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Innovation on the Rise: From Mithai to Mobility, India's Industries Go High-Tech

The Indian food industry is undergoing a transformation unlike anything seen before. With rising consumer expectations for quality, safety, and convenience, manufacturers are rapidly adopting automation and Artificial Intelligence (AI) to enhance efficiency and consistency. In today's competitive and tightly regulated market, embracing these technologies is no longer a choice—it's a necessity. Automation has become the backbone of modern food manufacturing, driving productivity and precision while enabling brands to scale sustainably.

Our cover story this month explores How Automation is Shaping the Future of Chitale Bandhu Mithaiwale. In an exclusive interview, Indraneel Chitale, Partner at Chitale Bandhu Mithaiwale, shares how the brand blends tradition with technology to maintain consistency, ensure efficiency, and prepare for the next phase of India's packaged food revolution.

This edition also features Sandeep Kerulkar, Chief Operating Officer – Telecom Division, Arvind Ltd., who highlights India's ascent as a global technology hub. He discusses the role of Cloud, AI, and IoT in driving digital transformation and how Syntel's agile, future-ready offerings are designed to meet evolving market needs, enhance operational performance, and deliver long-term value.

We also sit down with Samkit Shah, Co-founder of Jitendra New EV Tech, who outlines the company's journey in redefining India's EV space. He emphasizes Jitendra EV's focus on practical innovation, a robust service ecosystem, and a people-first approach that extends across its employees, dealers, and customers. The conversation also delves into the company's sustainability vision, R&D investments, and its goal of accelerating India's transition toward mainstream electric mobility.

Among our industry features this month is "Steel Wires: The Silent Backbone of Modern Industry," which explores the indispensable role of steel wires in automobiles, infrastructure, power systems, and precision engineering. As India's manufacturing momentum gains pace, steel wires are quietly strengthening the foundation of industrial growth and competitiveness.

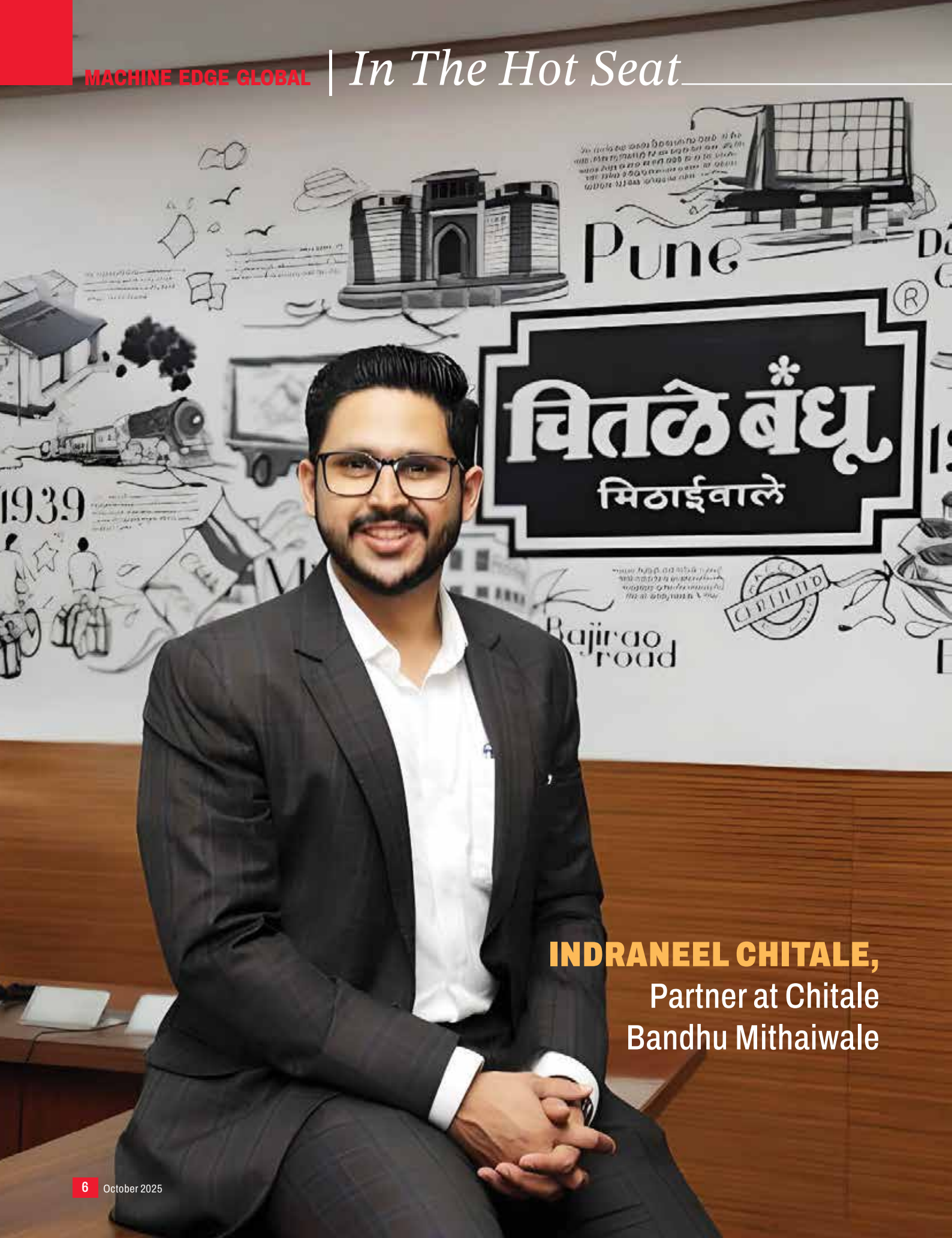
Another key feature, "Smart Solar Adoption: The Next Leap for Renewable Energy," looks at how IoT and real-time monitoring are revolutionizing solar power—from static installations to dynamic, intelligent energy ecosystems that improve performance, reduce costs, and build a resilient, connected energy future.

With these stories and more, Machine Edge Global continues to bring you insights that matter—spotlighting the people, technologies, and innovations shaping the industrial world of tomorrow.

Sanjay Jadhav

Sanjay Jadhav
Founder & Editor
editor@machineedgeglobal.com

CONTENTS



INDRANEEL CHITALE,
Partner at Chitale Bandhu Mithaiwale

How Automation is Shaping the Future of Chitale Bandhu Mithaiwale

With a legacy spanning more than seven decades, Chitale Bandhu Mithaiwale has become synonymous with authentic taste, tradition, and innovation in India's sweets and snacks industry. Established in 1950, the brand has not only preserved its timeless recipes but has also embraced technology as a driver of growth and transformation. From manual processes in its early years to advanced automation, data-driven insights, and state-of-the-art production facilities today, Chitale Bandhu stands as a shining example of how heritage businesses can scale without compromising authenticity. In this conversation, **Indraneel Chitale, Partner at Chitale Bandhu Mithaiwale,** speaks with **Sanjay Jadhav, Editor, Machine Edge Global,** about how technology and tradition converge in their operations, the role of automation in shaping consistency and efficiency, and what the future holds for India's packaged food sector.

Q. Chitale Bandhu Mithaiwale has a rich legacy dating back to 1950. How has the role of technology evolved in your operations over the decades?

Chitale Bandhu has been successful in keeping itself relevant in spite of being in business for 75 years, thanks to two key facets - value based management and technology adoption. Technology has gradually evolved at Chitale Bandhu, transitioning from manual methods to advanced automation, digitalization, and data-driven tools, helping the company scale while maintaining consistent quality and expanding market reach. Every significant milestone in Chitale Bandhu has been led around technology upgrade and that has contributed to a steady growth curve all along.

Q. Could you take us through some of the key automation technologies currently deployed at your manufacturing plants?

Chitale Bandhu's current manufacturing plants deploy specialised production machinery and automated monitoring systems which streamline processes and ensure standardised output. The flagship automated plant at our factory-Ranje utilises custom machinery for high-speed, continuous production of iconic products like Bakarwadi. Production lines blend imported equipment (from Germany, Belgium, and Italy) with locally adapted technologies, designed to handle mixing, rolling, shaping, frying, and packaging with minimal human intervention.

This mechanisation enables outputs that have grown from hundreds of kilograms per day to thousands per hour, meeting festive and year-round demand. The automation is deployed not to eliminate jobs but to empower the workforce—reducing repetitive manual tasks, reskilling staff, and creating new roles in supervision, quality assurance, and operations.

