



Local Expertise, Global Reach: Marelli's Distributed Model for High-Speed Innovation

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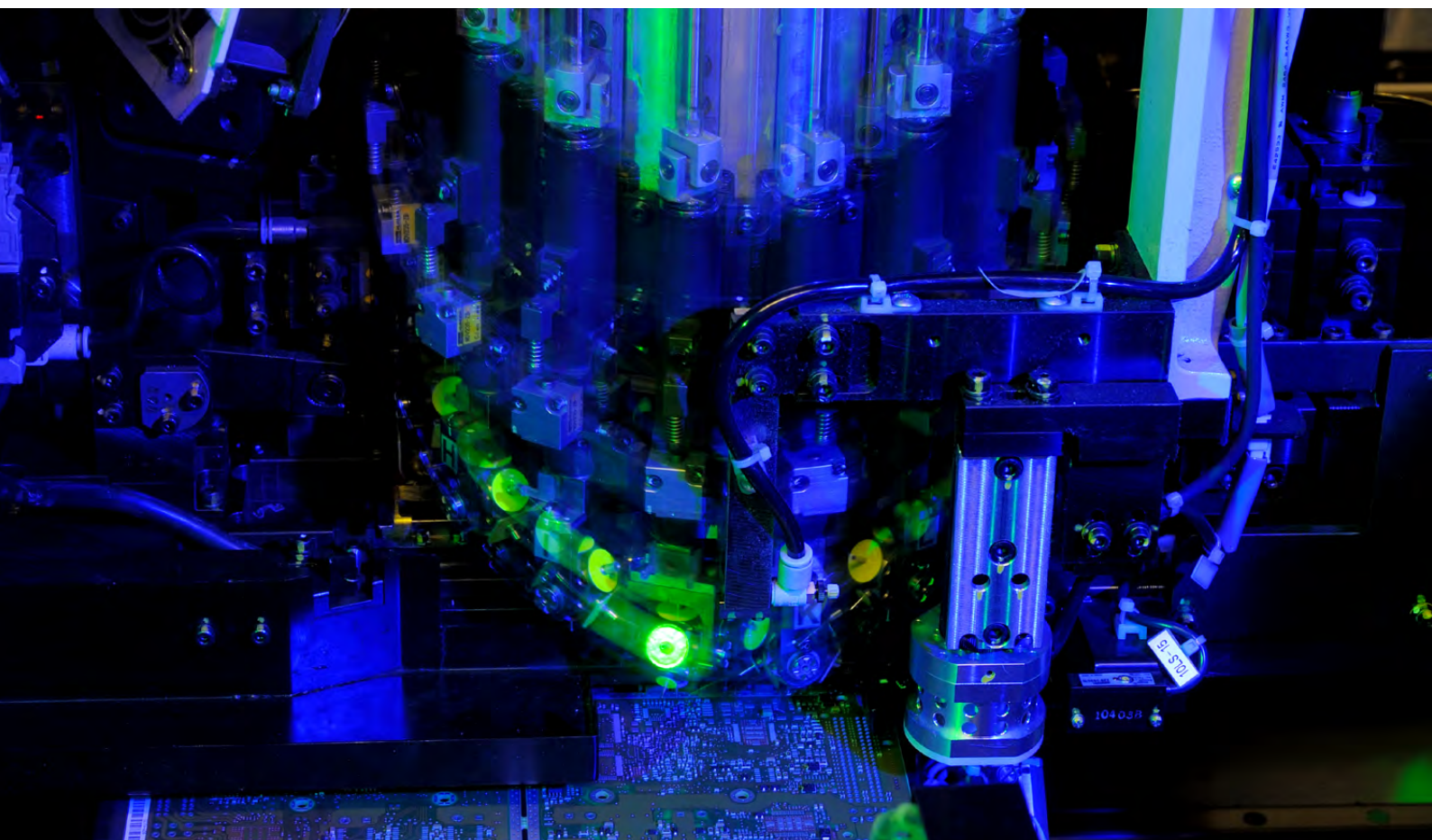
ABSTRACT

From its origins more than a century ago, Marelli has evolved into a global Tier 1 automotive supplier with over 150 sites worldwide, more than 40,000 employees and an international supplier network. This scale underpins a strategically polycentric operating model, designed to leverage regional expertise and cost structures while optimizing time-to-market and strengthening resilience in the face of potential disruption.

Centers of engineering and manufacturing excellence are distributed across multiple regions and supported by deeply embedded supplier partnerships.

Teams operate as an integrated global network, with project leadership and program management assigned according to expertise rather than geography. Resilience and cost control are further strengthened through multi-sourcing strategies, alternative design approaches and distributed engineering operations, reducing dependency on any single region, engineering hub or component supplier.

For OEMs, this globally integrated and robust model delivers engineering innovation at speed and scale, while ensuring consistent performance even under the most challenging business conditions.



