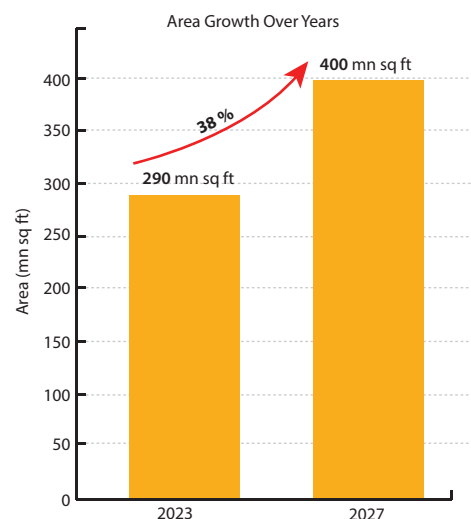


Figure 1: Grade A warehousing stock in India

Source: Jones Lang LaSalle (JLL)

the cost of automation is still high, the long-term gains in speed, safety, and storage efficiency make it a valuable investment for the future,” says Gupta.

In addition to hardware, software also plays a big role in improving efficiency. “Auto-alerts on inventory aging, real-time dashboards, and AI-driven reorder thresholds help eliminate blind spots. The magic lies in incremental change. You don’t need a fully robotic warehouse—just smarter workflows. Automation is the silent partner that doesn’t get tired, doesn’t make mistakes, and always shows up. That’s where operational edge is born,” explains Madisetty.

Gearing up for digitalised world

Modern material handling systems—like ASRS, conveyor-based sorting, and AI-powered inventory tracking—bring speed, precision, and predictability to warehouse operations. Barboza observes, “They reduce dependency on manual labour, minimise errors, and increase throughput per square foot. For safety, these systems drastically lower workplace injuries, especially in high-volume, high-stack environments. From a reliability standpoint, automation creates standardised processes that can be monitored in real-time, ensuring consistent service levels and SLA (Service Level Agreement) compliance. For a country aiming at global manufacturing excellence, scalable automation is no longer a luxury—it’s a necessity.”

According to Devaraj, advancements in digital technologies, such as real-time tracking systems and predictive analytics, are playing a transformative role in India’s logistics and warehousing infrastructure. “These technologies enable businesses to optimise their supply



“An efficient logistics and warehousing ecosystem is absolutely vital for the success of the Make in India initiative, especially in the face of global uncertainties.”

Arvind Devaraj,
COO, NIDSL

chains and reduce operational delays,” he says.

Philipose believes automation addresses the three chronic pain points of Indian logistics: inefficiency, unpredictability, and human dependency. “Our autonomous mobile robots (AMRs) and intelligent fleet controllers eliminate bottlenecks caused by manual handling, reduce error rates to near zero, and ensure 24/7 uptime. The result is faster throughput, higher storage

density, and measurable improvements in operational KPIs—from pick rate to order cycle time. Equally critical is safety. With worker fatigue and accidents common in traditional warehouses, automation introduces consistent, sensor-driven workflows that reduce workplace injuries and increase compliance,” he opines.

Philipose adds, “At ARAPL RaaS, we don’t see automation as replacing jobs but as augmenting human potential. Our hybrid deployment models combine man and machine to achieve higher reliability, especially in high-volume operations like automotive, e-commerce, and 3PL.”



“Autonomous, intelligent material handling is the only way India can compress its logistics cost—which remains at 13–14 per cent of GDP—closer to global benchmarks.”

Robinson Philipose,
Co-Founder and CEO, ARAPL RaaS Pvt Ltd

AI-enabled proficiency

Automation significantly enhances operational efficiency, often boosting productivity by two to three times while minimising errors. When combined with AI, it brings intelligence and adaptability to warehouse operations—enabling real-time inventory management, demand forecasting, predictive maintenance of equipment, and route optimisation to reduce costs. “Technologies such as automated storage and retrieval systems, autonomous mobile robots, and AI-driven Warehouse Management Systems (WMS) streamline operations, reduce manual labour, and minimise human error. These systems improve productivity through faster sorting, picking, and order fulfillment while optimising space and resources. Real-time tracking tools like RFID and barcode scanners further strengthen inventory accuracy and visibility across the supply chain,” elaborates Rao.

He adds, “From a safety perspective, automation reduces the risk of workplace injuries by taking over repetitive and physically demanding tasks. Companies like SMC and PUMA have reported substantial improvements in throughput, cost savings, and order accuracy through the integration of automation and AI.”

The industry is also seeing a fusion of digital intelligence with physical infrastructure. “The use of IoT sensors and digital twins allows companies to monitor warehouse environments and supply chains in real-time. Blockchain is being explored to improve traceability and reduce paperwork in cross-border logistics. WMS and

Transport Management Systems (TMS) are now being embedded with AI to optimise routing, fleet utilisation, and delivery accuracy. Cold chain innovation is also gaining traction, driven by pharmaceuticals, perishables, and the food sector. Meanwhile, 3PLs are evolving into 4PLs, offering integrated solutions that blend warehousing, technology, and last-mile analytics. All these trends point toward a future where logistics is lean, smart, and anticipatory—not reactive,” explains Barboza.

Robotics and AI are playing a pivotal role in transforming the warehousing & logistics sector. Rao says, “Technological advancements coupled with rising consumerism shaped the sector, leading to the emergence of several key trends. The widespread use of automation and AI has shortened delivery timelines and improved operational efficiency, leading to the emergence of the quick commerce (Q-commerce) segment.”

According to Tripathi, automation is fundamentally transforming India’s material handling sector, though its implementation follows a distinctly Indian trajectory that balances technological advancement with our unique market conditions. “Rather than pursuing full automation as seen in some highly developed markets, we’re witnessing a thoughtful integration of automated systems that complement existing operations while addressing specific challenges like labour shortages in skilled positions, safety concerns, and efficiency bottlenecks,” he explains.



Alok Kumar Tripathi,
President, TIL Limited

Smart warehouses

Warehousing in India is evolving with smart innovations that improve space usage, operations, and cost control. One major trend is the use of technology like sensors, WMS and AI-based monitoring tools to track inventory in real-time and reduce stock errors. Energy-efficient warehouses with solar power, rainwater harvesting, and smart lighting are also on the rise. Gupta observes, “Multi-level warehousing is emerging in space-constrained urban areas, helping store more in smaller land parcels. Cold storage warehouses with

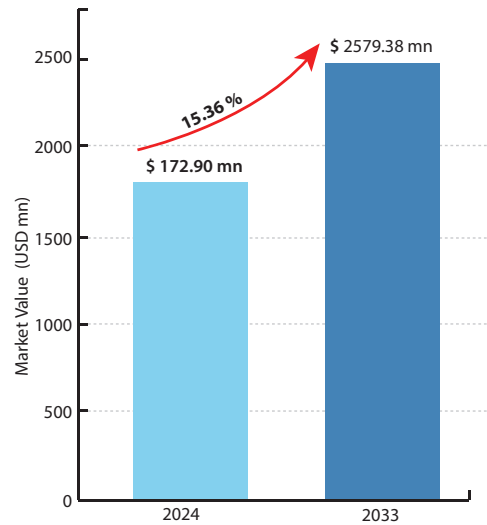


Figure 2: Indian warehouse automation market (in \$ million)

Source: IMARC Group

temperature control are expanding rapidly, especially for food and pharma. Mobile racks and modular shelving systems are allowing warehouses to be more flexible. Indoor air quality systems and fire safety innovations are also improving worker comfort and product safety. These changes are helping warehouses become more than just storage spaces, they’re turning into smart, agile centres that can quickly adapt to business needs while also saving on energy, manpower, and time.”

The logistics game is no longer just about moving boxes—it’s about moving intelligence. One trend we see growing rapidly is predictive storage—where warehousing decisions are based on demand forecasts, not just geography. “At SafeStorage, we use AI models to predict inflow and dispatch peaks, optimising manpower and space in advance. Another rising wave is the ‘Uberization’ of warehousing—on-demand storage spaces, hourly workforce models, and cloud-driven inventory. Businesses no longer want 10-year lease commitments. They want flexibility that mirrors their growth curve. Multi-client, pay-per-use models are becoming the new normal,” observes Madisetty.

Meanwhile, the rise of tier 2 demand is shifting focus away from metro-centric hubs to a distributed warehousing model. He comments, “What’s truly exciting is the role of no-code tech—where even mid-sized players can run a WMS without hiring developers. The industry is getting leaner, smarter, and more agile—not by copying the West, but by hacking the system in uniquely Indian ways.”

Data-driven decision-making, enabled by cloud-based WMS and Digital Twin technologies, helps streamline operations, saving both time and costs. “Additionally, the sector’s growing focus on sustainability has contributed

to reduced carbon emissions, making operations more intelligent, agile, and cost-effective. Workforce development programs and diversity initiatives are also helping bridge the skill gap and promote inclusivity within the industry,” opines Rao.

Devaraj adds, “Emerging trends include the adoption of AI and IoT for real-time tracking, predictive analytics, and automated decision-making in logistics operations. Blockchain technology for secure, transparent transactions and innovations in last-mile delivery like electric vehicles and drones also hold promise for making logistics operations more cost-effective, sustainable, and agile.”

Heading for a revolutionary growth

India’s warehousing and logistics industry is on the cusp of transformation, spurred by policy thrust, infrastructure development, and digitalization. The industry will keep enjoying its fast growth in the next few years. “The policies such as the National Logistics Policy, GatiShakti and more will create one logistics ecosystem, which will be cost-effective and efficient. With greater investment and innovation, India’s warehousing and logistics sector will be a world leader in coming years,” states Kaushik.

The warehousing industry in India is expected to grow steadily in the coming years, both in terms of capacity and quality. Developers are focusing on building more Grade-A warehouses with better construction quality, higher ceilings, smooth flooring, fire safety systems, and advanced security features. “As demand for safe and scalable storage grows, older warehouses are being upgraded, and unorganised units are being replaced with modern structures. The sector is also seeing a rise in built-to-suit warehouses, where designs match the specific needs of industries. Warehousing in tier 2 and tier 3 cities is expected to grow, driven by rising industrial activity and consumption. Automation, smart inventory tools, and energy-efficient systems will become standard features. Training and skill development for warehouse staff will also improve. Overall, the warehousing industry is moving towards being more organised, technology-driven, and ready to meet the storage needs of a growing and modern India,” says Gupta.

The government is targeting a reduction in logistics costs to 9 per cent of GDP to enable the growth of manufacturing sector in the country. Barboza says, “The future is bold, integrated, and digital-first. India’s logistics cost currently hovers around 13–14 per cent of GDP, compared to 7–9 per cent in developed economies. The future lies in compressing that gap—by enhancing multimodal connectivity, investing in smart infrastructure, and embracing digitalisation at every

layer. Warehousing will evolve into Grade-A, tech-enabled hubs connected through a national logistics grid. Tier 2 and 3 cities will emerge as warehousing and distribution hotspots, driving regional manufacturing growth. Sustainability will also take centre stage—with EV fleets, solar-powered warehouses, and green supply chains becoming the norm. If we stay on course, India can transition from a logistics cost centre to a global logistics advantage—powering not just Make in India, but also Ship from India.”

Philipose believes that India’s logistics sector is at an inflection point. “In the next 5–7 years, we will see a decisive shift from manual muscle to machine intelligence. Warehouses will evolve into smart hubs—automated, AI-driven, and networked into regional corridors enabled by multimodal logistics. I envision a future where India becomes not just a cost-efficient supply base, but a strategic logistics nerve centre for the Global South. This requires bold investments, policy continuity, and indigenous innovation,” he observes.



“Tools like conveyor systems, robotic arms, automated storage and retrieval systems, and forklifts are now becoming more common in large-scale warehouses.”

Ajay Gupta,
MD, Indian Extraction Ltd

According to Devaraj, the future of India’s logistics and warehousing sector is extremely promising, with a growing focus on digital transformation, automation, and sustainability. As the country invests in infrastructure, including the development of dedicated logistics parks, multimodal transport, and smart warehouses, logistics operations will become increasingly efficient.

“I see India’s logistics sector heading toward a quiet revolution—not a loud one. In 5–7 years, we’ll have fewer warehouses, but they’ll be 10X smarter. Facilities will move from being rent-generating real estate to ROI-generating digital assets. Warehouses will become “micro factories” where value is added—kitting, returns processing, light packaging—closer to the consumer. We’ll also see data become the real differentiator. The companies winning this space won’t be the ones with the most square footage, but the ones with the best data-to-action ratio,” observes Madisetty.

According to him, the future isn’t about copying Amazon or DHL. “It’s about building the ‘Indian Model’ of logistics—cost-efficient, tech-embedded, and scalable for a billion-plus people,” he says.

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Government Boosts Logistics Digitally

The use of technologies in logistics cannot be only the burden on the shoulders of government. For something to be created there should exist an environment consisting of private businesses, emerging businesses, and other tech companies, says **Arvind Devaraj, COO, NICDC Logistics Data Services (NLDS)**.



India's logistics sector often called the backbone of the economy, is changing in big ways. In the past, it struggled with slow processes, delays, and scattered operations. Now, it's moving towards a future powered by instant data smooth connections, and clear digital systems. The Indian government's focus on digital tools is driving this change. This shift is helping goods move more speeding up customs checks, and letting people make smarter choices across the whole supply chain.

PM Gati Shakti and ULIP PM Gati Shakti – National Master Plan launched in October 2021, forms the basis for the digital shift in India's logistics system. This big infrastructure plan aims to bring 16 ministries to a single digital platform. This allows for joined-up planning and teamwork in carrying out infrastructure projects that connect different parts of the country. The Unified Logistics Interface Platform (ULIP) came about under this plan. It breaks down barriers in logistics data, supports transport across different modes, and helps to see operations more. ULIP serves as a digital doorway. It

joins datasets from many government departments and private parties through safe APIs. This gives stakeholders the power to make choices based on real-time data.

Digital-first logistics

Seeing how digital systems can change supply chains, the government has started many projects to build modern logistics in India. The Unified Logistics Interface Platform (ULIP) created under the National Logistics Policy, plays a crucial role. It combines data from different ministries, port authorities, and private logistics companies giving a clear view of the whole supply chain. Other projects like the e-Way Bill system, RFID-based FASTag, and digital rail freight management systems have already made a difference. They've cut down travel times, stopped theft, and made following rules easier.

Perhaps the greatest single logistical challenge throughout history has been the isolated nature of operations and the data sharing policies, or lack thereof, between stakeholders. Digitalisation is addressing this challenge by promoting interoperability both between transport modalities and amongst private and public players. ULIP, for example, enables providers, fleet owners and shippers to access real time multimodal logistics information through secure APIs, improving planning and reducing idle time. This advancement also lowers the overall costs of logistics.

Increasing transparency and private-public partnerships

Traditionally, customs clearance as well as cross-

border logistics have been extremely paper-intensive. Technological advances are now enabling time-saving measures such as automated document submission, electronic signatures, and consolidated customs portals. This leads to less human interaction, faster clearances, and improved trade trust. Moreover, digital frameworks are assisting small to medium-sized logistics firms – previously not digitised – with the national network access, shipment tracking, and competitive service provisions without having massive infrastructural expenditure.

The use of technologies in logistics cannot be only the burden on the shoulders of government. For something to be created there should exist an environment consisting of private businesses, emerging businesses, and other tech companies. The open-architecture policies concerning ULIP adopted by the government is a proof of the integrative spirit model since it permits interfacing by standardized APIs. Corporations are now adding functionality to government infrastructure systems by addressing value-add challenges presenting on governments infrastructure systems dashboards, predictive analytics, visibility measures, and working with their infrastructures.

Remaining challenges

While the progress is promising, we still face a variety of challenges ahead including data standardization, digital literacy among smaller players, and infrastructure in remote areas. We will need to keep an eye on cybersecurity and data privacy as more players plug into shared platforms.