Q. How do you ensure that automation complements the craftsmanship and traditional recipes that Chitale Bandhu is known for?

Automation is always designed to support—not replace—the artisanal skills and legacy recipes that define Chitale Bandhu; technology handles repetitive tasks, allowing skilled workers to focus on critical aspects of flavour and authenticity. Our automation journey reflects a blend of tradition and modernisation, making it a leader in scalable, quality-driven production in India's packaged sweets and namkeens sector.

Q. What role does data analytics play in production planning, quality control, and inventory management?

In Chitale Bandhu, technology and data has always played a pivotal role in production planning, inventory management, and quality control by leveraging insights for smarter decision-making, optimising outputs, and proactively flagging inconsistencies.

The company integrates data analytics with automated vision systems and sensory data to monitor products consistently throughout the manufacturing process. Each batch undergoes tight scrutiny via data-driven quality checks, aided by SAP-integrated traceability systems that record every step—from procurement of raw ingredients to final packaging.

In essence, data analytics underpins holistic operational management at Chitale Bandhu Mithaiwale, enhancing planning accuracy, elevating product quality, and optimising inventory flows to meet customer expectations in India and global markets consistently. Beyond technology, Chitale Bandhu emphasises empowering teams with accessible data and actionable insights to support informed decision-making throughout the organisation. This data-driven culture enables agile responses to market dynamics and fortifies the company's competitive edge while preserving its legacy.

Q. In what ways has automation improved consistency, efficiency, and throughput in your production lines?

Automation has profoundly transformed production lines at Chitale Bandhu Mithaiwale, delivering significant improvements in consistency, efficiency, and throughput. By automating nearly 80% of operations in the modern manufacturing facility, the company has drastically reduced human intervention in repetitive and error-prone processes such as shaping, frying, packaging, and quality control, allowing for a smooth, uninterrupted production flow. For instance, the fully automated Bakarwadi production line has increased capacity from a modest 300 kilograms a day manually to an impressive 2,000 kilograms per hour, demonstrating a remarkable leap in scale and speed. This mechanisation enables rigorous quality checks and traceability that conform to stringent food safety standards, instilling consumer trust.

Real-time machine performance monitoring supports predictive maintenance, significantly reducing downtime — machines operate 18 to 20 hours daily even in off-season periods, with minimal stoppage for cleaning and repairs. Furthermore, automation empowers the workforce by shifting their focus from repetitive manual tasks to overseeing technology-driven processes, fostering a culture of safety and operational excellence. This seamless integration of advanced machinery and data-driven insights positions Chitale Bandhu to meet growing market demand efficiently while preserving the authenticity and superior taste that define the brand's legacy.

Q. How do you strike the right balance between high-volume manufacturing and maintaining the authentic taste and texture of traditional sweets?

Chitale Bandhu Mithaiwale strikes the right balance between high-volume manufacturing and maintaining authentic taste and texture by upholding the integrity of traditional recipes while carefully integrating modern technology. We maintain authenticity in our products by rigorously protecting traditional recipes and conducting frequent sensory evaluations at every stage to preserve the original flavours and textures loved by customers, while using automation where it adds value and reliability.

The production process is driven by a deep respect for artisanal craftsmanship, ensuring that automation supports rather than replaces the skilled techniques passed down through generations. Innovative packaging and processing technologies enable longer shelf life without using harmful preservatives, allowing the authentic taste to reach wider markets, including international exports. This blend of tradition with innovation allows Chitale Bandhu to scale production efficiently while delivering the consistent quality and genuine experience that define the brand's legacy.

Q. How does your R&D team work alongside the production and engineering teams to bring innovations from concept to mass production?

Chitale Bandhu's R&D team works in close synchrony, collaboratively developing pilot projects, refining new products, and using feedback loops to seamlessly transition innovations to large-scale manufacturing. Innovations are first developed and tested in pilot projects within the R&D lab, where feedback from production experts ensures feasibility and preserves quality standards.

This collaborative model allows incremental refinements and quick troubleshooting before scaling up to full-scale automated manufacturing lines. The process is supported by data-driven insights and continuous communication across teams, ensuring that each innovation aligns with operational capabilities and customer expectations, ultimately facilitating smooth and successful mass production.

Q. What measures do you take to ensure compliance with stringent food safety and hygiene standards in an automated environment?

Chitale Bandhu Mithaiwale ensures strict compliance with food safety and hygiene standards in its highly automated environment by implementing comprehensive measures at every level of production. All workers and visitors adhere to strict hygiene protocols, including wearing personal protective equipment (PPE) such as masks, gloves, and hairnets, to prevent any contamination.

Automation itself plays a vital role by minimising human handling, thus

> *Automation is always designed to support—not replace—the artisanal skills and legacy recipes that define Chitale Bandhu; technology handles repetitive tasks, allowing skilled workers to focus on critical aspects of flavour and authenticity."*

reducing the risk of cross-contamination while maintaining consistent cleanliness. The factory follows rigorous standard operating procedures with continuous sanitisation, real-time monitoring, and periodic deep cleaning during short operational downtimes. Furthermore, the company maintains strict adherence to national and international food safety certifications and continuously updates its protocols, ensuring that every product leaving the factory is safe, pure, and meets the highest quality standards.

Q. How do you see the role of automation and technology evolving in the Indian packaged food and sweets sector over the next decade?

Automation and technology will play a transformative and accelerating role in the Indian packaged food and sweets sector over the next decade. Advances in AI, robotics, and data analytics will drive higher efficiencies, improved quality control, and greater scalability for production lines, enabling companies to meet the expanding and sophisticated consumer demand. Furthermore, digital technology will reshape the supply chain, marketing, and customer engagement, allowing businesses to be more agile and data-driven. Automation will also empower the workforce by reducing repetitive manual tasks and creating more skilled job opportunities. Ultimately, integration of smart technologies will allow traditional brands like Chitale Bandhu to preserve heritage while innovating rapidly, thereby strengthening India's global footprint in the sweets and snacks industry.

"India is poised to play a transformative role in the global IT and telecom ecosystem over the next decade"

SANDEEP KERULKAR,
Chief Operating Officer,
Telecom Division,
Arvind Ltd.

In an interview with **Sandeep Kerulkar, Chief Operating Officer, Telecom Division, Arvind Ltd.**, by Machine Edge Global, he underscores India's growing role as a global technology hub, the importance of digital transformation through Cloud, AI, and IoT, and Syntel's commitment to agile, future-ready offerings that address market demands, enhance operational efficiency, and deliver long-term value to customers.

Q. How important will security and surveillance systems be for businesses in the future, and how is Syntel strengthening its SNEOS portfolio to meet this demand?

We are making some very important moves with our SNEOS portfolio. We are introducing new product series across different segments—high-end, mid-segment, SI-centric, and government-certified solutions that meet all necessary compliance standards. With these strategic steps, our expectations from the surveillance business are very high. We are confident that these additions position us strongly to meet evolving market demands and deliver exactly what customers are looking for.

Q. What role do you see India playing in the global IT and telecom ecosystem over the next decade?

India is poised to play a transformative role in the global IT and telecom ecosystem over the next decade. With its vast talent pool, rapidly advancing digital infrastructure, and a strong culture of innovation, India is no longer just a service hub—it is evolving into a global center for technology leadership.

Additionally, government initiatives such as 'Digital India' and 'Make in India' are accelerating self-reliance and creating opportunities for global collaborations. Over the next decade, India will not only cater to global demand but will also shape the future of IT and telecom by setting benchmarks in scale, affordability, and innovation.

Q. As COO of Syntel by Arvind, how would you describe the company's journey and its current positioning in the IT and telecom space?

Syntel by Arvind is a next-generation technology solutions provider that started its journey in the Enterprise

Telephony industry and has continually evolved to meet the changing needs of businesses. Over the years, we have expanded into offering a comprehensive range of Converged Technology Solutions including Enterprise Communication, Network Infrastructure, Audio-Visual System Integration, and Security & Surveillance solutions. Alongside our in-house product line — comprising EPABX systems, phones, switches, cameras, NVRs, and more — we also deliver complete end-to-end solutions tailored to client requirements. Through strategic tie-ups with multiple OEMs, we provide a wide bouquet of options, enabling our clients to choose the most effective and future-ready solutions for their businesses.

Q. Syntel operates both as a product manufacturer and a solutions provider. How do you balance these two divisions to create synergy?

At Syntel by Arvind, we hold a strong position in Converged Telephony products, as that is where our journey began. What has enabled us to stay in this position is not just our products, but the strength of our team, our advanced technology, and our deep understanding of the market. We consistently strive to improve in these areas. When we expanded into the solution provider segment, we were very clear about one thing: innovation must create long-term value for our customers and stakeholders. To achieve this, we have focused on building strong partnerships with leading OEMs while continuously creating and adopting new ideas. These ideas translate into improved solutions, products, services, processes, and business models that address evolving market needs and directly solve customer pain points. At the core of this journey is our team, which creates the right synergy to deliver sustainable value and position us as a trusted solution provider and product manufacturer.

Q. How do you see the rise of digital transformation influencing customer needs,

> *With its vast talent pool, rapidly advancing digital infrastructure, and a strong culture of innovation, India is no longer just a service hub—it is evolving into a global center for technology leadership.*

and how is Syntel adapting to stay ahead?

Syntel by Arvind is all ready to embrace innovation, upskill our customer-facing workforce and always keeping customer centricity at the core of its GTM. Syntel by Arvind has agility to quickly adapt to new revenue streams leveraging technologies like Cloud, AI & IOT. Fast changes on the technology horizon drive high rate of product obsolescence and this will drive enterprise customers to migrate from upfront CAPEX investments to OPEX financial models. Syntel by Arvind is ready with its attractive OPEX models ensuring return on technology investment and facilitating timely upgrade to the latest technologies.

Q. How do your product brands, SNEOS and NEOS, differentiate themselves in a market that is becoming increasingly competitive?

We actually deal and provide solution in four segments that is Enterprise Communication, Network Infrastructure, Audio-Visual System Integration, and Security & Surveillance, but we make our Enterprise Communication products comes under brand NEOS and we have earned strong industry recognition for it not just that we have been one of the market leaders in this space for over 30 years. In the Security & Surveillance segment, we entered the market in 2018-19 with brand name SNEOS, and despite being relatively new, our solutions have quickly gained traction. This success is driven by advanced technology, competitive pricing, and the strength of our distributor network which has played a pivotal role in establishing our presence and growth in the market.

Q. How has technology helped Syntel improve operational efficiency and deliver better customer experiences?

Rapid development in technologies will create opportunities for innovation and new services. Shift to cloud offerings across end-to-end converged solutions portfolio will enable service agility, innovation and global reach for solution providers like Syntel by Arvind. On the other hand, increasing incidences of cyberattacks and data breaches will position a significant threat to the industry. Navigating through different regulatory compliances is a tough challenge. Integrating new technologies with legacy systems will be much larger issue for the Enterprises while adapting to customer demands.

Q. The IT and telecom industry is evolving at breakneck speed. What do you see as the biggest opportunities and challenges in the next five years?

In today's rapidly evolving technological landscape, breakthroughs are happening every day, making it difficult to pinpoint the 'next big thing'—because in many ways, we are already living it and as far as its about our company, we are committed to stay ahead by partnering with leading OEMs to deliver comprehensive, one-stop solutions for our enterprise clients. We are continuously expanding our product portfolio to meet the evolving needs of the market and address the demands of the hour.

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"Tier-2 and Tier-3 cities are the growth engine of EV adoption"

In an interview with **Samkit Shah, Co-founder, Jitendra New EV Tech by Machine Edge Global,** he underlines Jitendra EV's differentiation through practical technology, robust service networks, and a people-first, purpose-driven philosophy that extends to employees, dealers, and customers alike. It also stresses the company's commitment to sustainability, significant investments in R&D and manufacturing, and its ambition to play a pivotal role in India's transition toward mainstream EV adoption over the next decade.

Q. Jitendra EV has emerged as one of the top 10 EV brands in India. Can you take us through its journey and what you believe has been the biggest driving force behind this success?

Jitendra EV, a venture of the Shah Group with 45+ years of legacy in the automobile industry, started its EV journey in 2016. In just 9 years, we have built a strong portfolio catering to both personal and commercial mobility needs.

The biggest driving force behind our success has been our customer-first approach and robust after-sales service, which ensures trust, reliability, and long-term satisfaction. This commitment, backed by our legacy and innovation, has helped us become one of the top 10 EV brands in India.

Q. Unlike many EV companies that concentrate on metros, Jitendra EV has a strong presence in Tier-2 and Tier-3 cities. What opportunities and challenges do you see in these markets?

Tier-2 and Tier-3 cities are the growth engine of EV adoption. Customers here value affordability, reliability, and after-sales service, which are our strengths. While challenges are the EV industry is at a crucial stage of growth, where trust, safety, and compliance are of utmost importance. While the market has seen the entry of multiple players and products, it is essential that every stakeholder

aligns with regulatory norms and quality benchmarks. Short-term approaches may create challenges, but for companies committed to building a sustainable and credible EV ecosystem, adherence to standards and delivering safe, reliable products will always remain the top priority. This is the only way to strengthen customer confidence and ensure long-term industry growth.

Q. The EV two-wheeler space is highly competitive today.

How does Jitendra EV differentiate itself from other players in terms of technology, customer experience, and after-sales support?

In a competitive EV market, Jitendra EV stands out by offering not just vehicles, but a complete ownership experience. Our strength lies in reliable technology, practical features, and a robust service network that ensures customers feel supported at every step. Backed by the 45+ year legacy of the Shah Group, we focus on building trust, convenience, and peace of mind, that's what truly differentiates us.

Q. In an era where many brands rely heavily on hype and aggressive marketing, how does Jitendra EV ensure that quality and reliability remain at the forefront of your offerings?

At Jitendra EV, we believe trust is built on performance, not hype. Backed by the Shah Group's 45+ year legacy,

our focus has always been on quality, reliability, and strong after-sales support rather than flashy marketing. Every product is designed with the customer's long-term satisfaction in mind, and this commitment has been the real driver of our growth.

Q. You emphasize a 'people-first, purpose-driven' approach. What does that mean in practice for your employees, dealers, and customers?

For us, people-first and purpose-driven means creating value at every level. For employees, it's about a culture of growth and empowerment. For dealers, it's partnership and trust, ensuring sustainable business opportunities. And for customers, it's delivering reliable products, strong after-sales service, and peace of mind. Everything we do is aligned to serve people and drive a larger purpose of sustainable mobility.

Q. Beyond Jitendra EV, how do you envision India's EV ecosystem evolving over the next 5–10 years? What role do you see your company playing in that larger shift?

Over the next 5–10 years, India's EV ecosystem will move from early adoption to mainstream mobility, driven by better infrastructure, government support, and rising consumer confidence.

The real growth will come from affordable, reliable solutions in Tier-2 and Tier-3 cities. Jitendra EV aims to play a pivotal role in this shift by delivering practical, customer-centric products and strengthening our after-sales and charging network, ensuring EVs become a trusted choice for both personal and commercial mobility.

Q. What kind of investments have you made in R&D and manufacturing capabilities? How do you see sales volumes growing in the near future?

Over the next five years, Jitendra EV will invest ₹125 crore, with ₹80–100 crore in R&D and product development and ₹25 crore in manufacturing capacity. These investments will fuel innovation, faster product launches, and scale, driving multi-fold growth in sales volumes across India.

Q. Shah Group has a 30-year legacy across multiple industries. How are you bringing that legacy into the digital and electric era while staying future-ready?

The Shah Group carries more than 45 years of legacy, primarily in the automobile industry, where we have built deep customer trust and market understanding. With Jitendra EV, we are channelling this legacy into the digital and electric era by combining our experience with cutting-edge technology, connected mobility solutions, and sustainable practices.

Our philosophy is to stay future-ready, not just by making EVs, but by creating a complete ecosystem of products, services, and digital experiences that reflect both our heritage of trust and our vision for tomorrow's mobility.

Q. Apart from producing EVs, how is Jitendra EV contributing to sustainability in terms of manufacturing processes, supply chain, or community initiatives?

For Jitendra EV, sustainability is a commitment, not a checkbox. In manufacturing, we are driving energy-efficient operations and waste reduction. Our supply chain emphasizes responsible sourcing and eco-conscious practices, while our community initiatives focus on spreading green mobility awareness and enabling cleaner, healthier cities. We see ourselves not just as an EV maker, but as a partner in building a truly sustainable future for India.