The pathway to a digitally empowered logistics industry is underway, and we can see the initial benefits. With sustained government initiative, and industry cooperation, India is on the path to developing a not just an efficient logistics sector, but a globally competitive logistics system. The future can involve increased access to digital technologies, creation of new products and services, and ensuring that everyone along the way from port operator to truck driver, to warehouse clerk realises its benefits.

SME



About the author:

Arvind Devaraj is the Chief Operating Officer at NICDC Logistics Data Services. Devaraj brings over two decades of leadership experience across various industries, specialising in business growth, strategic planning, and operations management. Before joining NLDS, Devaraj held key leadership positions at Tech Mahindra, serving as Vice President – Integrated

Engineering Services for North America. Prior to that, he held leadership roles at PwC India, Mazars India, and Infrovate Consulting, strengthening his expertise in technology consulting and logistics solutions.



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“We will launch new cranes and forklifts in next 4 years.”

In this interaction, **Alok Kumar Tripathi, President, TIL Limited**, elaborates on the company’s future plans and emerging trends in the material handling equipment (MHE) industry.

TIL Limited recently rolled out its 400th Hyster-TIL ReachStacker from its Kharagpur facility. What does this milestone mean for TIL business?

This milestone represents far more than a production number—it’s a testament to TIL’s manufacturing excellence and our successful journey in the material handling equipment industry over the past eight decades. When we began manufacturing ReachStackers in 2010, we produced just three units that first year. The fact that we have now reached 400 units, with annual production exceeding 50 units in recent years, demonstrates both market acceptance and our significantly enhanced manufacturing capabilities.

This achievement validates our strategic partnership approach with global leaders like Hyster-Yale, which has been instrumental in enabling us to integrate cutting-edge technologies while maintaining our indigenous manufacturing strengths. The fact that over 40 of these ReachStackers have been exported to markets like Australia, New Zealand, and Southeast Asia speaks volumes about our quality standards and global competitiveness. This milestone also underscores our contribution to the ‘Make in India’ initiative, establishing that Indian manufacturing can meet and exceed international standards.

How is TIL gearing up to play a pivotal role in shaping India’s MHE industry?

TIL is strategically positioning itself to play a pivotal role in shaping India’s MHE industry through a multi-dimensional approach that leverages our manufacturing heritage while embracing new technologies and market opportunities.

We’re actively expanding our product portfolio through strategic partnerships with global leaders like Hyster-Yale, Manitowoc, and Snorkel Europe. These partnerships allow us to bring cutting-edge technologies



Alok Kumar Tripathi,
President, TIL Limited

to the Indian market while maintaining strong indigenous manufacturing capabilities. Our recent unveiling of the Snorkel A62JRT articulating boom lift and our enhanced ReachStacker model demonstrates this commitment to portfolio expansion.

In terms of technological advancement, we’re focusing on incorporating IoT capabilities, telematics solutions, and real-time monitoring systems across our product range. These technologies not only enhance equipment performance but also provide valuable data that helps customers optimise their operations.

What are TIL’s growth plans for MHE business?

Looking ahead, TIL has formulated a comprehensive strategic plan to expand our MHE business across multiple dimensions. In terms of new product launches, we are launching new cranes, forklifts and a few unique models with several launches planned over the next 4 years. We’re also enhancing our ReachStacker line with next-generation features, including advanced telematics capabilities and electrification options, building on the success of our 400th ReachStacker milestone. Our E&D team is developing specialised equipment for urban infrastructure projects, focusing on compact, versatile machines suited for the constrained spaces typical in smart city development.

Geographic expansion represents another critical element of our strategy. We’re strengthening our presence in high-growth regions within India, particularly focusing on emerging industrial clusters and logistics hubs. Internationally, we’re building on our successful export of over 40 ReachStackers to markets including Australia, New Zealand, and Southeast Asia by expanding our focus to include the Middle East, Africa, and other parts of Asia. These markets share many operating characteristics with India, making our equipment particularly well-suited to their requirements.



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Phoenix Contact's Trio Power: Reliable Power Supply for Material Handling

The Trio Power panel-mount power supply from Phoenix Contact delivers high power—up to 2.5 kW—in a compact, robust housing, ideal for today's demanding industrial environments. With flexible panel mounting options, including both lateral and rear housing attachment, Trio Power enables customised integration within control cabinets, enhancing space efficiency. Designed for continuous 24/7 operation, it meets the high-availability requirements of modern material handling and automation systems.



Equipped with integrated protective functions, Trio Power safeguards against unexpected voltages and currents, ensuring long-term reliability. Its built-in O-ring diode supports direct parallel connection, enabling easy creation of redundant systems and enhancing supply security. A single system's power can be increased up to 10 kW, while static (120%) and dynamic (140% for 5 seconds) boost modes handle temporary load spikes effortlessly. Series connection also allows users to increase output voltage as needed.

Trio Power stands out with its intelligent monitoring features, including LED status indicators, CAN bus interface, and an End-of-Life (EOL) reminder—allowing proactive maintenance and preventing costly downtimes. Combined with battery charging mode

and strong EMC performance, this power supply offers the perfect balance of performance, flexibility, and durability for a wide range of industrial applications.

Advantages of Trio Power:

- High power density: Delivers up to 2.5 kW in a compact design, saving valuable control cabinet space
- Integrated redundancy: Built-in O-ring diode enables direct parallel connection for redundant systems and enhanced supply security
- Boost functionality: Static (120%) and dynamic (140% for 5 seconds) boost handles peak loads without system disruption
- Battery charging mode: Integrated battery charging function ensures fast and reliable energy, ideal for systems requiring uninterrupted 24/7 operation.
- Advanced monitoring & diagnostics: LED indicators, CAN bus, and EOL reminder provide real-time status and preventive maintenance alerts.

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For details, contact Phoenix Contact India Pvt Ltd, New Delhi, on Email: adverts@phoenixcontact.co.in

(Communication provided by the management of the company)

News Snippet

SafeStorage Expands Operations to Kolkata

SafeStorage, India's leading self-storage provider, launched its services in Kolkata, marking a significant milestone in its pan-India expansion strategy. With this move, SafeStorage brings its secure, flexible, and cost-effective storage solutions to one of Eastern India's fastest-growing economic and cultural hubs.

Ramesh Madisetty, CEO, SafeStorage said, "Our mission is to make storage as simple as ordering a cab or booking a hotel. With the expansion into Kolkata, we are enabling individuals and businesses to reclaim their space—whether at home or at the workplace—without the burden of long-term commitments, safety

concerns, or high costs. As one of the first companies in India's self-storage sector to cross 100,000 customers, our focus remains on building trust and delivering unmatched convenience. We are proud to bring our proven and trusted model to this vibrant city and look forward to serving the people of Kolkata."

Since its inception in 2015, SafeStorage has been at the forefront of India's storage revolution. The company actively manages 12,000+ customer storage units across 20+ warehouses in cities like Bengaluru, Mumbai, Delhi, Hyderabad, Pune, Chennai, and Coimbatore.

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Avians High-Speed Clean Room Doors: Advancing Contamination Control

Avians high-speed clean room doors are redefining contamination control in sensitive environments such as pharmaceuticals, electronics, and food production with rapid operation, energy efficiency, and advanced safety features.

In industries where precision, cleanliness, and contamination control are paramount—such as pharmaceuticals, biotechnology, electronics manufacturing, and food production—maintaining a controlled environment is crucial. One of the most effective solutions in these settings is the implementation of high-speed clean room doors. These advanced doors, specifically designed to maintain a sterile environment while offering high operational efficiency, have revolutionised contamination control practices across various sectors. Avians, a leading manufacturer in the field, is at the forefront of this technological advancement, offering innovative solutions for high-speed clean room doors.

The importance of clean room doors

Clean rooms are used in environments where the level of contaminants—such as dust, airborne microbes, and chemical vapours—is tightly controlled. These environments are essential in industries like pharmaceuticals and semiconductor manufacturing, where even the smallest particle can disrupt production or compromise product quality. The doors that provide access to these rooms are equally critical in ensuring that contaminants are not introduced during the process of entering or exiting.

Traditional clean room doors, while effective, often fall short in terms of speed, energy efficiency, and ease of use. High-speed clean room doors, on the other hand, address these issues by allowing for rapid opening and closing, thereby minimising the time during which the environment is exposed to outside contaminants.

Key Features of Avians high-speed clean room doors are:



1. **Rapid operation:** Avians high-speed clean room doors are designed to open and close quickly, reducing the risk of contamination each time the door is used. These doors operate with advanced motorised systems that can open and close in a matter of seconds, keeping the clean room environment intact and minimising the risk of external contamination.
2. **Energy efficiency:** The rapid operation of Avians high-speed clean room doors minimises air exchange, reducing the energy needed to maintain stable temperature and humidity levels. This feature

not only helps to reduce operating costs but also contributes to a more sustainable and eco-friendly production environment.

3. **Durability and low maintenance:** Avians high-speed clean room doors are built with high-quality materials, such as engineering-grade steel and specialised synthetic fabrics, making them resistant to wear and tear. Their smooth surfaces and minimal crevices reduce particle accumulation, simplifying cleaning and maintenance while ensuring long-term reliability.
4. **Customisability:** Every clean room has unique requirements, and Avians provides solutions that can be tailored to specific needs. Whether it's the size of the opening, the type of sealing required, or the integration with existing clean room systems, customisation ensures that the doors offer the best possible protection while maintaining optimal operational efficiency.
5. **Safety features:** Equipped with advanced safety sensors, Avians high-speed clean room doors detect movement and prevent accidental closures, ensuring smooth and secure operation. This enhances workplace safety, reducing the risk of injuries or equipment damage.

Applications of clean room doors

Some of the key applications of Avians high-speed clean room doors are:

- **Pharmaceutical and biotechnology manufacturing:** In these industries, contamination control is critical. Avians high-speed clean room doors are used in drug manufacturing facilities, research laboratories, and biotech production areas. Their ability to keep clean room environments sterile is indispensable in ensuring the integrity and safety of medical products.
- **Semiconductor and electronics manufacturing:** In semiconductor manufacturing, even the tiniest particle can cause defects in microchips, making contamination control a priority. Avians doors are used to create environments that are free from dust and other airborne particles, protecting sensitive components and ensuring the quality of the final product.
- **Food production:** Cleanliness in food production environments is vital for ensuring the safety and quality of the products. Avians high-speed clean room doors provide a quick, efficient barrier between the sterile and non-sterile areas, minimising the risk of contamination and ensuring food safety compliance.
- **Aerospace and research:** Industries involved in aerospace manufacturing and scientific research

also require strict environmental controls. Avians' high-speed clean room doors provide rapid access to critical areas, such as labs and testing facilities, while maintaining stringent cleanliness standards.

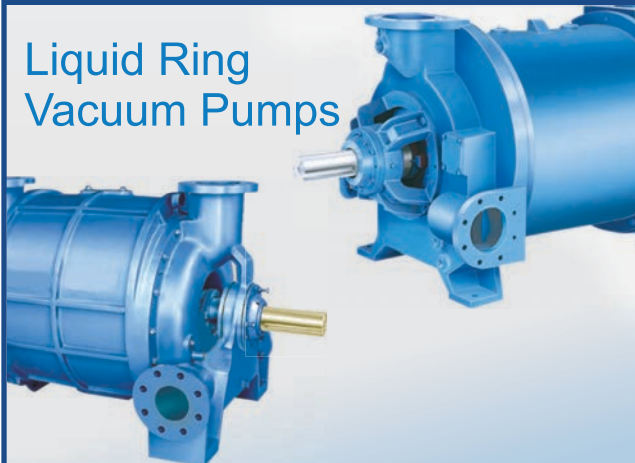
Avians high-speed clean room doors represent a significant leap forward in contamination control technology. With their rapid operation, airtight sealing, energy efficiency, and compliance with stringent industry standards, these doors play an essential role in protecting sensitive environments across various industries. Whether it's pharmaceutical manufacturing, electronics production, or food safety, Avians high-speed doors offer a reliable, customisable, and efficient solution to meet the ever-growing demands for contamination control. As industries continue to evolve and face new challenges, these advanced doors will remain at the forefront of maintaining safe and sterile production environments.

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For details, contact Avians Innovations Technology Pvt Ltd on Mob: +91 83903 00400; Email: sales@avians.co.in; or visit www.avians.co.in

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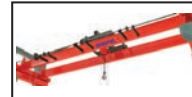


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Why Efficient HVAC Solutions are Must in Pharma Industry

HVAC systems account for more than 50 per cent of total energy consumption in cleanrooms. **Kishor Patil of Trane Technologies** explores how energy-efficient HVAC systems can help pharmaceutical companies meet sustainability goals without compromising regulatory compliance or product integrity.

Pharmaceutical manufacturing is one of the most energy-intensive industries, with heating, ventilation and air conditioning (HVAC) systems accounting for more than 50 per cent of total energy consumption in cleanrooms. According to the International Society for Pharmaceutical Engineering (ISPE), cleanrooms in pharmaceutical facilities can consume up to 15 times more energy per square meter than a standard office building. This high energy demand is driven by the stringent air change rates required to maintain air quality in pharmaceutical production. Whether in research and development, manufacturing, or storage, maintaining precise environmental conditions is crucial. Temperature, humidity, and air quality must be tightly controlled at every stage to ensure product quality, safety, and compliance with regulatory standards.

At the same time, the global push toward sustainability presents a new challenge for pharmaceutical companies, requiring them to balance operational requirements with the need to reduce energy consumption and carbon footprints. Given the strict regulatory requirements, energy-efficient HVAC solutions help pharmaceutical companies achieve both operational excellence and sustainability.

The critical role of precise climate control in pharma

Pharmaceutical manufacturing and storage environments, require tightly controlled temperature, humidity, and air quality levels. Sensitive products like biologics, vaccines, and certain medications require strict environmental conditions.

For example, cleanrooms used in the production of sterile medicines and vaccines need to be free of particulates and tightly controlled for pressure and airflow. This necessitates robust HVAC systems capable of maintaining precise conditions within narrow tolerances.

Beyond product quality, employee safety is another important consideration. Proper ventilation, air filtration, and climate control help protect workers from



exposure to hazardous materials while maintaining a comfortable and safe working environment.

Balancing regulatory compliance with sustainability

The pharmaceutical sector is one of the most regulated industries, with authorities like the FDA, WHO, ISO, and EMA enforcing strict guidelines on environmental controls to ensure product quality. At the same time, these companies are under increasing pressure to reduce energy consumption in alignment with global sustainability initiatives and corporate ESG goals.

While regulatory compliance is non-negotiable, the pharmaceutical industry is increasingly recognizing the need to adopt sustainable energy practices. Traditional HVAC systems are notorious for their high energy consumption, contributing to significant operational costs and environmental impact. As sustainability becomes a key focus, pharmaceutical companies are seeking ways to reduce their carbon footprint without compromising on compliance.

However, advancements in HVAC technology designed to optimise energy use while maintaining strict adherence to Good Manufacturing Practices (GMP) and

other industry standards are enabling pharmaceutical companies to achieve both objectives.

By leveraging data analytics, real-time monitoring, and smart controls, can help pharma companies strike the right balance and ensure that environmental conditions stay within the prescribed limits. By improving the efficiency of energy-intensive equipment like air handling units (AHUs) and chillers, companies can reduce their energy consumption and carbon footprint.