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Policy and Compliance: The Strategic Engine of Sustainability

Policies and compliance frameworks are no longer just regulatory checkboxes—they are powerful enablers that drive sustainability by ensuring accountability, transparency, and measurable impact. From SEBI's BRSR mandates to corporate commitments like HUL, ITC, and Infosys, compliance is shaping India's sustainable future.

The concept of sustainability seeks to balance environmental, social, and economic needs with the greater goal of preserving the planet's natural resources. Policies and compliance enable the accomplishment of this goal through the establishment and enforcement of rules and standards that guide businesses and organizations. Reports suggest that policies and compliance play a vital role in driving sustainability, encouraging businesses and institutions to adopt eco-friendly practices. The discussion below highlights how policy and compliance enable sustainability.

Government and Organizational Efforts

Government regulations, such as the Business Responsibility and Sustainability Report (BRSR) mandated by the Securities and Exchange Board of India (SEBI), require listed companies to report on their sustainability performance, including environmental impacts like carbon emissions. The reporting framework encourages companies to adopt sustainable practices. BRSR requires companies to disclose ESG performance, including environmental metrics like carbon emissions, energy consumption, and renewable energy usage. This reporting requirement incentivizes companies to improve their metrics to maintain investor confidence and comply with SEBI guidelines. The mandatory nature of essential indicators ensures companies cannot ignore sustainability, pushing them to set and achieve targets like renewable energy adoption.

The National Action Plan on Climate Change (NAPCC) sets targets that indirectly pressure companies to align, such as India's commitment to 50% non-fossil fuel-based energy by 2030. The NAPCC, introduced in 2008, draws strategies for climate change mitigation and adaptation. It includes missions like the National Solar Mission and National Water Mission, providing a comprehensive plan for ecological sustainability.

Laws like the Environment Protection Act 1986 empower the central government to lay down standards for emissions and effluents, which has led to regulations promoting energy efficiency and the adoption of cleaner energy sources.

To illustrate, ITC aims to meet 100% of its energy needs from renewables by 2030, already achieving over 50% in 2023-24. As of 2023-24, Wipro reported that approximately 75% of its electricity consumption in India was sourced from renewable energy. This underscores the company's commitment to its goal of utilizing 100% renewable energy by 2030. These efforts align with the need to report favourably under BRSR. Companies like ITC and Wipro, as major players, contribute to the achievement of national sustainability goals through their sustainability initiatives, driven by the regulatory environment shaped by NAPCC. This shows that regulation is not a barrier, but a strategic tool to align corporate goals with climate imperatives.

Organizational Policies and Corporate Commitments

Organizations are increasingly adopting internal sustainability policies to align with government regulations, global goals and stakeholder expectations. For instance, Hindustan Unilever Limited (HUL) has committed to sourcing 100% of its electrical and thermal energy from renewable sources by 2030. As of March 2024, HUL achieved 100% renewable electricity usage across its own manufacturing sites, with 96% of the combined electrical and thermal energy being renewable. HUL reports its sustainability performance under the ESG and BRSR frameworks, demonstrating that corporate sustainability can be driven through internal commitment aligned with external compliance. Similarly, Infosys is committed to transitioning to 100% renewable energy for all its electricity needs, being the first Indian signatory to the RE100 global campaign. The company has made substantial progress; as reported in 2023–24, Infosys significantly advanced its renewable energy initiatives. The company met approximately 67.52% of its total electricity requirements in India

through renewable sources.

The facts above thus lead us to the fact that compliance and policy drive sustainability through the following dimensions:

- **Mandated Transparency:** Frameworks like the Business Responsibility and Sustainability Report (BRSR) compel companies to disclose ESG metrics, including carbon emissions, energy use, and renewable adoption. This enforced transparency creates pressure to act rather than just promise—ensuring sustainability is measured, monitored, and made public.
- **Target-Driven Accountability:** National policies such as the National Action Plan on Climate Change (NAPCC) establish long-term goals like achieving 50% non-fossil fuel-based energy by 2030. These goals translate into sector-specific mandates, encouraging organizations to adopt measurable

internal targets aligned with national climate agendas.

- **Regulatory Incentives and Penalties:** Compliance with acts such as the Environment Protection Act helps avoid penalties and unlocks green certifications and benefits (e.g., higher occupancy rates, rental premiums in green real estate). This makes sustainability economically viable and strategically desirable.

- **Operational Integration through Internal Policy:** Organizations like ITC, Wipro, and Infosys internalize compliance by building structured policies that govern procurement, energy sourcing, waste management, and reporting. This way, sustainability does not get reduced to merely a campaign, it becomes part of operational DNA.

- **Stakeholder Trust and Investor Confidence:** Consistent adherence to policy-backed sustainability measures enhances brand credibility, investor interest, and public goodwill—especially in sectors under increasing ESG scrutiny. Thus, compliance becomes a competitive differentiator in capital and consumer markets.

- **Innovation Through Constraint:** Regulatory requirements often stimulate innovation—as seen in the hospitality industry's creative responses to waste reduction, or in Coca-Cola India's repurposing of PET waste for visibility gear. Companies have shown that compliance can inspire solutions that are resourceful, culturally resonant, and scalable.

Conclusion

Policy and compliance today serve as the strategic engine of sustainability. As India strives towards its ambitious climate targets, these frameworks determine intent and convert them into impact.

Whether through mandates like BRSR or corporate roadmaps driven by RE100 and ESG standards, sustainability is now as much about accountability as it is about aspiration. Regulation, when aligned with purpose, becomes a determiner, not a constraint.

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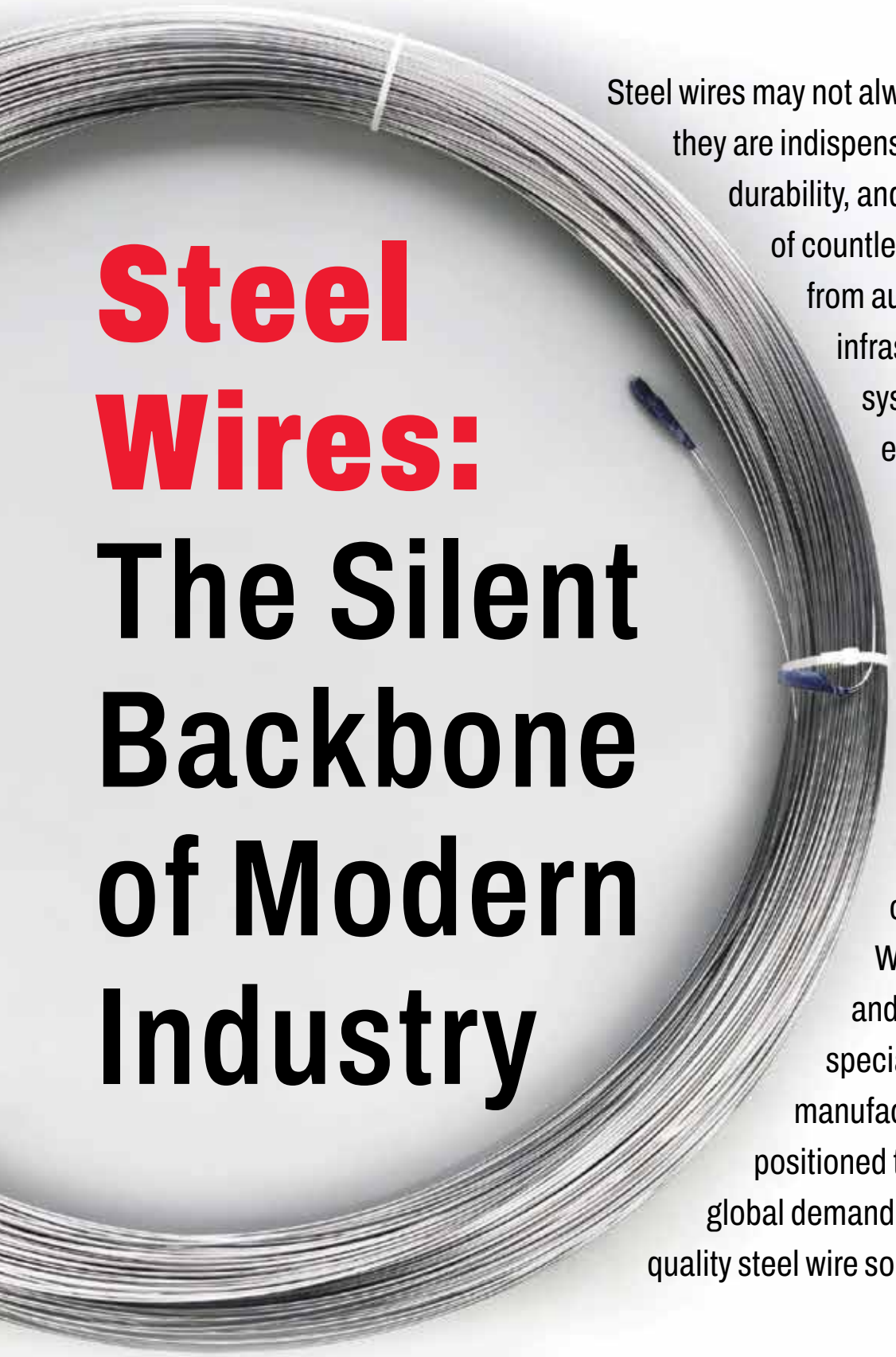

Steel Wires: The Silent Backbone of Modern Industry

Steel wires may not always be visible, but they are indispensable to the strength, durability, and performance of countless products — from automobiles and infrastructure to power systems and precision engineering. As India accelerates its manufacturing momentum, steel wires are emerging as a critical enabler of both domestic industrial growth and global competitiveness. With scale, versatility, and increasing specialization, Indian manufacturers are uniquely positioned to meet the rising global demand for reliable, high-quality steel wire solutions.

PRANAV BANSAL,
MD & CEO,
Bansal Wires Industries

Steel wires may not be visible in the final form of a product, yet they remain fundamental to its strength, durability, and performance. From automotive springs and fasteners to power transmission lines, construction reinforcement, and precision engineering, steel wires form the silent backbone of modern industry. In a world where manufacturing excellence increasingly hinges on reliability and precision, steel wires play a defining role in ensuring both.

India's Manufacturing Momentum

India is rapidly emerging as a global manufacturing powerhouse, and the steel industry is central to this transformation. While domestic demand continues to rise across infrastructure, mobility, energy, and engineering, the next frontier for Indian steel wires manufacturers lies in exports. With global supply chains diversifying, the opportunity to position India as a trusted supplier of high-grade steel wires products has never been stronger.

The question is not whether India can meet the world's demand, but whether it can meet it with quality, consistency, and innovation.

Scale with Versatility

Over the past few decades, India's steel wire manufacturing capacity has grown to global standards, with producers now offering one of the most diverse product portfolios in the world. This extends beyond stainless steel (SS), high-carbon (HC), and mild steel (MS) wires to include galvanized wires, oil-tempered wires, spring steel wires, welding wires, saw wires, super-fine specialty wires, and customized alloy-based variants. Manufacturers today can produce sizes ranging from ultra-fine diameters of 0.03 mm to heavy-gauge wires of 16 mm, catering to sectors as varied as infrastructure, automotive, energy, textiles, and precision engineering.

This unmatched combination of scale, versatility, and customization capability positions India uniquely in the global marketplace. Few countries can claim such depth of expertise across both mass applications and specialized, high-performance segments.

Enabling Growth Across Industries

The true impact of steel wires is best seen in the industries they support. In automotive, they provide the resilience required for springs, fasteners, and tyre reinforcement. In power and infrastructure, they deliver the durability essential for grids and transmission systems. In agriculture and poultry, they strengthen enclosures and equipment. In consumer durables and hardware, they ensure reliability in everyday products.

As India builds its domestic

industrial base, these same strengths also become its export proposition, a reliable partner across a remarkably wide spectrum of industries.

Competing on Global Standards

Global competition is not about scale alone. International buyers demand strict adherence to specifications, traceability across supply chains, and compliance with evolving sustainability norms. In markets such as automotive, aerospace, and defence, steel wires must perform flawlessly — even the smallest deviation can have costly consequences.

This means Indian steel wires manufacturers must invest in automation, testing, certifications, and ESG frameworks to match global benchmarks. It also means prioritizing R&D for high-value, specialty steel wires that are in growing demand worldwide.

Moving Towards High-Value Solutions

The future of steel wires manufacturing will be defined by smarter, value-added solutions. Industries are demanding steel wires that are stronger, lighter, more durable, and aligned with advanced applications. Specialty products like tyre bead wires and steel tyre cords reflect this shift. At the same time, sustainable practices — from energy-efficient production to

recyclable designs — are becoming key differentiators in export markets.

Looking Ahead

To capture the export opportunity, India's steel wires industry must focus on three key imperatives. First, expansion must go beyond sheer volume, with capacity increasingly geared towards high-grade, specialty products that deliver greater value in global markets. Second, international quality, certification, and sustainability standards need to be embedded at every stage of production to ensure credibility and trust with buyers worldwide. Finally, sustained investment in technology, R&D, and smarter processes will be essential to drive innovation, enabling Indian manufacturers to create differentiated products and establish themselves as reliable partners in advanced global supply chains.

Material and production leadership is not about being the largest producer alone. It is about building trust through consistency, aligning with future industrial needs, and demonstrating the adaptability required in a changing global economy.

As India positions itself as a leader in advanced manufacturing, steel wires producers have the opportunity to move from being local enablers of growth to global contributors to progress. The path forward lies in combining scale with innovation, compliance with sustainability, and ambition with responsibility, strengthening industries across the world, strand by strand.

Conclusion

The future of India's steel wires industry lies in moving beyond volume to value — delivering high-grade, sustainable, and innovative solutions that align with the world's most advanced applications. By investing in technology, R&D, and global standards, Indian manufacturers can establish themselves as trusted partners in international supply chains. Strand by strand, India has the opportunity to strengthen industries worldwide and solidify its position as a global leader in steel wire manufacturing.

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Smart Solar Adoption: The Next Leap for Renewable Energy

SHREYAS GOWDA,
Senior VP, Oorjan Cleantech

Solar power is no longer just about panels on rooftops—it's about intelligence, connectivity, and real-time efficiency. With IoT and smart monitoring, solar systems are transforming from static installations into dynamic energy ecosystems that boost performance, cut costs, and support a more resilient grid.

As the world rapidly embraces renewable energy solutions, solar power continues to emerge as a cornerstone, especially in countries like India, where solar energy potential is immense, estimated at 748 GW, according to the Ministry of New and Renewable Energy (MNRE). But while photovoltaic (PV) adoption has surged, the traditional solar setup—static, largely offline, and reactive—no longer aligns with the evolving demands of digital-first energy consumers and dynamic grid systems. This has paved the way for a new era: smart solar adoption, empowered by the Internet of Things (IoT) and real-time monitoring.

The Rise of Smart Solar Systems

Smart solar systems are not just solar panels; they're part of a connected ecosystem. These systems integrate IoT-enabled sensors, meters, and controllers directly into PV installations. These devices continuously collect and transmit data on vital parameters such as:

- Panel temperature and efficiency
- Shading impact and dust accumulation
- Inverter performance and battery charge/discharge cycles
- Real-time power generation and consumption

In India, where rooftop solar adoption has crossed 11.8 GW as of 2024, such smart integration is key to both scalability and reliability.

Real-Time Monitoring: A Game Changer

Traditional solar setups often required periodic inspections or manual monitoring to detect underperformance or system faults. In contrast, real-time monitoring platforms provide 24/7 access to operational data through cloud-based dashboards or mobile apps. Users get immediate alerts for performance anomalies, enabling instant troubleshooting and maintenance.

For instance, in smart homes using IoT solar solutions, users can:

- Track daily solar energy output and usage in kilowatt-hours (kWh)
- Set energy consumption goals and alerts.
- Compare current output with historical data to identify inefficiency.

Research from BloombergNEF shows that real-time monitoring can

increase overall system efficiency by 10–15% over time due to faster detection and resolution of issues.

Enhancing Energy Efficiency and Grid Integration

Smart solar isn't just for the user—it's transforming the larger energy ecosystem. Grid operators and utilities, increasingly dealing with variable and distributed solar sources, are turning to IoT-based energy management systems for smoother integration.

A McKinsey report estimates that smart grid and solar integration could reduce grid balancing costs by 20–30% globally by 2030.

Here's how it works:

- IoT-connected inverters can regulate output during voltage fluctuations
- Smart storage systems shift loads during peak demand.
- Weather-prediction algorithms help anticipate and manage dips in solar input.
- Dynamic pricing models trigger automated load-shifting to optimise savings.