Innovations in energy-efficient HVAC for pharma

Several key innovations are helping pharmaceutical facilities make the shift to more sustainable operations:

- High-efficiency chillers and AHUs use advanced compressors and heat exchangers to deliver precise temperature and humidity control with less energy.
- Hybrid HVAC Systems: Combining conventional HVAC with evaporative cooling, heat pumps, and thermal energy storage.
- Variable Air Volume (VAV) Systems: VAV systems adjust the volume of air supplied to different areas based on real-time demand. This dynamic control reduces energy consumption by avoiding the constant operation of HVAC units at full capacity. In pharmaceutical environments, VAV systems can be tailored to maintain precise conditions while optimizing energy use.
- Variable Speed Drives (VSDs) adjust fan and pump speeds based on actual demand, cutting down on unnecessary energy use.
- Heat recovery systems capture waste heat from processes and reuse it, reducing the load on heating and cooling systems.
- Advanced filtration and air purification technologies maintain cleanroom standards while consuming less energy. High-efficiency particulate air (HEPA) filters and ultra-low penetration air (ULPA) filters are designed to capture microscopic particles. Innovations in filter design and materials have led to more energy-efficient filtration solutions that maintain high air quality standards with lower energy consumption.
- Building Automation Systems (BAS) use intelligent controls and analytics to monitor HVAC performance, identify areas for improvement, and ensure compliance.
- The transition to low-GWP refrigerants further reduces environmental impact. The global warming potential (GWP) of refrigerants used in HVAC systems is a growing concern. Traditional refrigerants, such as hydrofluorocarbons (HFCs), have high GWPs and contribute significantly to

climate change. The transition to low-GWP refrigerants, such as hydrofluoroolefins (HFOs), is a critical innovation.

- Modular and scalable HVAC systems offer flexibility for facilities to adjust capacity as production needs change, improving efficiency and reducing waste.
- Sustainable Building Design: Integrating energy-efficient HVAC solutions into the overall design of pharmaceutical facilities can yield significant benefits. By considering energy efficiency from the outset, pharmaceutical companies can create facilities that are both compliant and sustainable.

By embracing energy-efficient HVAC solutions that align with operational, regulatory, and sustainability objectives, companies can drive future growth through enhanced energy efficiency and environmental stewardship, reducing emissions, lowering operational costs, and maintaining product integrity.

Several pharmaceutical companies have successfully implemented energy-efficient HVAC solutions to balance sustainability with stringent compliance requirements. For instance, a pharmaceutical company based in North India has successfully revolutionized its process and HVAC efficiency through the electrification of heating systems, moving away from traditional boiler methods. By replacing their conventional boiler with a state-of-the-art heat pump, the company has achieved an impressive annual energy savings of over 55 per cent. Additionally, the heat pump's by-product of cooling has further reduced the overall cooling demand, enhancing the system's efficiency.

This strategic shift to energy-efficient HVAC solutions, encompassing both system upgrades and operational optimisations, has not only led to substantial reductions in energy consumption, but also significantly improved the company's overall performance.

Striking the right balance between sustainability and strict regulatory compliance is challenging; however, with advanced HVAC solutions, it is not only achievable but is rapidly becoming the industry standard. The future of HVAC in the pharmaceutical industry lies in solutions that are not only compliant but also sustainable, paving the way for a greener and more efficient future.

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About the author:

Kishor Patil is the Country Leader of HVAC and Transport of India and SAARC market at Trane Technologies. Among his multiple achievements, he was recognized and awarded for spearheading the growth for past nine years across different product categories at Trane. Patil has actively participated in various key forums like ISHRAE Ozone cell and

Smart Buildings.



Security Seals for Solving Serious Logistics Problems

Despite advances in tracking and surveillance, many companies overlook a basic but powerful line of defence: tamper-evident sealing, says Rajesh Kumar Banka, MD, Safcon Seals Pvt Ltd.



In today's fast-moving logistics and supply chain world, the threats of tampering, pilferage, and unauthorised access haven't gone away—they've just gotten smarter. But here's the good news: protecting goods in transit doesn't have to involve complicated, expensive tech. Sometimes, the simplest solutions are the most effective. That's where security seals come in.

Why seals still matter

Despite advances in tracking and surveillance, many companies overlook a basic but powerful line of defence: tamper-evident sealing. Security seals act as clear indicators of interference. If a seal is broken, it sends a message—loud and clear—that something's wrong.

Whether you're shipping raw materials, finished goods, or high-value products across the country or overseas, seals create an undeniable, low-cost barrier that reinforces trust in your supply chain.

What makes a good seal?

At Safcon, we have spent over a decade refining

our seal designs to meet today's logistics challenges. Here's what industry buyers look for now:

- Ease of use: No tools needed to apply or remove in many cases.
- Clear identification: Company branding, unique serial numbers and barcoding
- Tamper evidence: Once broken, seals can't be reused or resealed.
- Versatility: Suitable for containers, tankers, truck tarpaulins truck doors, product packages, drums and barrels, warehouses, doors, plant valves and many other applications.

Safcon's most popular safety seal options are:

- Saflok Plastic Container Seals: Affordable, toolless and ideal for local delivery trucks and warehouses.
- Bolt container seals: Heavy-duty metal seals that require bolt cutters for removal – perfect for containers for domestic and international shipments.
- Cable seals: Flexible, weather-resistant, and color-coded—great for chemical, food and pharma logistics.
- Ball-Lok & pull-tight seals: Quick locking, tamper-evident and widely used in bulk tankers, truck tarpaulins, tote boxes, and distribution hubs.

Each seal is designed for a specific challenge—whether it's theft deterrence, route visibility, or compliance.

Beyond the seal: Best practices every logistics team should follow

Let's face it – no matter how secure the seal is, it's only as effective as your process. Here's what will work in 2025:

Seal control & tracking: Order seals only from authorised locations (like HQ); maintain separate logs for outbound and inbound seal records; and always apply seals in the presence of supervisors or shipping reps.

Application do's: Seal both rear and side doors; match the seal strength with shipment risk (e.g., bolt seal for domestic and international, plastic for intra-city);

and check every seal before use—look for signs of tampering or reuse.

What if a seal is broken mid-route?

Document everything: Who broke it? Why? When? What was the replacement? Who witnessed it?

This isn't about bureaucracy—it's about protecting your cargo, reputation, and bottom line.

Security isn't one size fits all

Just like no two shipments are alike, seal solutions must be tailored. While selecting a seal consider commodity value, risk zones, number of transit points, and ease of handling at destination.

We also recommend colour-coded seals for warehouses and terminals to prevent mix-ups and reduce the risk of unauthorised reuse. The use of random colours periodically reduces the chance of use of duplicate fake seal for theft and adulteration.

Final thought: Choose smart, not just cheap

The cheapest seal may not offer the security your cargo deserves. And investing in the wrong seal is no better than using none. Work with trusted



Security seals act as clear indicators of interference. If a seal is broken, it sends a message—loud and clear—that something's wrong.

manufacturers, know your cargo, and set a process and stick to it.

Because when something goes missing, it's not just the product that's lost—it's trust.

Safcon also specialised in security seals for utilities – electric, gas, water and heat and offers a wide range of innovative solutions for utility meters. SME

About the author:

Rajesh Kumar Banka is the Managing Director of Safcon Seals Pvt Ltd. With an experience of over 30 years in the security seal business, Rajesh Kumar Banka has invented many tamper evident security seals.

(Communication provided by the management of the company)

News Snippet

Johnson Matthey's Catalyst Technologies biz sold to Honeywell for £1.8 bn

Johnson Matthey Plc (JM) has signed an agreement to sell its Catalyst Technologies (CT) business to Honeywell International Inc. for an enterprise value of £1.8 billion on a cash and debt-free basis. The all-cash transaction is expected to deliver net proceeds of approximately £1.6 billion to JM, with £1.4 billion (around 88% of the net amount, or £8 per share) to be returned to shareholders following completion, anticipated in the first half of calendar year 2026.

Following this sale, Johnson Matthey will be repositioned as a more focused and efficient business centred on its global Clean Air and Platinum Group Metal Services (PGMS) divisions. The Group expects this transformation to unlock stronger cash generation and deliver higher ongoing returns to shareholders under a refreshed capital allocation framework.

Chair Patrick Thomas commented, "The sale of Catalyst Technologies and the refreshed Group strategy



create a compelling proposition for shareholders, with strong future returns built on core strengths and focus."

Liam Condon, Chief Executive, added, "This is a pivotal moment in JM's history. The divestment of CT follows our earlier exit from Medical Devices and allows us to reshape JM into a leaner, more focused

business. With leading positions in Clean Air and PGMS, we are well-placed to drive sustainable cash generation and deliver long-term value."

CT is a global leader in catalyst supply and process technology licensing, with a robust pipeline of over 150 projects supporting sustainable technologies. The £1.8bn valuation exceeds average analyst expectations of £945m and provides a strong return for shareholders. From the £1.6bn in net proceeds, JM intends to return £1.4bn to shareholders via an appropriate mechanism to be announced before deal closure. The remaining £200m will be retained for general corporate purposes, improving Group leverage ratios to within a targeted range of 1.0x–1.5x net debt to EBITDA. SME

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“PLI schemes have had a major impact on several Indian sectors.”

Calcom Vision Limited, engaged in the manufacturing of LED lights, battens & other electronic items, has been a pioneer in electronics manufacturing for over four decades. Its advanced 30,000 sq m facility in Greater Noida is equipped with comprehensive R&D and backward integration capabilities. In this interaction with Rakesh Rao, **Abhishek Malik, Executive Director, Calcom Limited**, highlights the impact of government's schemes on the Indian electronics manufacturing sector and the company's growth plans.



Abhishek Malik,
Executive Director, Calcom Limited

Please walk us through the evolution of your business.

As one of the leading innovators in the lighting and electronics sector for 48 years, Calcom Vision has made a name for itself in Original Design Manufacturing (ODM) and Electronics Manufacturing Services (EMS). In the 1970s, we were making computers and were way ahead of the time. We actually made a personal computer and surprisingly, it was the same time when Steve Jobs was working on the first Macintosh in India. We then shifted into making scientific calculators. And then again we shifted to manufacturing televisions and audio systems. From B/W and colour televisions, solar items, LED lighting, home appliances, scientific programmable calculators, and now EV chargers, it has been a very thrilling journey for us.

Now, with the evolution of global trends and market, we also have shifted to ODM and EMS provider. In ODM, we take the lead in creating unique solutions that are tailored to the demands of our customers. We provide goods including BLDC fans, solar-powered systems, and IoT-enabled smart lighting from conception to prototyping, all of which are designed to meet market expectations and the most recent technological developments.

Additionally, in case of EMS, we have a 15000sq.m

facility, fully equipped with advanced tools, automated processes and with in-house backward integration such as plastic extrusion, plastic moulding, an in-house tool room, powder coating plant and pressure die casting plant, where we work on large-scale productions. This enables us to deliver efficient, cost-effective manufacturing without compromising on quality. Our ability to quickly adjust to shifting client demands ensures flexibility while upholding the highest production and delivery standards.

Our development is proof of our flexibility, extensive technical expertise, and dedication to excellence—qualities that have enabled us to establish ourselves as a reliable partner for some of the most prestigious brands.

How do you view the current trends in India's electronics manufacturing sector?

The Indian electronics manufacturing sector has seen a major transition in the past few years, especially on energy sufficient and sustainable lighting. At Calcom Vision, we have shifted towards IoT and R&D technologies keeping in mind the current trends going on in the industry.

IoT is a game changer that is transforming how people use their homes and workplaces. At Calcom, we

use cutting-edge R&D capabilities to develop smart lighting solutions that provide energy-efficient and automated smart lighting solutions. By connecting with smart home ecosystems, our products—like connected indoor and outdoor LED systems—offer customised lighting experiences while maximising energy efficiency. We are right now focusing on user centric designs and advanced IoT innovations, to connect innovation, sustainability, and convenience.

Our wide range of products includes IoT-powered indoor and outdoor LED lighting, smart home lighting systems, and space transformation through affordable, eco-friendly, and intelligent lighting options. By implementing automation and integration, we are changing the future of contemporary homes and businesses, expanding our capabilities, and setting new industry standards.

How has Calcom positioned itself in the evolving Indian electronics landscape?

We have adopted double strategy for expanding its manufacturing capabilities and diversifying its product portfolio, so fully aligning itself with the ‘Make in India’ and ‘Atmanirbhar Bharat’ objectives. Our fully integrated Greater Noida facility is being expanded from 15,000 to 30,000 square meters, doubling our capacity to meet growing domestic and international demand. Quality control, cost effectiveness, and independence are improved by our investments in automation, backward integration, and infrastructure, such as the establishment of internal powder coating and aluminum pressure die casting facilities. These initiatives not only support import substitution but also position Calcom as a resilient and scalable manufacturing partner.

Additionally, we are expanding our business globally as well. Our collaboration with Korea’s Taewha Enterprise has resulted in production of 100,000 Brushless DC (BLDC) fans annually delivering 50–60 per cent more energy efficiency than conventional fans. By investing in automation and backward integration, we enhance productivity and cost-efficiency. This collaboration accelerates localisation, cuts down import dependency, and reinforces our commitment to sustainability and national initiatives like Make in India and Atmanirbhar Bharat. It positions Calcom Vision to expand its market presence, diversify its product portfolio, and actively contribute to India’s energy efficiency goals through innovation-led manufacturing.

What tangible impact have you seen of PLI on the over-all Indian electronics industry?

PLI schemes have had a major impact on several Indian sectors. By encouraging domestic manufacturing, these programs have raised output, created jobs, and

increased exports. Additionally, they have drawn large investments from both domestic and international firms. Notably, the recent enhancement of the PLI threshold from ₹100 million to ₹250 million reflects the government’s commitment to doubling down on manufacturing incentives and enabling greater industry participation. We have observed the positive impact of the PLI Scheme, which has transformed the manufacturing industry in India. In addition to increasing investment and production, it has helped the sector scale its operations and improve its self-reliance. The program aligns with the Atmanirbhar Bharat vision and, combined, they are assisting in establishing India as a competitive global manufacturing powerhouse, fostering innovation, reinforcing supply chains, and facilitating sustainable growth.



The government's ambitious target of achieving \$500 billion in electronics manufacturing by 2030 underscores its commitment to fostering innovation, enhancing value addition, and creating employment opportunities.

What is your outlook on India’s position in the global electronics manufacturing space over the next decade?

India is poised to become a global leader in electronics manufacturing over the next decade, driven by a combination of robust policy initiatives, strategic investments, and a burgeoning domestic market. The Production Linked Incentive (PLI) scheme, with an allocation of ₹229.19 billion, has been instrumental in attracting significant investments and scaling up production capacities. As a result, India’s electronics production is projected to reach \$300 billion by 2026, positioning the country as a key player in the global supply chain. Furthermore, the government’s ambitious target of achieving \$500 billion in electronics manufacturing by 2030 underscores its commitment to fostering innovation, enhancing value addition, and creating employment opportunities. With a focus on reducing import dependency, bolstering component manufacturing, and leveraging its skilled workforce, India is well on its way to establishing a competitive and sustainable electronics manufacturing ecosystem that can cater to both domestic and international markets. 



Six Steps for Smart Factory Transformation

The smart tech world is seemingly never-ending, but a few essential staples create an unshakable foundation. Here, **Emily Newton** suggests six essential ingredients for a transformation to smart factory.



Image Courtesy: www.freepik.com

Automation and manufacturing experts compete to be the most technologically advanced operation in their niche. Smart factory buildout is a combination of quality equipment and commitment to innovation. While organisations take vastly different approaches, several standard elements are vital to a successful transformation.

1. Connectivity and data acquisition

Comprehensive data collection is the foundation of many smart factory requirements. Each device, software and machine should have information-gathering capabilities. Facilities should consider installing sensors to measure metrics like temperature and pressure to maintain environmental conditions.

Other smart manufacturing components include:

- Programmable logic controllers (PLCs)
- Industrial-strength Ethernet
- Wireless communications like Wi-Fi and Bluetooth
- Data acquisition systems

Companies may also use artificial intelligence and machine learning. Though these tools are not must-haves, they can process large volumes of data and enhance competitive advantage. Despite adopting a more complex tech stack, 20 per cent of manufacturers mentioned asset efficiency was a leading advantage of committing to a smart transition.