In India, the Green Energy Corridor initiative aims to enable grid communication with renewable sources, including smart solar systems, to meet the country's target of 500 GW of non-fossil fuel energy by 2030.

Predictive Maintenance and Performance Optimisation

One of the most underrated benefits of smart solar adoption is data-driven maintenance. Instead of relying on reactive servicing, IoT platforms use machine learning to track equipment health and forecast failures.

For instance, a solar module consistently underperforming compared to others under similar conditions may indicate a micro-crack or dirt deposition, triggering an automated alert. Such predictive strategies:

- Improve system uptime
- Reduce O&M (operation & maintenance) costs by up to 25%
- Extend equipment life span by identifying issues early.

Companies like SunPower and SolarEdge have embedded AI algorithms into their platforms to offer diagnostic insights, making solar upkeep both efficient and cost-effective.

Overcoming Challenges and the Road Ahead

Despite its transformative potential, smart solar adoption faces some hurdles:

- **Cybersecurity:** IoT systems are vulnerable to hacking and data breaches if not properly secured.
- **Cost:** The initial investment for smart components can be 10–20% higher than traditional systems.
- **Interoperability:** Integration across diverse device manufacturers remains a challenge.

However, falling sensor and cloud computing costs—combined with policy support such as India's PLI scheme for solar manufacturing and standards by BIS—are helping bridge these gaps.

A study by the IEA predicts that by 2030, over 60% of all new solar systems globally will be "smart" by default.

Conclusion

The convergence of solar energy with IoT and real-time analytics is more than a technological upgrade—it's a paradigm shift in how we manage energy sustainably. With enhanced performance tracking, predictive maintenance, and seamless grid integration, smart solar adoption empowers both individual users and utility-scale providers.

As global energy needs rise and climate urgency intensifies, smart solar systems will be instrumental, not just in meeting sustainability goals but in building a resilient, responsive, and intelligent energy future.

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GAURAV SINGAL,
CEO, Eastman IMPEX

The Hidden Strength behind Modern Construction

In the world of modern construction, durability, precision, and cost efficiency define the success of a project. Whether it is skyscrapers, industrial plants, or residential buildings, the foundation of structural reliability often rests on the quality of sheet metal components used. Sheet-metal fabrication, coupled with galvanising, plays a critical role in delivering robust and corrosion-resistant supplies that meet the stringent demands of today's infrastructure landscape.

Over the past two decades, I have witnessed how the industry has evolved from conventional manual processes to highly automated and technologically integrated systems. At Eastman IMPEX, our commitment to excellence lies not only in producing high-quality construction supplies but also in creating a streamlined process, from raw material procurement to finished, galvanised products, that ensures consistency, safety, and sustainability.

In this article, I will walk you through the end-to-end process of sheet-metal fabrication and galvanising, highlighting each stage, its significance, and the technological advancements shaping the future of construction supplies.

Raw Material Selection and Preparation

Every strong structure begins with the right choice of raw material. The quality of sheet metal, typically steel, aluminium, or stainless steel, directly impacts performance in construction applications.

- Steel remains the most common choice due to its strength and versatility.
- Aluminium is preferred where lightweight yet durable components are required.
- Stainless steel is used for specialised environments requiring high corrosion resistance.

At this stage, mill-certified materials are sourced, ensuring compliance with international standards for tensile strength, thickness, and composition. The raw sheets undergo flattening, levelling, and surface cleaning to prepare them for fabrication. Precision here reduces material wastage and ensures uniformity in downstream processes.

Design and Engineering: The Digital Backbone

Gone are the days when sheet-metal fabrication was driven purely by manual drawings. Today, CAD (Computer-Aided Design) and CAM (Computer-Aided Manufacturing) software form the digital backbone of the process.

Design engineers create detailed 3D models, simulating stresses, load-bearing capacities, and fitment accuracy. These blueprints are then converted into machine-readable formats for automated fabrication equipment.

Advantages of Digital Design:

- Ensures near-zero design errors.
- Allows virtual prototyping before actual production.
- Reduces turnaround time for customised components.

By integrating Building Information Modeling (BIM) into sheet-metal design, construction stakeholders can visualise how each component will fit into the final structure, improving coordination and reducing costly onsite adjustments.

Cutting: Precision at Scale

Cutting is the first physical step in transforming flat sheet metal into usable parts. Modern fabrication units employ advanced cutting technologies such as:

- **Laser Cutting:** Offers unmatched precision, ideal for complex geometries.
- **Plasma Cutting:** Faster and cost-effective for thicker sheets.
- **Water jet Cutting:** Uses high-pressure water with abrasives, ensuring no heat distortion.

Automation ensures that cuts are consistent across thousands of pieces. Nesting software optimises the layout of cuts on each sheet, minimising scrap and maximising material utilisation, an important factor in controlling costs.

Forming and Shaping: Adding Structural Integrity

Once cut, the sheets undergo forming processes to achieve the required geometry and strength. Techniques include:

- **Bending:** Using press brakes for precise angles.
- **Rolling:** For cylindrical or curved components.
- **Stamping:** High-volume forming with dies for repetitive shapes.
- **Punching:** Creating holes or patterns with CNC punching machines.

The emphasis here is on dimensional accuracy and stress management, ensuring that bends and forms do not weaken the material's structural integrity.

Welding and Assembly: Building Complex Structures

Fabrication often requires assembling multiple components into a single unit. Welding plays a critical role in this stage.

- MIG (Metal Inert Gas) and TIG (Tungsten Inert Gas) Welding are widely used for precision and strength.
- Spot Welding is preferred for sheet-to-sheet joining in bulk manufacturing.

Advanced robotic welding systems now ensure consistent welds, reducing human error and increasing speed. Non-destructive testing (NDT) methods like ultrasonic testing and X-ray inspection validate weld quality, a non-negotiable factor for structural safety.

Surface Preparation: Ready for Protection

Before galvanising, fabricated components undergo surface treatment to remove mill scale, rust, and oils. Processes include:

- **Degreasing and Pickling:** Removing contaminants with acid solutions.
- **Shot Blasting:** Using abrasive media to achieve a clean, roughened surface for better coating adhesion.

This stage is critical because even the best galvanising cannot compensate for poorly prepared surfaces.

Galvanising: The Shield against Corrosion

Galvanising is the process of applying a protective zinc coating to steel or iron to prevent rusting. For construction supplies, hot-dip galvanising remains the gold standard.

Process Overview:

- The cleaned metal is immersed in molten zinc at ~450°C.
- Zinc metallurgical bonds with the base metal, forming zinc-iron alloy layers.
- The outer surface solidifies into pure zinc, acting as a sacrificial

layer against corrosion.

Advantages of Galvanising in Construction:

- Extends life expectancy of steel components by decades.
- Offers uniform coverage, even on sharp edges and recesses.
- Provides a tough, abrasion-resistant finish.
- Requires minimal maintenance over the product lifecycle.

Some projects demand specialised coatings, such as duplex systems combining galvanising with powder coating or paint, offering enhanced aesthetics and extended corrosion resistance.

Quality Control and Testing

No fabrication process is complete without rigorous quality control. At Eastman IMPEX, we follow multi-layered inspections at each stage.

- **Dimensional Checks:** Using CMM (Coordinate Measuring Machines) for high-precision verification.
- **Coating Thickness Tests:** Ensuring uniform galvanising layers.
- **Salt-Spray Testing:** Simulating corrosive environments to validate coating performance.
- **Load and Stress Testing:** Ensuring parts can withstand real-world conditions.

These checks not only guarantee compliance with international standards like ASTM and ISO but also instill confidence in end users about the reliability of construction supplies.

Packaging, Logistics, and Delivery

Once approved, products are carefully packaged to avoid damage during transit. For global shipments, moisture-proof packaging and protective wraps ensure that components arrive in pristine condition. Efficient logistics, whether by road, sea, or air, play a vital role in supporting the just-in-time requirements of construction projects worldwide.

Sustainability in Fabrication and Galvanising

Today, sustainability is not just a choice; it is an imperative. The sheet-metal fabrication and galvanising industry is increasingly adopting eco-friendly practices:

- **Material Recycling:** Scrap metal is fully recyclable, reducing resource consumption.
- **Energy-Efficient Furnaces:** Lowering emissions during galvanising.
- **Closed-Loop Water Systems:** Preventing contamination during surface preparation.
- **Green Supply Chains:** Partnering with logistics providers committed to carbon reduction.