2. Data storage and processing

Data streams need several safe locations, including cloud servers and external hard drives. Storage is critical for continuous information processing. The hardware and infrastructure also provide peace of mind by backing up data in case of corruption or breach.

Companies can incorporate more advanced storage equipment during smart factory buildout, like data warehouses and lakes, edge computing devices or SQL databases.

3. Analytics and visualization

Not everyone within a facility has the same data science capabilities, so software is vital for creating visualizations of processing efforts. It makes insights more accessible to the broader workforce. The images take raw data and make it digestible, showing staff how well they achieve key performance indicators or customer feedback.

For example, facilities to reduce energy consumption need to view each piece of equipment contributing to high usage to make an action plan. Case studies have shown smart software can lower facility energy requirements by 50 per cent through comparative analysis.

Factories should consider analytics software and reporting tools to make data as versatile as possible. They can be web-based applications or human-machine interfaces. Statistical analysis is another prime opportunity to leverage AI and algorithmic training to expand the usefulness of visualizations.

4. Cybersecurity

Digital transformation promises improved productivity, scaling and profitability. However, the data is unusable when in hackers' hands. Around 51 per cent of businesses think attacks on smart facilities will increase in the future, though 47 per cent say this is of little concern to C-suite executives.

Protecting digital assets is nonnegotiable, as exposure damages reputations and puts stakeholders in danger. Facilities must delegate cybersecurity tasks to

trained professionals who will constantly monitor data resources.

Additionally, factories must vet third parties with strict criteria. Many smart tools and equipment will come from outside vendors and should have equally high security standards. Internal and external defenses may include: firewalls, endpoint security, business continuity planning, virtual private networks, encryption, data minimisation, and intrusion detection systems.

5. Automation and control

Even the most robust team cannot realistically handle terabytes of data. Installing automation technologies is vital for maximising the constantly incoming information. Experts can adjust the controls to automatically generate visualizations based on preassigned programming.

Over time, corporations will identify the most time-consuming elements of the smart transition and experiment with ways to automate specific processes. Software-based algorithms can shoulder some responsibility and reduce machine downtime by 30 per cent to 50 per cent by lowering human error and automating maintenance notifications.

However, there are more tangible applications. For example, an automated guided vehicle could have orders to transport pallets to a department based on the time of day. CNC machines remove tedious, manual cutting tasks using the most effective historical blueprints to inform future models. Other helpful equipment includes actuators, proportional-integral-derivative controllers and advanced remote control panels. The most beneficial tools will vary based on the factory's niche.

6. Skills and training

Education is the final nonnegotiable. Tools, programs and installations only have value if operators know the best ways to employ them in their workflows. Seminars and classes will fill skills gaps, increasing digital literacy in staff across all demographics and tenures.

Facilities can go beyond the conventional classroom and embrace advanced training tools. Assets like simulation software with virtual and augmented reality expose workers to real-life circumstances in safe, controlled environments, giving people hands-on experience without the repercussions of failure.

Learning management systems complement training efforts by tracking each worker's progress and educational needs. This technology will help with one-on-one training and ensure skills coherence and consistency throughout every department.

Smart factory requirements for long-term success

It is inspiring to imagine a completely revamped facility with advanced sensors and data-gathering equipment. The data pours into software and motivates companies to achieve their goals. The smart tech world is seemingly never-ending, but a few essential staples create an unshakable foundation. Focusing on these prerequisites will make customised and disruptive inclusions more effective and sustainable in the long term.

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About the author:

Emily Newton is a tech and industrial journalist and the Editor-in-Chief of Revolutionized magazine. Subscribe to the Revolutionized newsletter for more content from Emily.

News Snippet

B&R presents new automation engineering experience

Automation Studio Code of B&R Industrial Automation (A member of the ABB Group) offers engineering teams a whole new way to interact with their projects and each other. A modern, intuitive interface and advanced engineering features make work easier than ever. DevOps integration ensures smooth, efficient and reliable software delivery pipelines. Explore the new world of engineering with the advanced development add-on for Automation



Studio Code. This development plug-in is perfectly integrated into Automation Studio 6 and makes working on a project with two tools possible without any migration required, fully compatible and flexible. Efficient automation starts with an AI-powered expert coding assistant and the flexibility of cloud-based collaboration, developers can do their best work and deliver smarter solutions faster.

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India to Have 123 Million EVs On-Road by 2032

By 2032, the projected stock of electric vehicles (EVs) is expected to reach approximately 4.3 million, 5.8 million, and 10 million electric four-wheelers under the Worst Case, Business as Usual (BAU), and New Energy Vehicle (NEV) scenarios, respectively, says IESA-CES report.



Source: Freepik

In a significant move towards sustainable development and to achieve net zero emissions by 2070, there is a need to adopt electric vehicles (EVs), this can bolster India's economy while supporting the ambitious target set for 2030—EV penetration of 30 per cent. With robust government policies and an R&D landscape, India's electric vehicle (EV) momentum is impossible to ignore. The report, titled 'India Electric Vehicle Charging Infrastructure Market Overview', by IESA (India Energy Storage Alliance) and CES (Customized Energy Solutions), outlines the potential impact of this transition on the country's infrastructure and energy landscape. According to the report, India is set to see a notable surge in electric vehicles, with an estimated 123 million EVs projected to be on the roads by 2032. This remarkable growth aligns with the National EV Targets (NEV) scenario, highlighting the nation's commitment to boosting sustainable transportation and reducing carbon emissions.

The report estimates that India's cumulative on-road lithium-ion electric vehicle (EV) population increased nearly twelvefold, rising from 0.35 million in 2019 to 4.4 million in 2024. This rapid growth has been fuelled by supportive government policies, such as the FAME-II scheme, which offers demand incentives for electric two-wheelers, three-wheelers, and four-wheelers, along with capital subsidies for public charging infrastructure.

It further highlighted that electric two and three-wheelers together accounted for over 93 per cent of India's on-road EV stock in 2024. In contrast, electric four-wheelers represented around 6 per cent, while electric buses and trucks comprised less than 1 per cent. Notably, the personal electric four-wheeler (E4W) segment has emerged as a key driver of the country's expanding private and home charging ecosystem.

Vinayak Walimbe, Managing Director, CES says, "By 2032, IESA and CES projects that India's on-road EV stock could reach approximately 49 million (Worst Case), 60 million (Business-as-Usual), or 123 million (NEV scenario). The NEV scenario is based on the EV30@30 ambition, assuming that by 2030, EV penetration reaches 80 per cent for electric two- and three-wheelers, 30 per cent for private electric four-wheelers, 70 per cent for commercial cars, and 40 per cent for electric buses—fully aligning with NITI Aayog's vision for transport electrification."

As per the report, in 2024, there were approximately 220,000 personal electric four-wheelers (E4Ws) on roads, most of which depended on Type-2 AC chargers installed in residential areas. By that same year, India had an estimated 320,000 private Type-2 AC chargers, with 70 per cent being 3.3 kW units, 28 per cent 7.4 kW units, and the remaining 11-22 kW units classified as high-capacity. India had roughly 76,000 cumulative public and captive charging points in 2024, with a combined installed capacity of 1.3 GW. While AC-001 chargers made up nearly half of all installed points, the overall installed capacity was dominated by CCS2 chargers, reflecting the growing demand for DC fast charging.

Debmalya Sen, President, IESA said, "To support the projected EV growth, we can anticipate that India's cumulative installed EV charging points—public and captive—will need to grow nearly 12 to 28 times, from around 76,000 in 2024 to between 0.9 million and 2.1 million by 2032. Installed charging capacity must also scale more than 17 times, rising from 1.3 GW to 23 GW, depending on EV adoption and infrastructure utilisation levels."

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Igus E-Chains Receives New Dry-Cleanroom Certificates

A high degree of cleanliness is essential in semiconductor and battery production. As these technologies have to deliver increasing performance, they are becoming more sensitive.



The igus e-chains have now also proven their suitability for dry cleanrooms in long-term tests and received two new certificates from the Fraunhofer IPA.

environmental conditions. 'In dry cleanrooms, many systems have a short service life and need to be replaced after two to three months,' explains **Kira Weller, Product Manager e-chains, igus**. 'Particle emissions in particular can increase significantly due to the dry conditions as the materials are often not designed for this and become brittle.' Therefore, igus has tested its portfolio of cleanroom-compatible energy chains such as the e-skin soft, e-skin flat and E6 in this dry environment. 'Together with the Fraunhofer IPA, we have now developed two new certificates that verify the durability and purity of these e-chains in dry environments with a relative humidity of less than 1 per cent,' says Weller.

Two years ago, igus presented the E6.29, the first certified energy chain for dry cleanrooms. In order to offer customers long-term security, the motion plastics specialist commissioned the Fraunhofer IPA to carry out a test to investigate the ageing behaviour of its e-chains in the dry cleanroom - with positive results. Together with the IPA, the company has now developed new certificates that confirm the suitability of the energy chains E6, e-skin flat, e-skin soft and easy chain E14 for dry cleanrooms in long-term tests.

A high degree of cleanliness is essential in semiconductor and battery production. As these technologies have to deliver increasing performance and be as small as possible, they are becoming more sensitive. This also increases the requirements regarding production environments, which are fulfilled by a combination of dry rooms and cleanrooms. However, not all machine components can withstand these demanding

High degree of cleanliness over 10 months and 15 million double strokes

The two new certificates are divided into 'Pre-aging' and 'Aging behaviour'. For the 'Aging behaviour' certificate, two of the energy supply systems, E6.J and the e-skin flat system, were tested in the dry room over a period of 10 months. In the process, they completed over 15 million double strokes. The systems were tested and certified for their ISO class every two months. The e-skin flat survived the double strokes without problems and received the best possible certification of ISO Class 4. A higher certification is not possible because the test environment (ISO Class 3 dry cleanroom with a relative humidity of less than 1 per cent, corresponding to a dew point of -40°C) does not allow for this. The E6.J was also able to maintain this result for four months, but ended up with ISO Class 5, which is a very good result for battery production.



Analysing India's Clean Energy Goals

India's clean energy ambitions are among the most aggressive globally and success in this arena is not only crucial for the country's own sustainable development but also pivotal for global climate change mitigation, says **Kumar Shivam, Area Sales Manager, Axitec Energy India.**



Source: Freepik

India, one of the world's fastest-growing economies, has been at the forefront of the global clean energy transition. With ambitious targets under its Nationally Determined Contributions (NDCs), India aims to achieve 500 GW of non-fossil fuel-based capacity by 2030, including 280 GW from solar energy alone. However, recent trends indicate a worrying slowdown in clean energy project tenders and auctions, which could significantly hamper progress toward these goals.

Declining momentum with tender and auction slowdown

Tenders and auctions are the primary mechanisms through which renewable energy projects are allocated in India. These competitive bidding processes have helped drive down costs and attract private investments.

However, data from the Ministry of New and Renewable Energy (MNRE) and Bridge to India indicates that renewable energy tenders issued in FY 2023-24 fell by nearly 35 per cent compared to the previous year, and auctions witnessed a drop of nearly 50 per cent in capacity awarded.

This decline stems from a combination of regulatory uncertainty, land acquisition challenges, grid integration issues, and financial instability among distribution companies (DISCOMs) such as:

- Delayed PPAs and payment defaults - DISCOMs often delay signing PPAs or make delayed payments, affecting the financial viability of projects.
- Ceiling tariffs and policy uncertainty - Arbitrary ceiling tariffs imposed by the government reduce profitability, discouraging bidders from participating.

- Grid constraints - Lack of adequate transmission infrastructure results in bottlenecks, especially for large-scale solar and wind projects.

Implications for India's clean energy goals

The slowdown in auctions and tenders has direct implications for India's clean energy targets. According to a 2024 IEA report, to stay on track for its 2030 targets, India needs to add around 40–45 GW of renewable energy capacity annually. However, the current rate is hovering around 15–20 GW per year, indicating a significant shortfall.

If this trend continues this may cause the following:

- India may fall short of its 2030 commitments under the Paris Agreement, undermining global climate goals.
- Private and international investors may shy away due to increased policy and financial risks.
- Delayed expansion in renewables can force reliance on coal and imported fossil fuels, increasing vulnerability to global energy price shocks.
- The renewable energy sector was projected to create nearly 1 million new jobs by 2030. A slowdown could stall employment growth in this critical sector.

Way forward and addressing core issues

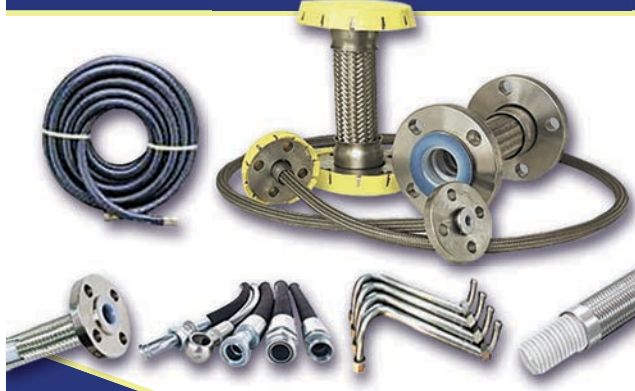
To reverse the decline in tenders and auctions and steer the country back on track, systemic reforms are essential:

- Strengthening DISCOMs - Financially empowering distribution companies through reforms, debt restructuring, and improved collection efficiencies is crucial to ensuring timely payments and signing of PPAs.
- Transparent and investor-friendly policies - Removing tariff ceilings and offering greater predictability in policy frameworks can restore investor confidence. The introduction of Green Open Access Rules (2022) was a step forward, but broader policy coherence is needed.
- Accelerating transmission infrastructure- Investments in green energy corridors, especially under the GEC-II scheme worth INR 12,000 crore, must be fast-tracked to accommodate the surge in renewable energy supply.
- Decentralised and hybrid models - Encouraging rooftop solar, floating solar, and hybrid renewable models (wind-solar-storage) can help diversify generation sources and ease land acquisition challenges.
- Digitalisation and forecasting- Using AI and smart grids for better demand forecasting and integration of renewables can reduce curtailment and improve efficiency.

India's clean energy ambitions are among the most


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aggressive globally and success in this arena is not only crucial for the country's own sustainable development but also pivotal for global climate change mitigation. However, the recent declines in renewable energy tenders and auctions signal a red flag that needs immediate attention. Without swift corrective measures, India risks derailing its energy transition and compromising long-term climate commitments.

The coming years will be critical in determining whether India can transform its clean energy vision into reality. Political will, regulatory clarity, and infrastructure readiness must converge to reignite momentum, ensuring that the world's third-largest emitter turns into a leader in the green energy revolution.

SME



About the author:

Kumar Shivam serves as the Area Sales Manager at Axitec Energy India, where he oversees solar energy solutions, business growth, and sales strategy across North India. With an M.Tech in Solar and Alternative Energy and over five years of experience in the renewable energy sector, he brings a strong blend of technical expertise and strategic sales acumen to his

role. His core competencies include PV system design, solar technologies, energy storage, grid and off-grid solutions, feasibility studies, and solar policy frameworks.



Building the Energy Workforce of the Future

The Climate Change Committee projects that by 2030, low-carbon industries could create between 135,000 and 725,000 new jobs. The energy industry will need a workforce that's tech-smart, adaptable, and ready to lead, says **Avantika Gupta, CEO, OPG Power Generation Pvt Ltd.**



Source: FreePik.com

The energy sector powers progress. A quieter shift is happening, not in turbines or batteries but in its people. Every solar farm, smart grid, and storage system needs someone to make it work. This shift is driving a massive need for skilled workers—engineers, data analysts, project managers, and sustainability specialists—who can build, run, and maintain advanced energy systems. The Climate Change Committee projects that by 2030, low-carbon industries could create between 135,000 and 725,000 new jobs. The energy industry will claim a huge chunk of that talent. This is about building a workforce that's tech-smart, adaptable, and ready to lead. Here's what it takes.