Sustainability not only reduces the environmental footprint but also improves cost efficiency in the long run.

The Future of Fabrication and Galvanising

The future of sheet-metal fabrication lies in Industry 4.0 integration, smart factories powered by IoT, AI, and robotics. Predictive maintenance of equipment, real-time tracking of material flow and AI-driven quality inspection will redefine efficiency and precision.

For galvanising, advancements in nano-coatings and eco-friendly zinc alternatives are paving the way for longer-lasting and more sustainable protection solutions.

Conclusion

From raw material to finished, galvanised construction supplies, the journey of sheet-metal fabrication is a testament to the synergy between engineering, technology, and craftsmanship. Each stage in this process, design, cutting, forming, welding, surface preparation, and galvanising, contributes to the reliability and longevity of infrastructure.

As construction demands continue to rise globally, the industry's responsibility lies in ensuring that every beam, bracket, and panel is not only strong but also sustainable. At Eastman IMPEX, we believe in pushing the boundaries of innovation while staying true to the principles of quality and trust that define our legacy.

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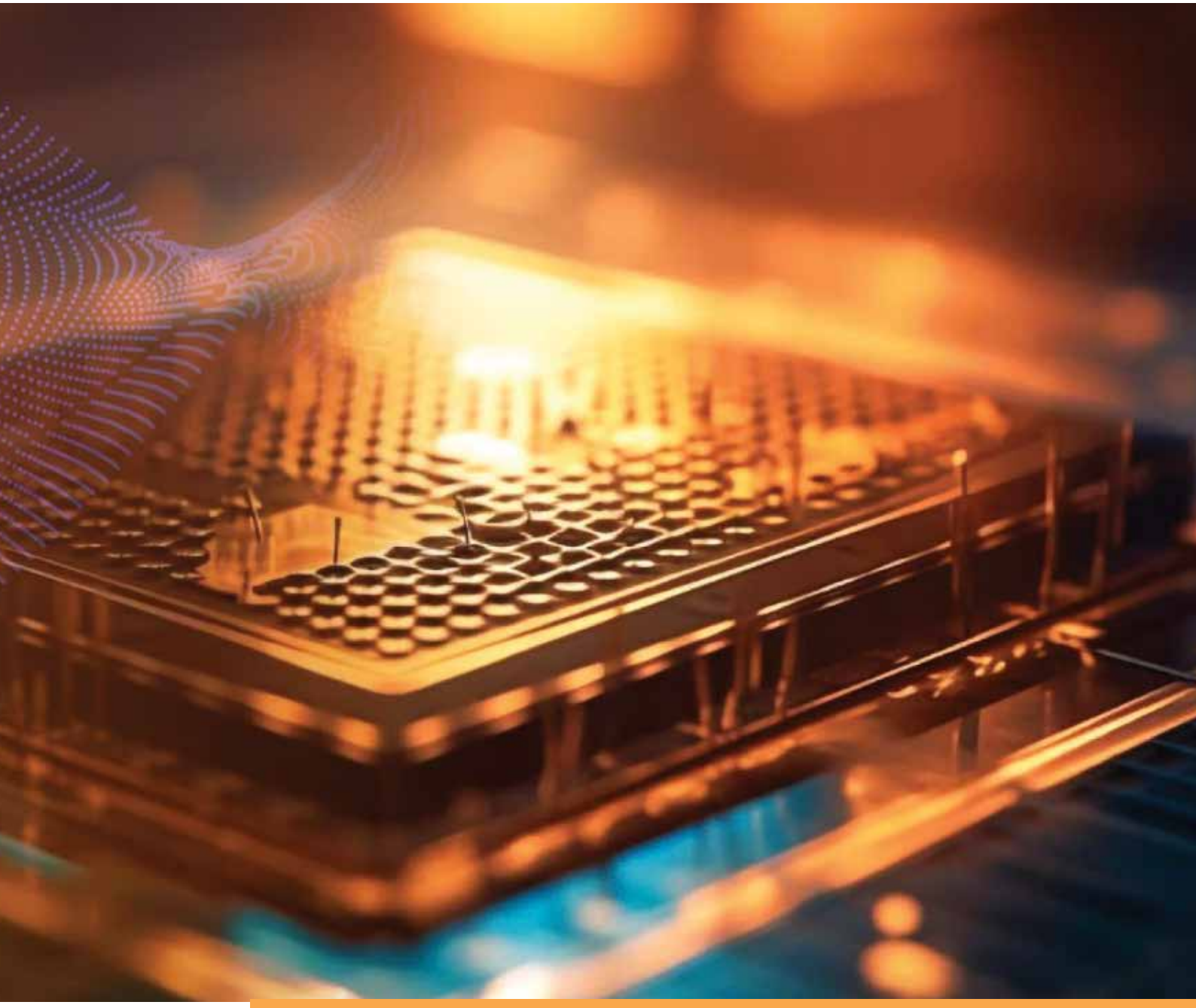
AI-Assisted PCB Designs: The Future is Here

In today's fast-paced electronics industry, the design of printed circuit boards (PCBs) has become more critical than ever. Traditionally a meticulous and time-intensive process, PCB design has relied heavily on experienced engineers to ensure accuracy, signal integrity, and manufacturability. However, the advent of Artificial Intelligence (AI) is transforming this landscape, offering automation, optimization, and intelligent insights that allow engineers to create smarter, faster, and more efficient PCB designs.

SUDHIR WOKHLU,
Vice President - HW Division, Tessolve



In an era of rapidly evolving electronics, printed circuit boards (PCBs) designs hold significant importance. A well-organized PCB design is vital for ensuring seamless functionality and bringing electronic components to life. Having said that, historically, PCB designs have largely remained a meticulous, time intensive and manual process, reliant on experienced human designers – until now.

The emergence of Artificial Intelligence (AI) has ushered in a new era of automation which is reshaping and optimizing PCB designs. AI-assisted PCB designs isn't just something for the future, but a present-day imperative which can offer a crucial advantage in the ever-evolving electronics industry.

Understanding the challenges of traditional PCB designs

Traditional PCB designs involve experienced designers manually laying out complex circuits. Further, factors like

signal integrity, thermal management and manufacturability adds a layer of complexity. Each of these processes demand a high-level of engineering expertise and often add weeks to production timelines to ensure an error-free design & manufacturing.