Skills that keep the lights on

Energy systems are getting smarter. Wind turbines predict their own repairs. Solar panels feed data to the cloud. AI spots problems before they cost millions. Workers need to match this pace. They are reading analytics, tweaking automation, and mastering digital tools. One technician caught a fault early using sensors, saving a plant from days of downtime. That's the new reality.

Companies are moving fast. Some set up training hubs to teach drone inspections or carbon capture tech. One firm turned its maintenance crew into drone pilots, cutting inspection times in half. However, technical skills are only part of it. The real spark comes when people work across roles. A worker who troubleshoots a grid and then teams up with coders to boost efficiency is gold. Shared projects and role switches break old divides and fire up new ideas. It's about people who don't just do their job but change how it's done.

Leadership that sets the tone

Leadership today isn't about giving orders. It's about sparking action. Old, rigid styles don't work when tech and goals shift daily. Leaders need to rally teams around big targets—say, cutting emissions by 25 per cent in five years. They trust people to experiment. One manager tested AI for energy monitoring with a small budget. It saved 10 per cent on costs. Now it's standard across the company. That's what happens when you give people room.

Mentorship is just as big. Veterans who've seen shifts like coal to renewables need to share their stories. It is

about showing young workers they matter. In a market where talent picks its future, that's a game-changer. Top leaders also stay open. They learn with their teams, own their gaps, and embrace new ideas. That builds trust. It's leadership that inspires.

Sustainability in every job

Sustainability is the heart of energy now. The Paris Agreement aims to cut greenhouse gas emissions by 43 per cent by 2030 compared to 2010 levels, yet the United Nations warns emissions may climb 10 per cent by then. The latest United Nations Framework Convention on Climate Change (UNFCCC) technical report, set to guide COP28 talks, demands "radical decarbonization" across all industries, urging swift and bold action in every sector. The workforce must live this mission. Training needs to tie to green goals. Teach technicians to squeeze more from turbines, and you cut carbon. Train teams to track emissions, and you build accountability. One company teaches engineers, clerks and even others to measure carbon. It's not just about rules. It's about owning the fight.

Hiring needs a new lens. Look for people who burn for the planet, not just those with degrees. An engineer who's passionate about climate solutions will outwork others. Diversity makes it stronger. Teams with different backgrounds—men, women, different skills—solve problems like grid upgrades better. Data shows diverse

groups make smarter calls. As cleaner tech like biomass retrofits rolls out, everyone, including engineers, planners, and finance, must work as one. Training that builds those bridges keeps projects on track.

A call that can't wait

This isn't a one-off task. It's a constant push. Companies need training that keeps up with tech, career paths that hold talent, and cultures that cheer for growth. They also need to think ahead—skills for hydrogen or new batteries in 2035. The demand is huge. A skilled workforce doesn't just run plants—it reshapes the industry. It turns rules into opportunities, tech into strengths. Most of all, it builds a cleaner world.

The tools are there: strong training, real mentorship, tight teamwork. The job is to use them. Companies that bet on their people today won't just keep the lights on—they'll light the way forward.

SME



About the author:

Avantika Gupta is the CEO of OPG Power Generation Pvt Ltd and a member of the ESG Committee. She drives the company's endeavor at meeting and exceeding the performance metrics of top global companies in this sector by prioritising an objective capital allocation process. She has vast experience in a spectrum of disciplines relevant to the energy and

power sector.

News Snippet

Continental Petroleums bags ₹326 mn order for power distribution project

Continental Petroleums Limited (CPL) has bagged a Rs 326.4 million order from Jaipur Vidyut Vitran Nigam Limited for developing power distribution infrastructure at Jhalawar in Rajasthan on a turnkey basis. Jaipur Vidyut Vitran Nigam Limited has awarded a Letter of Intent to Continental Petroleums for development of distribution infrastructure work for segregation of 11KV mixed feeders at Jhalawar of Jaipur Discom under the revamped reforms-based and results linked distribution sector scheme.

Madan Lal Khandelwal, Chairman and Managing director, CPL, commented, "We are glad to have bagged this prestigious order for developing the distribution infrastructure for Jaipur Vidyut Vitran Nigam Limited,



Power transmission and distribution EPC has been a core area of focus for us and we are looking to strengthen our presence in this segment in a big way moving forward. We believe this order will not just give a boost to our topline but will also help enhancing our presence and reach in the EPC

business across the country."

Continental Petroleums Limited is one of the leading manufacturers of industrial lubricants & greases in India, manufacturing a wide range of premium quality lubricants for automotive & industrial application. The company is also engaged in common treatment disposal/incineration of hazardous waste viz. solid, liquid, and aqueous and EPC projects particularly in power transmission and distribution infrastructure.

SME



"CGTMSE ensures collateral-free credit for MSEs."

Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) was formed with the intention of helping micro and small enterprises (MSEs) by providing guarantee to enable them access credit leading to setting up viable businesses. In this interview with Rakesh Rao, **Manish Sinha, CEO, Credit Guarantee Fund Trust for Micro and Small Enterprises**, explains how CGTMSE is proactively working on facilitating finance and capacity-building for MSEs amid market uncertainty.

How is CGTMSE assisting the growth of Indian industries?

The primary objective of CGTMSE is to facilitate collateral-free credit to Micro and Small Enterprises (MSEs), thereby fostering entrepreneurship and financial inclusion. CGTMSE offers credit guarantee coverage for loans up to ₹10 crore. This allows lenders to extend credit to eligible MSEs without requiring collateral security or third-party guarantees, which are often barriers for small businesses. By mitigating credit risk for lending institutions, CGTMSE encourages wider access to institutional credit for MSEs. The scheme has been instrumental in promoting first-generation entrepreneurs, women-led enterprises, and those from underserved and underrepresented segments. In doing so, CGTMSE has significantly contributed to strengthening India's entrepreneurial ecosystem and enhancing the reach of formal financial services to grassroots businesses.



Manish Sinha,
CEO, CGTMSE

- Low awareness among MSEs about available financial products and schemes tailored to their needs.

CGTMSE addresses these challenges by offering collateral-free credit guarantee coverage to lending institutions for loans extended to eligible MSEs. The guarantee coverage ranges from 75 per cent to 90 per cent, depending on the profile of the borrower and the nature of the enterprise. This significantly reduces the risk for lenders, making them more willing to support MSEs.

In addition, CGTMSE has developed tailored schemes to support women entrepreneurs, Scheduled Caste/Scheduled Tribe entrepreneurs, MSEs operating in aspirational districts, and informal micro enterprises. These targeted interventions have been instrumental in enhancing financial inclusion, ensuring timely credit access, and enabling MSEs to scale operations and contribute to India's economic development.

What are the key challenges faced by MSEs?

MSEs face a host of challenges when it comes to accessing formal credit. These challenges include:

- The lack of collateral, which prevents many enterprises from qualifying for loans from financial institutions.
- Limited credit history and inadequate financial documentation, which make it difficult for lenders to assess their creditworthiness.
- A high perceived risk by lenders, often leading to reluctance in extending credit to small businesses.
- Delays in payments and inefficient working capital cycles that strain liquidity.

With the new classification of MSMEs coming into effect from April 1, 2025, what impact do you foresee on the funding opportunities for MSEs?

The revised classification of MSMEs is expected to significantly enhance funding opportunities for micro and small enterprises by introducing more clarity and flexibility in defining enterprise size based on investment and turnover thresholds.

This change is likely to:

- Expand the base of enterprises eligible under various credit-linked schemes, including those supported by CGTMSE.
- Facilitate graduated and uninterrupted access to finance, thereby enabling enterprises to grow without

the fear of losing MSME benefits as they scale up.

- Encourage formalisation, better record-keeping, and improved financial documentation, which in turn make enterprises more bankable and creditworthy.

CGTMSE is currently aligning its operational frameworks and guarantee mechanisms to accommodate the revised classification norms. The Trust is committed to ensuring that more enterprises can benefit from collateral-free, timely credit under the new definition and continue contributing to the growth of the Indian economy.

Will the new tariff war that is now raging on in the world have any impact on Indian MSEs?

Yes, the ongoing global tariff war poses several challenges for Indian MSEs, particularly those involved in international trade—either as exporters or importers of raw materials and components. The potential impacts of such geopolitical tensions include:

- A rise in input costs due to increased tariffs on imported machinery, raw materials, and intermediate goods, which can directly affect profitability.
- A reduction in the competitiveness of Indian exports if other countries impose retaliatory tariffs, making Indian products costlier in global markets.
- Disruption in global supply chains, which could delay production cycles and strain delivery schedules.
- Increased uncertainty and volatility in demand in international markets, which may affect cash flows and financial planning for MSEs.

To counter these risks, MSEs will need to build financial resilience, diversify their markets, and explore domestic alternatives for sourcing and

production. CGTMSE plays a pivotal role in this context by ensuring that MSEs continue to have access to collateral-free credit. This helps them invest in upgrading operations, adapting to market shifts, and expanding into new territories.

Are there any new plans for facilitating finance for MSEs in the manufacturing sector?

Yes, CGTMSE is proactively working on several forward-looking initiatives to meet the evolving needs of MSEs, with a special focus on the manufacturing sector which is vital for India's GDP growth and employment generation.

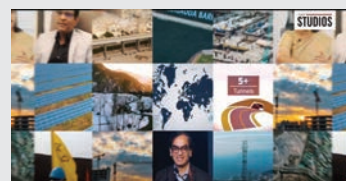
Some of the key initiatives include:

- Enhanced guarantee coverage for manufacturing MSEs, including special incentives for women-led enterprises and units certified under the ZED (Zero Defect Zero Effect) scheme. These provisions are aimed at promoting high-quality, sustainable manufacturing practices.
- Dedicated guarantee schemes to formalise informal micro enterprises, facilitated through platforms like the Udyam Assist Platform, which helps bring GST-exempt businesses into the formal economy.
- Collaborations with State Governments to design and implement sector-specific co-guarantee models, tailored to the needs of regional manufacturing clusters and niche industries.
- Ongoing efforts to explore capacity-building partnerships that focus on enhancing credit readiness, improving financial literacy, and strengthening regulatory compliance among manufacturing enterprises.

These initiatives are aligned with CGTMSE's vision to not only support financial inclusion but also to build long-term resilience and competitiveness within the Indian manufacturing ecosystem.

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Igus' Positional System for Precise Adjustment

Users can adapt the new linear system to their application. The rails are available in lengths of up to 3,000mm and as hard anodised, silver anodised or black anodised versions.



The new linear guide with the PTFE-free drylin WWP locking carriage can be used in a variety of ways, be it in coffee machines, for adjusting headrests and screens or for sofas with leg rests.

Whether moving to specified spots with a sensor, adjusting a headrest to the desired height or getting a screen into an ergonomic position until it clicks: igus has launched the new linear guide with PTFE-free drylin WWP locking carriages for simple positioning tasks, e.g. in the interior. The solution is intuitive, compact, durable and, thanks to the material combination of lubrication-free high-performance plastics and aluminium, particularly light, hygienic and low-maintenance.

People like comfort and appreciate the possibility of individualisation. It is therefore not surprising that, as technology advances, more and more objects are identified that can be individually positioned for comfortable and ergonomic use - from sofas with leg rests and screens in vehicle cabins to headrests and armrests on aeroplanes and trains. Adjustment is particularly convenient when it requires as few movements as possible. "A lot of manufacturers want linear guides with a snap mechanism that are as minimalist as possible and do not require levers or other complex mechanical and electrical components," says **Michael Hornung, Product Manager drylin Linear and**

Drive Technology, igus. "We have therefore developed the new linear guide drylin WWP with snap function, which allows uncomplicated and cost-effective positioning."

Precise, flexible and strong adjustments

The linear guide consists of two components: a carriage made of high-performance plastic, which can be connected to the object to be moved, and an aluminium linear rail, on which the movement takes place - for example the adjustment of a sofa headrest. The special feature: at regular intervals, the rail contains small polymer rings that are just a few millimetres. On the underside of the carriage there is a steel ball that sits on a spring with a pretension that can be chosen. As soon as a predefined position is reached during adjustment, the ball engages with an audible click and the object remains firmly in position. The maximum static load capacity is 100N vertically to the guide and 50N horizontally to the guide. To release the carriage, the user only needs to apply enough force to push the ball out of the recess. The system then moves freely again until the ball engages in the next position. Hornung says, "The system is very intuitive, durable and fail-safe thanks to the absence of complex mechanical components." This is also confirmed by tests in the company's own 4,000m² test laboratory.

65 per cent lower weight and dry-running operation without lubrication

Users can adapt the new linear system to their application. The rails are available in lengths of up to 3,000mm and as hard anodised, silver anodised or black anodised versions. For customised drilling patterns, igus also offers rail profiles without holes. The polymer carriages are available in two sizes: installation size 1030 (slide dimensions: L60xW56xH24mm) and miniature size 0620 (slide dimensions: L40xW32xH14 mm). "With these dimensions, the system is more compact and lighter than systems with recirculating ball bearings. The lightweight design also means that it is flexible and can be transported, which makes it ideal for interiors where space is often at a premium," says Hornung. 



Gandhi Automations' Dock Levelers Redefine Loading Bay Operations

Available in capacities of 6, 9, and 12 tonnes, GAPL's dock levelers are versatile enough to meet a wide range of operational needs.



Edge-of-dock leveler

Gandhi Automations Pvt Ltd (GAPL) is recognised as India's No.1 entrance automation and loading bay equipment company due to its relentless pursuit of excellence, innovation, and a steadfast commitment to delivering quality. Since its inception in 1996, GAPL has been at the forefront of manufacturing, importing, distributing, and installing products that are both reliable and user-friendly.

Among its range of innovative solutions, dock levelers play a crucial role in enhancing the efficiency and safety of loading and unloading operations. GAPL offers electro-hydraulic, pneumatic, and mechanical dock levelers, each designed to ensure fast, smooth, and safe transitions between vehicles and loading bays. Designed to meet EN 1398 standards, these dock levelers are engineered for the most demanding environments. Available in capacities of 6, 9, and 12 tonnes, GAPL's dock levelers are versatile enough to meet a wide range of operational needs.

To meet diverse loading needs, GAPL provides a

comprehensive range of dock levelers:

Radius lip dock levelers: Available in various sizes and capacities, radius lip dock levelers connect the dock with the truck bed, facilitating easy drive-on and drive-off operations for forklifts and other equipment. Their self-cleaning lip-hinge system prevents the accumulation of dust and dirt, ensuring smooth operation.

Telescopic lip dock levelers: Ideal for situations where vehicles cannot dock closely, such as sea containers or side-loading railway wagons, these levelers come with an extendable lip that can reach up to 1 meter, providing flexibility in various loading scenarios.

Edge-of-dock levelers: Compliant with the latest EN 1398 safety standards, our Edge-of-Dock (EOD) levelers are ideal for facilities without an existing pit, where the height difference between the loading dock and the truck bed is minimal. These levelers are particularly suited for environments with consistent truck heights, such as warehouses, distribution centres, and retail facilities. EOD levelers offer an efficient, space-saving solution for quick loading and unloading in locations where installing a pit-style leveler is not feasible. They offer reliable performance and safety for efficient loading operations.

Forklift roll-off barrier lip dock levelers: The newly introduced forklift roll-off barrier lip dock leveler includes a run-off protection feature that prevents accidental forklift roll-off when the overhead door is open and no trailer is present. This leveler combines the benefits of hydraulic dock levelers with the added security of a robust barrier.

All GAPL's dock levelers can be seamlessly interlocked with existing doors and vehicle restraint systems, ensuring top-notch performance and security in every loading operation.

SME

For details, contact Gandhi Automations Pvt Ltd, Mumbai, on Tel: +91 22 6672 0200, 6672 0300; Email: sales@geapl.com, or visit www.geapl.com

(Communication provided by the management of the company)

PNEUMATIC STRAIGHT GRINDER

PFERD offers a wide range of pneumatic straight grinder PGAS 1/750.

Features:

- The drive is equipped with a collet tool mounting for mounted tools. The exhaust air flow of the air grinder is at the back. The air grinder with removable spindle sleeve has a high rotational speed. It has to be used with oil. The air grinder with its slim and lightweight design has a ring throttle version.
- Its advantages include: Ideal for the recommended mounted tools thanks to the collet mounting; no dust turbulence on the workpiece side; removing the spindle sleeve enables narrower and harder-to-reach areas to be accessed more easily; the high rotational speed affords the drive a high cutting speed for tungsten carbide burrs and grinding points. The drive with a ring throttle can be used for continuous use.

Easy guidance thanks to slim, lightweight design.

About the Company: PFERD engages in development, production and support and distribution of tool solutions on jobs for surfaces and material cutting.

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Contact:

PFERD, Bengaluru

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Mobile: 09880665415, 09741481117

Email: sales@swit.in



HIWIN INTERNAL RECIRCULATION TYPE BALLSCREW

BK Engineers Pvt Ltd offers a wide range of Hiwin internal recirculation type ballscrew.

Features:

- Internal recirculation type ballscrew, consists of the screw spindle, the ball nut, the steel balls and the ball return caps. The steel balls make only one revolution around the screw spindle.
- The circuit is closed by a ball return cap in the nut allowing the balls to cross over adjacent ball tracks. Since the ball return caps are located inside the nut body, this is called the internal recirculation type ballscrew.
- Adapted to normal leads and Outer diameter of nut is small.

About the Company: Established in 2014, IBK Engineers Pvt Ltd, is engaged in the wholesaling, supplying, distributing and trading of deep groove ball bearing, mechanical bearing, roller chain, steel rear sprocket, safety equipment, automotive components, electric equipment, etc.

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Contact:

IBK Engineers Pvt Ltd, Bengaluru

Tel: 080-26321112 Mobile: 09880566644

Email: raju.kn@ibizkart.com



TERMINAL ENCLOSURES

Werner Electric presents the Terminal Enclosures, designed for easy installation and maximum flexibility in cable management.

Features:

- Effortless Wall-Mounting: The rear panel is pre-drilled with holes, allowing for quick installation with a wall mounting bracket or direct wall attachment.
- Flexible Interior Configuration: Equipped with integral perforated system strips, offering a 12.5mm pitch pattern for versatile interior setup and optimized cable routing.

About the Company: Werner Electric is committed to delivering high-quality, innovative products that meet industry needs. With years of expertise, the company combines user feedback and cutting-edge design to provide solutions that ensure reliability, efficiency, and long-lasting performance.

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Contact:

Werner Electric Private Limited, Mysore

Mobile: 07353947299

Email: info@wernerelektrik.com



FLOW HOUR COUNTERS

HTM Hydraulics Pvt Ltd offers a wide range of flow hour counters.

Features:

- Ideal for recording the operational time of equipments in the hire market.
- Monitoring the service interval of attachments. Recording the time use of shared hydraulic tools between many users. This battery life is: 10+years.
- Max flow capacity: 200 lpm; max, working pressure: upto 420 bar.

About the Company: HTM Group has been in the field of hydraulics since 1995. Their expertise in the industry makes us one of the leading competitive companies in the field of trading, marketing & servicing and straining for customers in India and abroad. HTM group has headquarters in Bangalore, India.

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Contact:

HTM Hydraulics Pvt Ltd, Bangalore

Tel: 080-41572101 Mobile: 09741165877

Email: info@htmhydraulics.co.in,

sales@htmhydraulics.co.in



IMPACT SOCKETS

Reliable Trade Links offers a wide range of impact sockets.

Features:

- Impact sockets are designed for use with powered impact wrenches or 'drivers'. Impact wrenches can be powered pneumatically (by compressed air), electrically, or hydraulically (oil).
- The combination of an impact wrench and impact socket can deliver greater torque to the head of a fastener than can be achieved with a manual wrench.
- Its features include: Can be used with both impact and powered turning tools as well as manual ones; Less chance of injury from sockets shattering; Can be used to apply greater torque to a fastener.



About the Company: Reliable Trade Links was established on April 1999. They are a team of quality professionals in the field of Engineering, sourcing and commercial activities, with the synergy of nearly 90 man-years of hands-on experience, we have created

Reliable Trade Links organization.

Contact:

Reliable Trade Links, Chennai

Tel: 044-26547920

Mobile: 09381045752

Email: teamreliable@rediffmail.com,

treliable@rediffmail.com

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MILLING APPLICATIONS

Schunk Intec India Pvt Ltd offers a wide range of milling applications.

Features:

- It is extremely high holding forces for machining on machining centers.
- Magnos from Schunk offers extremely high holding forces for milling applications with very high machining parameters. Magnos mfrs magnetic chucks with square poles are especially suited for the deformation-free clamping in general milling applications.
- 5-sided workpiece machining with pole extensions. Very high holding forces for milling machining. Deformation-free and low-vibration clamping. Only single power supply needed for MAG/DEMAG. Secure and fast clamping of the work pieces.



About the Company: Schunk Intec India is engaged in products distribution and supply of industrial automation systems, automation work holding, tool holding, heat shrink tool holder, etc.

Contact:

Schunk Intec India Pvt Ltd, Bangalore

Tel: 080-40538999

Email: rakhi.singh@in.schunk.com,

info@in.schunk.com

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HIGH SPEED TRIPPING RELAY TWO ELEMENT RELAY - JRV 181X2

JVS Electronics Pvt Ltd offers a wide range of high speed tripping relay two element relay JRV 181x2.



Features:

- High speed tripping relays are voltage operated, attracted armature type with 5 contacts per element. Each element is enclosed in a dust proof moulded, transparent, polycarbonate cover.
- Radio metal is used for the magnetic components such as the armature, the core and the yoke of the tripping relay to ensure good electrical performance.
- The contacts are made of phosphor bronze and are nickel plated. The contact tips are made of pure silver.
- High speed interface between the protection system and the circuit breaker Functions requiring a number of simultaneous switching operations, interlocks in control and closing circuits.
- Its features include: wide range of voltage & contacts configurations; Electromechanical design; Hand reset contacts; Protective transparent cover for the element; Compact panel mounting case.

About the Company: JVS Electronics Pvt Ltd is an exporter, manufacturer and supplier of audio indicating instruments, visual indicating instruments, electrical indicating instruments, etc.

Contact:

JVS Electronics Pvt Ltd, Bangalore

Mobile: 09448288863

Email: bangalore@jvselectronics.in

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END MACHINING CENTRE

Brisk Tech Engineers offers a wide range of end machining centre.



Features:

- This machine is suitable for tractor manufacturing and conveyor manufacturing applications. Cutting edge operations are as follows: Rotary triller: facing, ID/OD chamfer, turning, threading. Idler conveyor pipe-boring, facing, ID/OD Chamfer.

About the Company: Brisk Tech Engineers was established in 2003. A design consulting firm developing products designed for various machine tools.

Contact:

Brisk Tech Engineers, Bengaluru

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Mobile: 09448479855, 07892743816

Email: info@brisktechengineers.com, briskanand500@gmail.com

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CABLE DRAG CHAINS

Elektromag offers a wide range of metallic/plastic cable drag chains.

Features:

- This Elektromag drag chains enable the conveyance of flexible cables/hoses, etc to movable units with maximum reliability.
- Its advantages of Elektromag cable drag chains is avoidance of mechanical strain on the cables/hoses.
- No tensile stress or compression, no frictional wear as there is no relative movement between the cables/hoses and the cable drag chain, no bending below an established radius, no crushing, buckling or forming of loops or torsion strain.

About the Company: Established in the year 1958, Elektromag is engaged in manufacturing of metallic/plastic cable drag chains and supplying to various steel plant, machine tools, cement, foundries, etc.

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Contact:

Elektromag Methods, Mumbai

Mobile: 09820192772

Email: cablereels@elektromag.com



VIBRATORY FURNACE CHARGER

Elektromag-Joest Vibration Pvt Ltd offers a wide range of vibratory furnace charger.

Features:

- This vibratory furnace chargers are a cost effective method of increasing productivity and quality of melt.
- With constant improvement in technology, furnaces require rapid and uniform charging to keep pace with the melting power of the system for which the Furnace chargers are the optimum solution. .
- Due to controlled feed, the hot metal splashing is avoided and the charger can be operated from a framed plate by the operator without actually being near to the furnace.

About the Company: Elektromag-Joest Vibration Pvt. Ltd., is a leading manufacture of Vibrating equipments for foundry, steel, mining, quarrying, chemical, food, recycling, etc.

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Contact:

Elektromag-Joest Vibration Pvt Ltd, Mumbai

Tel: 022-66624444

Email: vibration@elektromag.com

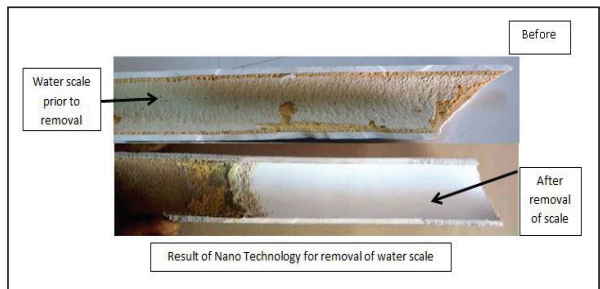


FEATURED PRODUCT

HEAT EXCHANGER SCALE REMOVAL COMPOUND -HESR-300

Process & Technology offers heat exchangers scale removal compound -HESR-300.

Heat exchangers, boilers, cooling towers and pipes handle turbulent water. Depending on the source of water a scale is formed in the equipments. This scale is a composite material of carbonates, sulphates, phosphates, silicates and fluorides of calcium, sodium, magnesium etc. This scale is stubborn, hard and dense. Sometimes this scale is as hard as stone. The scale formed by water causes problems of higher consumption of energy, lower flow rate, cost of replacement for plant and equipment, increased downtime of machine and sometimes even a total replacement of plant. It is therefore essential to remove this unwanted water scale.



This scale can be removed by a modern technology known as Nanotechnology. The Nanotechnology removes the scale without any harm to the substraat material and without causing any pollution problem and hazards to the operating work force. The time of removal of scale depends on its thickness, flow velocity, temperature of water pressure differentials and the source of water. The adjacent photographs show before and after results of removal of water scale by use of Nanotechnology. The technology can also be applied for removal of scale while the technology is suitable for a closed loop water circulation system; it can also be used for an open loop circuit.

Contact:

Process & Technology

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Contact Person: Mrs. Asha Sayanatama Shaw

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Mob- 98798 38448

Email: process_technology@yahoo.com

LARGEST WIRING HARNESS, CABLE LOOMS

Miracle Electronic Devices Pvt Ltd offers a wide range of largest wiring harness, cable looms.



Features:

- One of the largest cable harness manufacturers in India, Miracle Electronics specializes in offering premium wire harness solutions for a range of industries, such as industrial, automotive, and aerospace. Being the most reputable looms manufacturer in India, we focus on providing our customers with specialized, dependable, and effective wire harnesses that satisfy their exacting requirements.
- Wire harnesses for aerospace industry: Miracle Electronics, a certified manufacturer with the largest wiring harness manufacturing in India, carefully builds aerospace wire harnesses to endure vibration, mechanical stress, and high temperature fluctuations – all typical issues in the aerospace environment. Their wire harnesses are especially designed to satisfy strict industry requirements, including resistance to environmental factors, durability, and weight efficiency.
- The reliability and effectiveness of wire harnesses are crucial in the extremely specialized field of aircraft engineering. Their wire harnesses offer a more compact, safe, and well-organized way to connect several cables than free wires.
- Being one of the largest cable harness manufacturers in India, we prioritize reducing installation faults by providing chances for process standardization.
- Customized solutions by Miracle Electronics: Miracle Electronics is aware that the requirements of various applications vary. As a result, we offer wiring solutions that are specifically tailored to our clients' needs.
- Their products are made to the highest standards, guaranteeing reliable and durable performance in a range of applications.
- Comprehensive product range: Miracle Electronics offers an extensive range of wire harness solutions, including: Single & Discrete EMI Cables; EMI Shielded Cable Harnesses; Wiring Harness Multiwire; Flat Cable Harness Assembly; Airborne Looms; Ribbon Cable; Harness Assembly; Military Looms Assembly.

About the company: Miracle Electronics is a renowned Transformer manufacturer in India, engaged in manufacturing Power transformers, Toroidal transformers,

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EI transformers, SMPS transformers, Medical Isolation Transformers.

Contact:

Miracle Electronic Devices Pvt Ltd,
Bangalore Tel: 080-28362750
Email: sales@miracle.net.in

TWIN SPINDLE CNC CHUCKER - MW80G

Meiban Engineering Technologies Pvt Ltd offers a wide range of twin spindle CNC chucker - MW80G.

Features:

- Muratec MW80G is a compact twin spindle turning machine with Gang tooling (Linear) concept.
- Machine offers high precision with direct spindle drive and construction. MW80 is suitable for Hard part turning with short cycle times.
- This small machine comes with a 6" chuck and can accommodate up to 4 gang tools. MW80 has a Spindle power of 7.5kw and speeds up to 6000 RPM are available. It can turn parts up to 80mm diameter and length of up to 50mm.



- Linear Tooling eliminates turret Indexing time for significant cycle time reduction. Loader is available with swivel or horizontal types.
- With standard Loading/unloading time as low as 3 secs, MW80 is an optimal solution for high-speed turning and for simple parts such as small bearings, rings, gears and hard part turning.
- Most widely used applications are: Bearing Outer and inner, Differential Pinion and side gear, compressor wheel etc.
- Machine can be supplied with either single or twin gantry loaders. Muratec is a global leader in providing fully integrated built-in automation for a variety of applications.

About the Company: Meiban Engineering Technologies Pvt Ltd is a solution provider in the field of automation and turn key projects for manufacturing automobile and sheet metal components.

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Contact:

Meiban Engineering Technologies Pvt Ltd, Bangalore
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Email: office@meibanengg.com

CONCEPT-HYDRO GRIPPING SYSTEMS

Concept Engineers offers a wide range of concept-hydro gripping systems.

Features:

- The advent of CONCEPT-hydro gripping system opens new ways in mastering the most difficult situation with uncompromising thoroughness. Sophisticated technology, perfect construction and special materials make the clamping devices a generation ahead of the conventional work holding fixtures in clamping force, clamping accuracy and load torque.
- Whereas remarkable technical advance are being made on machines and machine tools, clamping fixtures have scarcely changed.
- CONCEPT-Hydraulic holding devices on the one hand reduce cost and improve quality in almost all areas of machining and inspection while on the other solve the most difficult clamping problems.
- The very high repeatability and reliability factors reduce rejections to a minimum. There is no deformation of work piece or damage to the clamping surface - though the clamping force is a maximum of 5 Kg/mm - as the clamping force is transmitted evenly to the entire clamping surface. This means even very short or thin walled components could be securely clamped with the least danger of canting or deformation.
- CONCEPT-Hydraulic holding devices have no loose components (collects or liners) making pressure coolant applications on chucks direct and efficient.
- Flexibility in design and application of hydraulically controlled holding devices lies in the fact that they can be adopted to perform any machining operation - turning, copy turning, boring, drilling, gear cutting, gear finishing, etc.
- Concept Hydraulic expanding arbors and chucks could be applied successfully in inspection of components accurately.
- A selection of arbors and chucks in standard sizes and average bearing lengths are generally available from stock. An outline of the operations performed with pertinent machining data or inspection techniques should accompany your enquiry.