Applications of AI in PCB design manufacturing

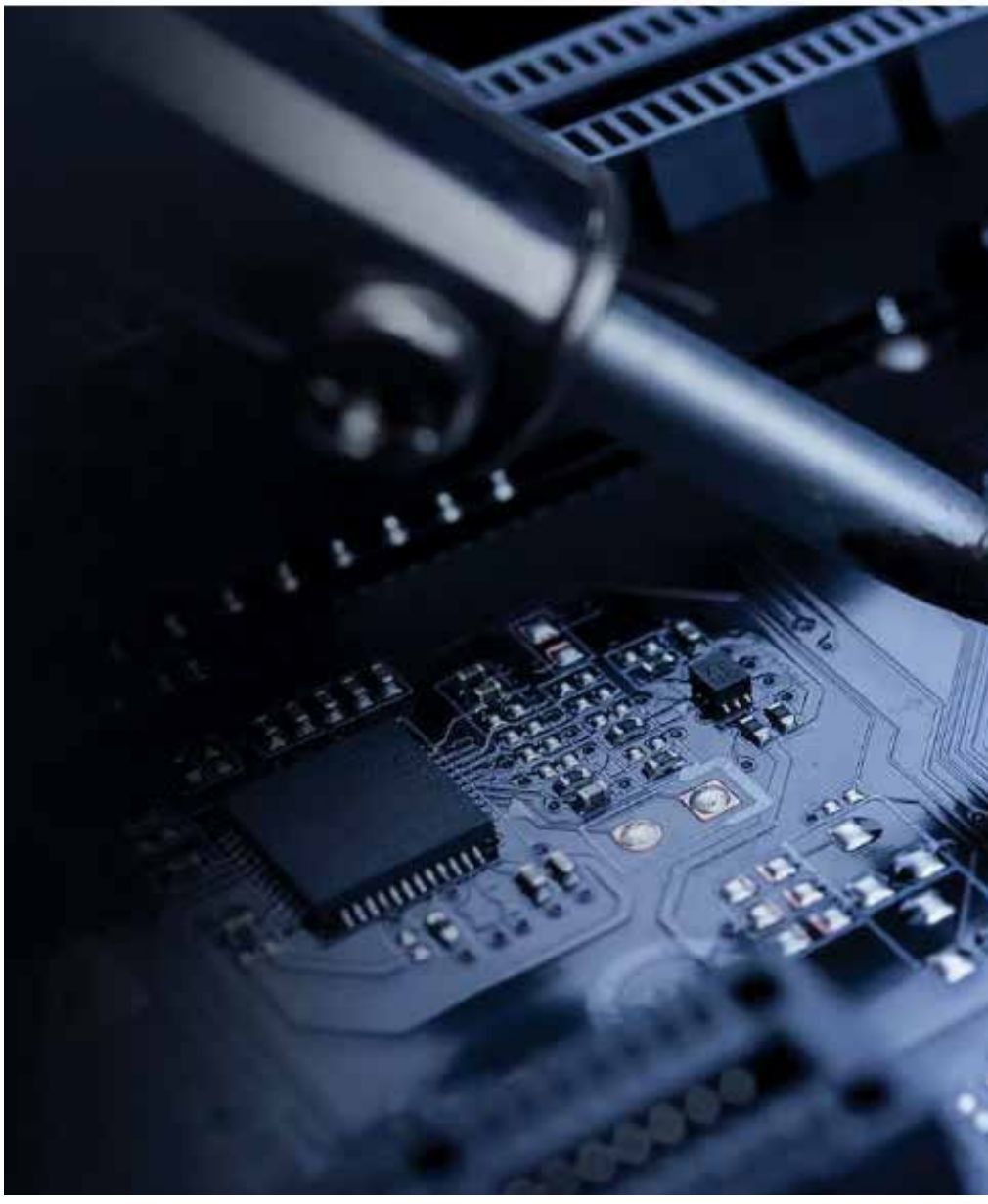
This is where AI steps in to streamline the entire process. The AI tools assist engineers by automating tedious, repetitive and error-prone tasks. This includes automating processes like component placement and trace routing, while predicting optimal layouts by taking into consideration factors like signal integrity, thermal management and power distribution.

Apart from automation, AI can also analyze existing PCB designs and identify areas for improvement. This can lead to the development of smaller and more optimal board sizes, while ensuring improved signal integrity and better thermal management.

Apart from improvement areas, AI can also be used to detect potential design flaws early-on in the process. This helps the company reduce both cost and time delays. AI Algorithms can also be set to ensure compliance with DRC (Design Rule Checking) and ERC (Electrical Rule Checking) guidelines.

Artificial Intelligence can also be adopted in the assembly and manufacturing processes. First by using visual recognition algorithms, to identify the flaws in PCBs and enhance quality control.

Second, it can also be implemented to improve the main assembly processes which help increase production and overall manufacturing efficiency. It can also be used to predict potential failure points, allowing for preventive maintenance across the entire manufacturing process.

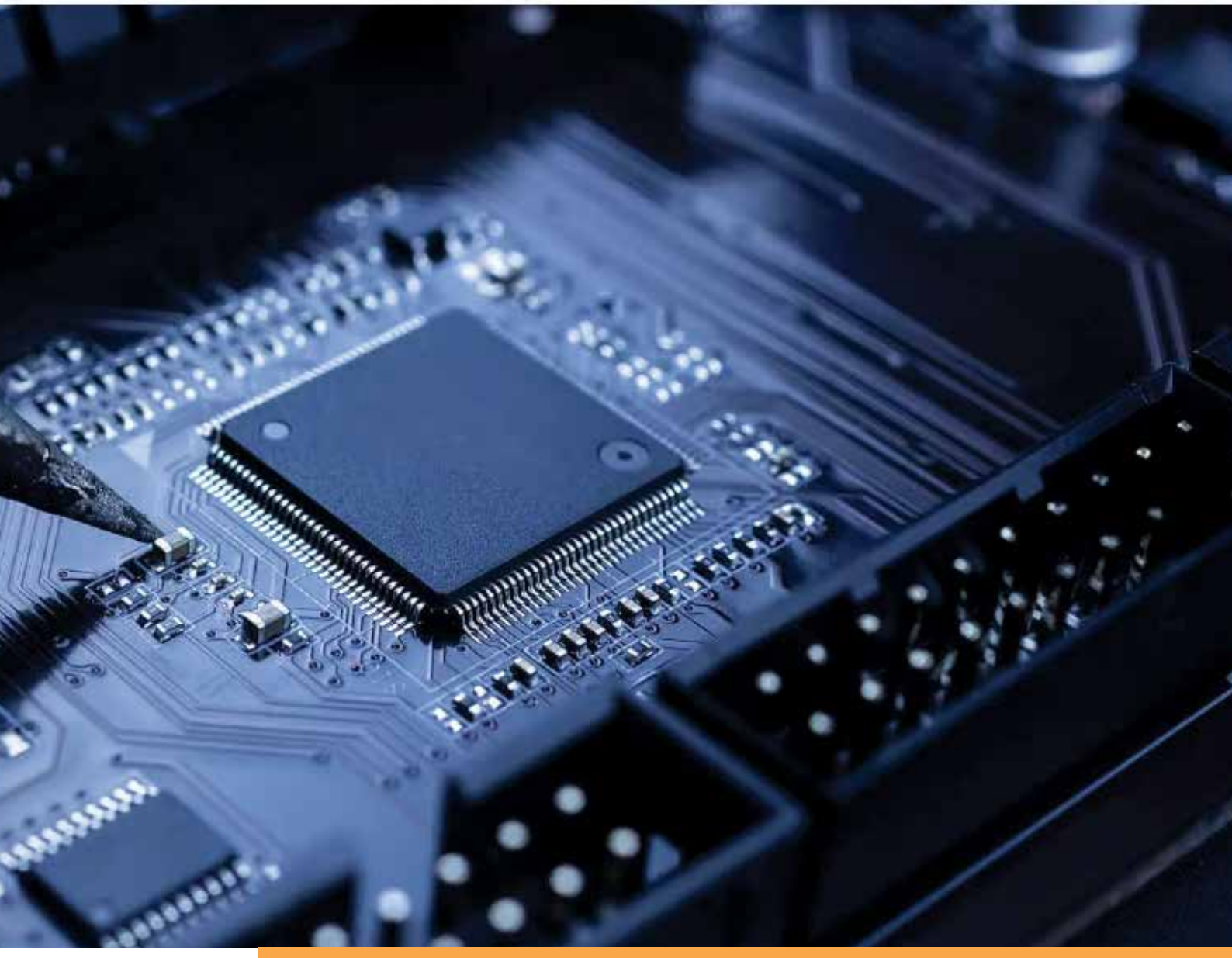


Benefits of AI in PCB designs

The integration of AI offer a lot of crucial benefits for companies and engineers involved in the designing of PCBs. The accelerated design process, allows companies to bring the products to market quicker. Automation of processes significantly reduce the cost of manufacturing by minimizing rework, optimizing material usage and reducing the overall development time. All AI-assisted PCB designs guarantee that all the regulations and quality standards are met. Finally, AI acts as a valuable assistant to engineers designing PCBs, allowing them to work on more complex design challenges.

The way ahead!

The integration of AI is not just an incremental shift, rather a foundational shift towards intelligent design



systems. It aligns with the broader industry trends in electronic design automation, where the entire product development lifecycle is guided by AI-driven decision making. Companies are also investing heavily, both in internal R&D and academic collaboration. These investments are made with the aim of developing domain-specific AI models tailored for PCB designs.

With rapid innovation across the industry, the integration of AI in complex processes like PCB designs isn't just an optional shift, but an essential one to remain competitive. However, integration of AI in PCB designs should be a collaborative approach, where AI handles all the repetitive tasks and optimizes processes, while human designers leverage their expertise for critical decision making.

AI is no longer a futuristic concept for PCB design—it is a present-day necessity that empowers engineers, accelerates product development, and ensures superior quality and compliance. By combining AI-driven automation with human expertise, companies can optimize design, enhance manufacturing efficiency, and reduce costs, all while staying competitive in an ever-evolving electronics ecosystem. The future of PCB design lies in this collaborative approach, where intelligent systems and skilled engineers work together to drive innovation forward.

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