About the Company: Concept Engineers, the pioneer in precision engineering designs and tools was established in 1984 by a team of young, dynamic and professional engineers to manufacture a range of precision Concept

Hydraulic Chuck and Mandrels/Arbors, Taper Collets and Hydraulic Fixtures, etc.

Contact:

Concept Engineers, Bangalore
Tel: 080-25258885 Mobile: 09845017701
Email: design@conceptarbors.net



SHADED POLE GEARED ELECTRIC MOTORS

Delco Fans Pvt Ltd offers shaded pole geared electric motors for light duty applications.

Features:

- Designed specifically as per customers requirements; Available in 2-pole, single phase design; Wide range of motors from 5 Watts to 30 Watts; Output RPM available from 5 to 140; Temperature rise is limited to 40 D Celcius.
- Available in 110 VAC and 230 VAC; Ball Bearing type; Shaft available EN8 and SS 304; Output Shaft diameter 8 mm; Length available from 25 mm to 65 mm; Motor can be mounted Horizontally and Vertically; Motor cooling blade also provided; Thermal protector can also be provided; Brass Gear Train.
- It application areas: Oil Skimmers; Popcorn Machines.

About the Company: Delco Fans Pvt Ltd established in 1975. Their manufacturing range consists of FHP Electric Motors, Geared Electric Motors, Centrifugal Blowers, etc.

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Contact:

Delco Fans Pvt Ltd, Thane
Mobile: 09769201564
Email: delcofans@gmail.com



DUMP TUBES

IndiTech Valves Pvt Ltd offers a wide range of dump tubes.

Features:

- Dump Tubes play a critical role in Turbine Bypass applications. Due to the low-pressure conditions at the outlet of the Turbine Bypass Valves, the specific volume of steam dramatically increases, which calls for large pipe sizes.
- By deploying Dump Tubes, the size of the Turbine Bypass Valve and pipe sizes between the Bypass Valve and the Condenser can be reduced considerably, thereby reducing the overall cost of the system.
- Its features include: Precise steam temperature control; Customised to Maintain desired upstream conditions; Single-Stage/Multi-Stage Pressure Reduction options available to reduce noise to the required specification.

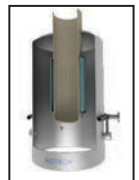
About the Company: IndiTech Valves Pvt. Ltd., established in 2000 under the leadership of Mr. Chandrashekhhar Indi, has evolved to become a leading control valve manufacturer in India.

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Contact:

IndiTech Valves Pvt Ltd, Pune
Tel: 020-25420021
Mobile: 09518330514, 7066040407
Email: info@inditechvalves.com



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METERING CHAMBER

Excel Power Switchgear Pvt Ltd offers a wide range of metering chamber.

Features:

- Metering chamber is equipped on top of the breaker chamber and encased separately from the high voltage section.
- Based on customer's specification, protective relays, meters, control switches, indicating lamps and other pilot devices are flush mounted on the hinged and lockable front door.
- Sufficient space is available inside the chamber to arrange all the secondary control equipment, fuses, MCB's, auxiliary relays, terminal blocks, etc.

About the Company: Excel Power Switchgear, a high tech manufacturing unit established in 1998, is engaged in R&D, production, and manufacturing of low & medium voltage switchgear. Since then, Our company has displayed a rapid growth in the switchgear industry by attaching primary importance to customer oriented

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approach and by producing quality products.

Contact:

Excel Power Switchgear Pvt Ltd, Chennai
Tel: 044-22254870
Email: sales@excelpower.co.in



HOSE REELS – AIR / WATER / OIL

Vijay Air Control offers a wide range of hose reels – air/water/oil.

Features:

- An included spring works to retract a hose into the device automatically.
- A contained hose solves the short of air consumption for air tool owing to a large inner diameter.
- A ratchet system applied for the device can keep a tool suspended at any position on the hose travel where your want. Available in both closed body construction as well as open today.
- Its bore sizes: Ø16, 20, 25, 32, 40, 50, 63, 80 and 100; Conforms to ISO 21287 standards.

About the Company: : Vijay Air Control is a one large workplace where work is done and then put on the market in the form of products and services. This work must be benefit if it is to hold its own in the face of competition.

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Contact:

Vijay Air Control, Bengaluru
Tel: 080-23148871, 23141136
Mobile: 08951101436, 09880652082
Email: saivacblr@vacpneumatic.co.in



MEASUREMENT SOFTWARE

Blum-Novotest Measuring & Testing Technology Pvt Ltd offers a wide range of measurement software.**Features:**

- User-friendly software for workpiece measurement and temperature compensation with BLUM touch probes. y.
- They can be used both for workpiece referencing as well as for measuring during the production process.
- Optimum exploitation of potential of the BLUM touch probes.
- NC-based measuring cycles for measurement of the Kinematics of 4 or 5 axes milling machines. Measurement of the accuracy and correction of the kinematics of 1 or 2 rotary axes. Identification of machine problems caused by incorrect machine settings, collisions or wear.

About the Company: Blum Novotest Measuring & Testing Technology Pvt Ltd has made a name for itself in the list of top suppliers of bore gauge, radio receiver in India.

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Contact:

Blum-Novotest Measuring & Testing Technology Pvt Ltd, Bangalore
Tel: 080-23185468 Mobile: 09075004435
Email: info@blumnovotestindia.in



PRECISION TWIN MACHINE VICE

B R Precisions offers a wide range of precision twin machine vice.

Features:

- Twin machine vices are capable of clamping two pieces simultaneously with one single movement of the handle keeping the total length constants.
- This makes it ideal for machining series of work pieces in machining centers. The exterior clamping system towards the center makes the elevated forces in the clamp area to be compensated dynamically thus avoiding deformations.
- Grinding of all surfaces, Possible working positions supported on the base on the side or vertically on the head. Suitable for working in horizontal and vertical machining centers Squareness and parallelism accuracy at 0.02 Microns.

About the Company: B R Precisions is dedicated to the manufacturing of clamping solutions; our main products are high pressure and precision vices.

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Contact:

B R Precisions, Bangalore
Mobile: 09845208854, 09449648171
Email: brvices@rediffmail.com, brprecisions@gmail.com



POWER PRESS

Universal Machine Tools Corporation offers MS body, fixed/inclinable type power press.

Features:

- The frame is off all steel construction, fabricated from rolled steel plates with suitable ribbings.
- The clutch is of pin/rolling key type, crankshaft is made of special alloy steel, fitted with bronze bushes for smooth working, properly sized fly wheel gears all of steel cast / fabricated, table and ram made of heavy-duty cast iron, perfectly aligned to each other. Inclinable type presses are provided with inclining mechanism.
- These press are available in various sizes: 'C' type / inclinable – 3 tons to 300 tons; 'H' frame 20 tons to 300 tons.

About the Company: Universal Machine Tools Corporation, established in 1981, is one of the leading companies in the machine tool industry.

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Contact:

Universal Machine Tools Corporation,
Bangalore
Mobile: 09845006959, 09844199559
Email: universalblr@gmail.com,
info@universalblr.com



BELT DRIVE SPINDLES – MV0910

Secon Technological Solutions Inc offers a wide range of belt drive spindles – MV0910.

Features:

- Offered two types of high precision spindles for CNC machining centers; belt drive spindles and direct drive spindles for a versatile range of machining options.
- The five series of CNC machining center spindles are all very rigid and feature very low run out tolerances, with speeds up to 12,000rpm.
- These high precision, high speed spindles are available in a range of sizes and are guaranteed to offer smooth operations and a long service life.

About the Company: Secon Technological Solutions Inc. is engaged as a manufacturer, trader, service provider, distributor of CNC machines tools, preventive maintenance and consultancy services.

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Contact:

Secon Technological Solutions Inc,
Bangalore
Telefax: 080-23575752
Email: secontech2000@gmail.com,
secontech@hotmail.com



AIR FILTER REGULATORS

Placka Instruments India Pvt Ltd offers a wide range of air filter regulators.

Features:

- This air filter-cum-pressure regulator removes completely the moisture and dust particles, and provides the exact pressure constantly at varying air demands.
- Its compactness and highly accurate performance for a long period with minimum of maintenance make for an optimum compromise between the ideal and the practical, consistent with end-use. This economically priced unit is extensively used for process control instruments, air-actuated control valves, cylinders and other equipments.
- The primary air through the inlet port, passes through the filter element, leaving down the contaminants in the bowl. When the knob is adjusted suitably, the spring acts on the diaphragm which in turn actuates the main valves to allow the pure secondary air at a particular pressure to the outlet.
- The main valve is supported between the relief valve and the main valve spring, eliminating the need for stem guiding. Toggle action between main valve and relief valve completely eliminates the alignment problems and thus, erratic output pressure.
- Its features include: Longer life assured as the materials used are selected for their corrosion resistance and long wear; Excellent characteristics throughout the full flow range particularly at low flow zone in which the unit usually serves instruments; and negligible pressure drop due to high porosity ratio of the filter.
- The filter is reusable and has a high impact strength. In addition to solid particles, the unit extracts a high percentage of water thus ensuring trouble-free service even in the most adverse conditions. Built-in relief ensures rapid response to circuit-induced pressure changes. The dust and liquid contaminants can be fully drained out when the regulator is mounted both vertically and horizontally as in the case of control valves, transmitters, etc.

About the Company: Placka Instruments & Controls (Shreyas Instruments Pvt Ltd), established in 1974, manufactures process control instruments, such as air filter regulators, rotameters, level switches, level gauges, liquid level controllers, transmitters etc.

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Contact:

Placka Instruments India Pvt Ltd,
Chennai
Tel: 044-22231559
Email: plackainstruments@yahoo.com,
sales@plackainstruments.com



AUTOMATION CARRIAGE - WELDING AND CUTTING

Gullco International India offers a wide range of Kat® welding and cutting automation carriage - rigid track. The Gullco rigid Kat® welding carriage is used throughout the world to automate a wide.



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Contact:

*Gullco International India Pvt Ltd, Pune
Tel: 07276060382
Mobile: 09920414253
Email: india.io@gullco.com*

CUTTING EQUIPMENT - AIR PLASMA

Ador Welding offers a wide range of air plasma cutting equipment - Plasmacut 25. This machine is recommended for air plasma cutting of all electrically



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conducting sheet metal up to 25 mm thick in industries.

Contact:

*Ador Welding Ltd, Pune
Tel: 020-40706000
Email: cmo@adorians.com*

JOINING WELDER - COIL

Kriton Weld Equipments offers a wide range of coil joining welders. Coil-end welders for strips are available in a variety of models to suit individual line requirements of strip range. The equipment is offered with suitable automation.



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Contact:

*Kriton Weld Equipments Pvt Ltd, Vadodara
Tel: 0265-2642809, 2645070, 2651718
Email: purohit@kritonwelders.com*

COREWELD 46 LS MILD STEEL WIRES

ESAB India Ltd offers a wide range of mild steel wires - Coreweld 46 LS. Coreweld 46 LS is a new generation metal cored wire based on ESAB's revolutionary cored wire surface technology.



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Contact:

*ESAB India Ltd, Mumbai
Tel: 022-24018044, 28516724
Email: communications@esabindia.com, ravikumar.r@esabindia.com*

ARC WELDING MACHINE

Parmo Welding Machines offers a wide range of arc welding machines. These are high quality industrial grade welding machines suitable for rolling mills, workshop, sugar mills, ship yard, bridges, fabrication shops and steel furniture.



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Contact:

*Parmo Welding Machines (P) Ltd, Rajkot
Mobile: 09898770717
Email: paras@parmoelectro.com*

SPOT WELDING MACHINE

Vijay Electricals offers a wide range of portable spot welding machines. These spot welding machine guns are for high-speed production in metal fabrication shops, particularly for the manufacture of automobile bodies and sub-assemblies. A variety of portable weld guns with different throats.



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Contact:

*Vijay Electricals, Faridabad
Mobile: 09891149638, 09811164638
Email: ajay_giri1981@yahoo.co.in*

PLASMA CUTTING MACHINE

Arc Welding Company offers a wide range of automated plasma cutting machines. The A120 system is based on an industrial proven platform; it offers standard features to meet the needs of many automated applications. With all the advantages of iTorch and proven systems reliability.



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Contact:

*Arc Welding Company, New Delhi
Tel: 011-25289751, 25288693
Mobile: 09999200148, 09811110477
Email: arcweldingcom@gmail.com*

TAB SPOT WELDER - LITHIUM ION BATTERY

Cruxweld Industrial Equipments offers a wide range of lithium ion battery tab spot welder. Excellent quality lithium ion battery tab spot welder manufactured using high grade material is offered. This is a battery spot welding hand-held welding machine with dual modes.



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Contact:

*Cruxweld Industrial Equipments Pvt Ltd, Faridabad
Mobile: 08800882983, 09560878350
Email: sales@cruxweld.com*

WELDING CURTAINS

Toss Weldtronics offers a wide range of welding curtains. These curtains are widely used to protect the worker from the flying sparks and hazardous glare of welding operations. This range, including industrial welding



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curtains.

Contact:

Toss Weldtronics, Pune
Mobile: 09665011565, 08600890123
Email: response@cuttingmachinesindia.com

CUTTING MACHINE - AIR PLASMA

ATE Welding Engineering Robotics & Automation manufactures of a wide range of air plasma cutting machines. It is light in weight and compact in size and also can be used with ordinary compressed air.



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Contact:

ATE Welding Engineering Robotics & Automation Pvt Ltd, Pune
Mobile: 08805002806, 08980504141
Email: indiasales@ate-engg.com

AIR MOTOR

Amro Airtech offers a wide range of air motor - AM-0707. This is an imported radial piston air motor with 5 pistons; it is very powerful and very compact. With 0.5 HP power, it generates a maximum torque of @ 7nm, and has a



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maximum speed of 1,700 rpm.

Contact:

AMRO Airtech, Pune
Mobile: 09890135193, 09545735193
Email: amroairtech@gmail.com

ROLLER BEARINGS

Bhasin Overseas Corporation offers a wide range of special roller bearings. These highly efficient special roller bearings are made using high tensile raw materials. They are widely used for bearing jerks and shocks and to give linear or axial movements to the equipment.



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Contact:

Bhasin Overseas Corporation, New Delhi
Tel: 011-23924855, 23928821
Mobile: 09811336846
Email: info@indianbearings.com

QUALITY HELICAL GEARS

Sri Dhanalakshmi Gears offers a superior quality range of helical gears. These helical gears are manufactured incorporating the latest technology and making use of top-grade materials under the supervision of experts.



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These products are extensively used in various industries.

Contact:

Sri Dhanalakshmi Gears, Coimbatore
Mobile: 09976970147
Email: dhanalakshmigears@gmail.com

CLUSTER GEARS

Trishla Gear Industries manufactures and supplies a wide range of cluster gears. The robustly designed cluster gears offer hassle free performance. These products are checked for quality to make sure that the range complies with global industrial standards.



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Contact:

Trishla Gear Industries, Chennai
Tel: 044-26880578, 26880520
Mobile: 09841025097, 09841874997
Email: trishla@eth.net

PRECISION DEEP GROOVE BALL BEARINGS

Rohit International offers precision deep groove ball bearings. These bearings provide high speed and are widely used as radial bearings; the non-separable bearings are available in a wide variety of seal, shield and snap-ring arrangements.



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Contact:

Rohit International, Kolkata
Tel: 033-39854505, 33475050
Mobile: 09830033458, 09830032458
Email: rohitinfo@ymail.com

ALIGNED BRAKE MOTORS

Engineering Hindustan offers a range of brake motors. Offered is a wide range from fractional HP to 40 HP; TEFC (totally enclosed fan cooled) motors; and factory fitted and aligned brake motors. The brake mounting provision is in-built; no modifications are carried out on the motors, thereby keeping the full warranty of the motors intact.



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Contact:

Engineering Hindustan, Navi Mumbai
Mobile: 09821334017, 09820740067
Email: enghind@bom3.vsnl.net.in

MOTOR DRIVES - VARIABLE SPEED

Concept Automation offers a wide range of variable speed motor drives. These are compact in design with low noise operation, and corrosion resistant; engineered under



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experienced quality controllers and following international industrial standards.

Contact:

Concept Automation Pvt Ltd, Kolkata
Mobile: 09432437981, 08017985832
Email: conceptautomationpvtltd@gmail.com

SERVO DRIVES

Bristol Industrial Electronics offers optimum quality, fully digital servo drives. These servo drives can be operated with ease and give excellent performance. They are equipped with a variety of control modes; high speed, current and position loop and sinusoidal outputs.



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Contact:

Bristol Industrial Electronics, Delhi
Tel: 011-27396648, 32970441
Email: bristolelectronics@rediffmail.com

SILENT MICROSTEPPING MOTOR DRIVER

Yugandhar Systems offers a silent microstepping motor driver – YSSPD 4. This is a compact, silent, yet a powerful driver, which eliminates all the problems related to vibration,



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resonance and sound in the stepper motor.

Contact:

Yugandhar Systems, Pune
Tel: 020-24228445 Mobile: 09823037997
Email: yugandharsystems@gmail.com

VECTOR DRIVES - COMPACT SPEED

Confident Automation offers compact speed vector drives. These are manufactured under rigid quality norms in keeping with global quality standards and can be availed for AC drive series for sensor-less vector and closed-loop vector.



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Contact:

Confident Automation, Coimbatore
Mobile: 09362264242, 09843264242
Email: confidentautomation@gmail.com

WELDING WIRES

Modi Arc Electrodes Company offers a wide range of welding wires - MIG wire carbon steel, Excel MAG 1. This is double deoxidised copper coated Mn-Si wire suited for gas metal arc welding in all positions for mild and fine grained steels. It produces weld with excellent radiographic qualities.



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Contact:

Modi Arc Electrodes Company, New Delhi
Mobile: 08393889192
Email: infodelhi.modiarc@groupmkm.in

MIG MAG WELDING MACHINE

Mansoori Weldarc India manufactures, exports and supplies a high quality range of Mig Mag welding machines. This machine is manufactured using optimum quality material and sophisticated technology in tune with industry standards.



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Contact:

Mansoori Weldarc India Pvt Ltd, Faridabad
Mobile: 09313103366, 09811100410
Email: afzal@weldarcindia.com

WELDING MACHINE - PROFILE

Eewa Engineering Co offers a wide range of profile welding machines. The offered range is designed by skilled professionals employing fine quality components and progressive technology. To ensure quality and flawlessness, this range is stringently monitored on various quality parameters.



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Contact:

Eewa Engineering Co Pvt Ltd, Ahmedabad
Mobile: 09879538559, 09998848278
Email: contact@eewaengineering.com

MOSFET BASE WELDING MACHINE - DC TIG

Welding Aids offers DC TIG (inverter base) mosfet base welding machine. This is soft switch technology, highly efficient with low power consumption. It offers automatic protection from over current, over heat, over/under voltage; TIG welding and MMA welding.



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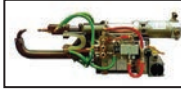


Contact:

Welding Aids, Delhi
Tel: 011-23214114, 23212453
Mobile: 09811062635, 09811945400
Email: weldingaids@gmail.com

PNEUMATIC WELDING GUNS

Shreeji Weld Industries manufactures a range of spot servo pneumatic welding guns. The offered pneumatic gun is manufactured using the best grade raw materials and latest technology in compliance with international quality standards.



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Contact:

Shreeji Weld Industries, Mumbai
Tel: 022-65796241, 27721402
Mobile: 09323275103, 09224572471
Email: shreejiweld@gmail.com

VIBRATORY MOTORS - THREE PHASE

Anup Industries offers a quality range of three phase vibratory motors. The firm deals in the finest quality range of 'MMIRACAL' three phase vibratory motors, known for flawless design and optimum performance.



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Contact:

Anup Industries, Ahmedabad
Tel: 079-22976217
Mobile: 09825310874, 09429716864
Email: anupind88@gmail.com

VIBRATORY MOTORS

NBE Motors offers a wide range of vibratory motors. These motors are used in a wide range of applications like scanners, medical instruments, control sticks and various other machines. Its features include: maximum throughput; superior functionality; less power consumption; high efficiency.



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Contact:

NBE Motors Pvt Ltd, Ahmedabad
Mobile: 09824035406
Email: info@newbharat.com

PEN SPRAY HAND SANITIZER

Kavit Polybind Pvt Ltd trades and exports a wide range of pen spray hand sanitizer. This hand sanitizer contains 70 per cent alcohol with a special blend of vitamin-E moisturizers which not only kills all the germs but also moisturizes for hands.



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Contact:

Kavit Polybind Private Limited, Ahmedabad
Mobile: 08046040742
Email: tapanshah69@gmail.com

CLEANER HOT WATER / STEAM

Deluxe Cleaning Systems Pvt Ltd is a provider of a wide range of high pressure cleaner hot water/ steam, H21. H21 is a versatile and highly mobile industrial high pressure hot water and steam cleaner.



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Contact:

Deluxe Cleaning Systems Pvt Ltd, Pune
Tel: 020-24531777, 24545029
Fax: 020-24531700
Email: info@deluxecleaningsystems.com

BLACK KNITTED HAND GLOVES

Balaji Enterprises is a manufacturer of a wide range of black knitted hand gloves. They are among the most prominent manufacturers and suppliers of an extensive range of back knitted hand gloves. These hand gloves are precisely designed using quality assured cotton-natural fibers.



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Contact:

Balaji Enterprises, Pune
Mobile: 08048710129
Email: sales@bajajenterprises.net

VARIETY AEROSPACE COMPONENTS

Kazi Industries offers a variety of aerospace components. These components are available in a wide variety of materials i.e, stainless steel, titanium, nickel alloy, heavy alloys, 316, 304 stainless steel, aluminum, copper, brass, bronze, aerospace special steel.



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Contact:

Kazi Industries, Pune
Tel: 020-25381995
Email: feeroz@kaziindustries.com, info@kaziindustries.com

3 WHEEL ELECTRIC FORKLIFT TRUCK

Maini Materials Movement offers Yale-Maini 1.5 tonne, 3-wheel electric forklift truck. High on performance and ergonomics, with lowest TCO RCF – the 3-wheel electric forklift truck scores high on operator comfort on account of its virtually effortless operation.



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Contact:

Maini Materials Movement, Bangalore
Tel: 080-43526555
Email: mtrlsmov@maini.com

HAND PALLET TRUCK

Mankalp Industries offers a wide range of hydraulic hand pallet trucks. The firm offers hand pallet truck, customised heavy-duty pallet truck, reel pallet truck, pallet truck with railing, high lift pallet truck and insulator lifting pallet truck. The vast assortment of hydraulic hand pallet trucks has high load bearing capacity.



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Contact:

Mankalp Industries, Ahmedabad
Mobile: 09210044555
Email: info@mankalp.in

TRUCK ROLLERS

Muvtons Castors offers pallet truck rollers in a wide range of sizes. Heavy-duty premium polyurethane bonded to precision, machined steel core, offers low rolling resistance, smooth and noiseless running and is non-marking, floor-protective.



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Contact:

Muvtons Castors Pvt Ltd, Noida
Mobile: 09910140111
Email: sales@muvton.com

PLATFORM TRUCK

Nandhi Technologies offers a wide range of platform trucks. These products are crafted with innovative techniques, are efficient to carry heavy loads and are tested on stiff quality parameters. They are ideal for use in warehouses, airports, railway workshops.



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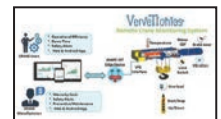


Contact:

Nandhi Technologies, Bengaluru
Tel: 080-28396173
Mobile: 09900097552
Email: nandhitech@gmail.com

MONITORING SOLUTION

VerveTronics Imagineering has launched its most advanced, fully indigenous, overhead crane monitoring solution. The main benefits of this solution include usage tracking, preventive maintenance alerts, brake effectiveness.



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Contact:

VerveTronics Imagineering Pvt Ltd, Pune
Mobile: 09021506588
Email: anuja.kelkar@vervetronics.com

BOOM & WELDING COLUMN

Mogra Engineering offers welding column and boom. This equipment is designed to ease continuous automatic welding operations by suitably manipulating the welding head, which is fixed at the end of the boom. With the combination of horizontal movement of the boom.



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Contact:

Mogra Engineering Pvt Ltd, Pune
Mobile: 09371034939, 09325383312
Email: mograengg@gmail.com, marketing@mograengg.com

SHOT BLAST MACHINE

Patel Furnace & Forging offers a continuous monorail hanger type shot blast machine. This type of machine is with equipped with continuous overhead monorail; components are moved in blasting chamber and moved out continuously through the machine.



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Contact:

Patel Furnace & Forging Pvt Ltd, Vadodara
Mobile: 09737061333
Email: patelf@satyam.net.in

DIE SPOTTING PRESS, HYDRAULIC

Achieve Hydraulics & Pneumatics offers hydraulic die spotting presses. Die spotting presses are used with various applications, especially for the verification and manufacturing of moulds and dies. In addition to the dimensions defined according to the mould or die.



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Contact:

Achieve Hydraulics & Pneumatics Pvt Ltd, Pune
Tel: 020-65344771
Mobile: 09922443405, 08805983086
Email: response@achievehydraulics.com

AIR COMPRESSOR

Amrit Vayu Equipments manufactures, supplies and trades in premium quality single stage air compressors. Available at cost effective prices, these single stage air compressors are known for consistent performance, longer service life and energy efficient design.



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Contact:

Amrit Vayu Equipments Pvt Ltd, New Delhi
Tel: 011-26365297
Mobile: 09891884492, 09821385910
Email: jainankit86@gmail.com

Event	Date & Venue	Contact
INDIA WAREHOUSING SHOW - NEW DELHI	June 26-28, 2025 IICC India international Convention and Expo Center New Delhi	RX India, Gurugram Tel: 0124-4774444 Email: Chandan.Kumar@rxglobal.com
INDIA FASTENER SHOW - CHENNAI	July 11-13, 2025, Chennai Trade Center Chennai	FME (Future Market Events) Media Pvt Ltd Noida Email: eisha@futuremarketevents.com futuremarketevents.com
AUTOROBOT - COIMBATORE	August 01-03, 2025 Codissia Trade Fair Complex Coimbatore	Midaas Touch Events & Trade Fairs LLP Chennai Mobile: 09600047460 Email: vivek@midaastouch.in
AUTOMATION EXPO - MUMBAI	August 11- 14, 2025 Bombay Exhibition Centre (BEC) NESCO Mumbai	IED Communications Ltd, Mumbai Tel: 022-22079567 Email: jyothi@iedcommunications.com
IPEC INDIA PROCESS EXPO & CONFERENCE – HYDERABAD	August 22 -24, 2025 Hitex Exhibition Center Hyderabad	Hyderabad International Trade Expositions Lt. Hyderabad Email: js@hitex.co.in
LASER WORLD OF PHOTONICS INDIA BANGALORE	September 17-19, 2025 BIEC - Bangalore International Exhibition Center Bangalore	MMI India Pvt Ltd, Mumbai Tel: 022-42554700 Fax: 022-42554719 Email: info@mmi-india.in
CUTTING & WELDING EQUIPMENT EXPO (CWE) - MUMBAI	September 27-29, 2025 Bombay Exhibition Centre (BEC) NESCO Mumbai	Hyve Group PLC W26JG London, United Kingdom of Great Britain and Northern Ireland Email: mosbuild@hyve.group
7TH IMS 2025 INDIA MANUFACTURING SHOW	November 06-08, 2025 BIEC, Bangalore	India Exposition Mart Ltd Mobile: 09743784166 Email: exhibition21@indiaexpocentre.com
17TH ENGIMACH – GANDHI NAGAR	December 03-07, 2025, Helipad Exhibition Centre Gandhi Nagar, Gujarat	K AND D Communication Ltd Ahmedabad Mobile: 09909041613/18 Email: info@kdclglobal.com
INTERNATIONAL		
SHEETMETAL -CHINA SHANGHAI	June 17-20, 2025 NECC National Exhibition and Convention Center Shanghai, China	Confederation of Chinese Metalforming Industry (CCMI) 102206 Beijing, China Tel: +86 10 53056669 Email: metalform@chinaforge.org.cn
CWIEME – SHANGHAI	June 25-27, 2025, Shanghai World Expo Exhibition & Convention Center, Shanghai, China	Hyve Group PLC 2 Kingdom Street Paddington W26JG London Email: mosbuild@hyve.group
AIREXPO SHANGHAI - CHINA SHANGHAI	August 07-09, 2025 Shanghai Convention & Exhibition Center of International Sourcing Shanghai, China	Shanghai Golden Commercial Exhibition Co. Ltd Shanghai, China Tel: +86 (0)21 31276864 Email: goldenexpo@yahoo.com.cn
ALL ABOUT AUTOMATION - WETZLAR	September 10-11, 2025, Buderus Arena Wolfgang-Kühle-Str. 1, 35576 Wetzlar Hesse, Germany	Easyfairs GmbH 33719 Bielefeld, Germany Email: bielefeld-office@easyfairs.com

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X BHEL



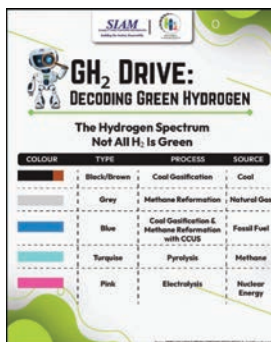
Bharat Heavy Electricals Limited (BHEL) has been recognised for its outstanding export performance at the EEPIC India Export Excellence Northern Region Awards 2025. BHEL received the Gold Trophy for 2019-20 and a Special Trophy for 2020-21. The awards were presented by the Hon'ble Chief Minister of Delhi, Rekha Gupta, to Bani Varma, Director (IS&P), and Jitendra Das, Executive Director (International Operations), BHEL, at a ceremony held in New Delhi on 28th May, 2025.

X Vedanta Limited - Aluminium Business



Vedanta Aluminium is writing a new chapter for Odisha. At the beginning of this year, we committed a ₹1 lakh crore investment in a new 3 MTPA aluminium facility and an Aluminium Park. We're not just expanding capacity. We're creating over 2 lakh employment opportunities and foster MSME growth across automotive, power, construction, and logistics.

X SIAM India



Hydrogen-powered vehicles depend not only on clean production but also on a reliable and efficient transportation network to ensure consistent fuel availability. For the automotive industry, this necessitates the development of flexible, scalable supply chains involving pipelines, cryogenic transport, and specialized shipping solutions. As fuel cell electric vehicles (FCEVs) gain traction in both commercial and passenger segments, robust hydrogen logistics become critical to scaling infrastructure, minimizing downtime, and reducing emissions across the mobility value chain. Achieving net-zero begins with rethinking how fuel moves.

X Ministry of Power



A call for financial viability in the power sector. Union Minister Shri Manohar Lal stressed reducing AT&C losses, timely payments, and leveraging pre-paid smart meters in government establishments by Aug 2025. Big steps towards an efficient power ecosystem.

X Tata Motors



In partnership with Tata Power Renewable Energy, we are co-developing a 131.2 MW wind-solar hybrid project to power our six manufacturing facilities in Maharashtra and Gujarat. This initiative will significantly advance our clean energy transition, helping us achieve our RE-100 commitment ahead of the 2030 target. By offsetting over 200,000 tons of CO₂ emissions annually, we are accelerating progress towards net-zero operations and building climate-resilient operations. A meaningful step towards building a greener, more sustainable India.



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