INTRODUCTION

International automakers face unprecedented pressures in today's market. To remain competitive, they must develop increasingly content-rich vehicles—while shortening development cycles, optimizing costs and building more robust supply chains. At the same time, OEMs are accelerating the transition to electrification and Software-Defined Vehicles (SDVs), fundamentally reshaping how vehicles are engineered, sourced and brought to market.

Co-creating with Marelli helps OEMs navigate this challenging environment. Marelli has over a century of cross-domain expertise and a global manufacturing and engineering footprint that spans Europe, North and South America, China, India, Japan and Southeast Asia, enabling customers to balance agility, innovation and cost with structural resilience.

The ability to leverage expertise spanning both established markets and best-cost challenger territories is central to this approach. Teams are integrated across worldwide centers of excellence, enabling innovation to flow throughout Marelli's international network. The strategic development of products based on dual or even triple design concepts and multiple sourcing solutions, both in-house and through trusted supplier partners, supports cost optimization while strengthening resilience to global disruption.

Marelli's presence in China—first established in 1996—is particularly important. Over the past five years, China has been the major driver of industry transformation, as adoption of electrified vehicles and SDVs has increased. Domestic manufacturers have rapidly grown market share to over 70%¹ and expanded overseas, reshaping competitive boundaries and accelerating industry cycles².

Speed has been critical to this shift. Chinese OEMs have shortened new-vehicle cycles to as little as 12-18 months³ by embracing integrated, cross-functional teams, advanced digital tools, streamlined processes and continuous development. To remain competitive, global OEMs must rethink organizational structures, foster greater collaboration between engineering, procurement and manufacturing and accelerate decision-making. Partnering with Marelli supports this transition towards lean, digitally enabled product development and a culture of continuous innovation, enabling OEMs to deliver competitive products faster and more efficiently.

This paper uses real-world examples to demonstrate Marelli's integrated approach to engineering co-creation between our international teams, customers and global supplier network, helping automakers achieve long-term competitiveness in a rapidly evolving landscape.

Marelli's ability to leverage expertise across established markets and best-cost challenger territories is central to our co-creation approach.

OUR POLYCENTRIC APPROACH



Spanning more than 150 sites worldwide, with long-established engineering and customer-facing operations, Marelli teams are empowered with local autonomy to move fast while collaborating with an integrated international network. This is reinforced by cross-domain expertise in Lighting, Interiors, Body, Electronics, Propulsion, Exhaust, Suspension and Thermal Management.

The result is an ecosystem in which innovation thrives, vehicle quality is enhanced and development cycles are reduced.

Our growth in China reflects this integrated approach. Since our entry to the market, Marelli has expanded to more than 5,000 employees, eight R&D centers and 17 manufacturing plants serving seven distinct business lines. Through joint cost workshops and early collaboration with OEMs, we co-create solutions with our customers, quickly resolving challenges and delivering cost-competitive, tailored results.

Decisions are made by experts with in-depth market knowledge, enabling Marelli to meet rapid timelines and respond nimbly to evolving demands. As a result, project timelines are streamlined; for example, headlamp and ECU development programs have been reduced to as little as eight months.

In India, Marelli has approximately 1,000 engineers developing global software programs in collaboration with international Marelli teams. This capability is underpinned by a growing R&D footprint, including engineering centers in Gurugram and a recently opened second technical R&D center in Bangalore's Manyata Tech Park, strengthening Marelli's capacity in software, electronics and system-level development.

Europe and the US continue to play a central role for international programs, with our principal European branch in Corbetta, Italy, and North American customer and program-management operations in Detroit, Michigan. Additional manufacturing and industrialization capabilities in the Americas, North Africa, China and throughout Asia further strengthen Marelli's global footprint.

Crucially, common development processes, governance models and quality gates are applied worldwide, ensuring that accelerated development is achieved in full compliance with international quality standards.

INTEGRATED TEAMS, ACCELERATED RESULTS

By positioning integrated international teams at our core, we leverage the strengths of both local expertise and international reach to drive rapid innovation and superior project delivery.

In parallel, Europe, China and the United States play a crucial role in Marelli's global development governance to meet the most rigorous international regulations.

Marelli software engineering teams in India contribute to and, in some cases, lead worldwide and regional programs, collaborating with international engineering teams across multiple vehicle domains. The new Bangalore facility, for instance, co-develops technologies for SDVs, advanced lighting, Engine and Battery Management Systems (BMS) and Automated Manual Transmissions (AMTs) in partnership with international colleagues and customers.

China serves as a strategic hub for piloting and testing new processes prior to worldwide deployment. A high level of local autonomy enables our rapid adaptation to domestic market demands. Strong partnerships with local suppliers support fast, informed decisions on component selection and sourcing—often resolving technical queries with suppliers within 24 hours.

This agility feeds new approaches and solutions back into Marelli's international network, influencing best practices and accelerating development timeframes. For example, a new ultra-thin light headlamp module developed in China in just 18 months is now being offered worldwide, allowing global OEMs to deliver a mid-life model update much faster than the typical three to five-year cycle.

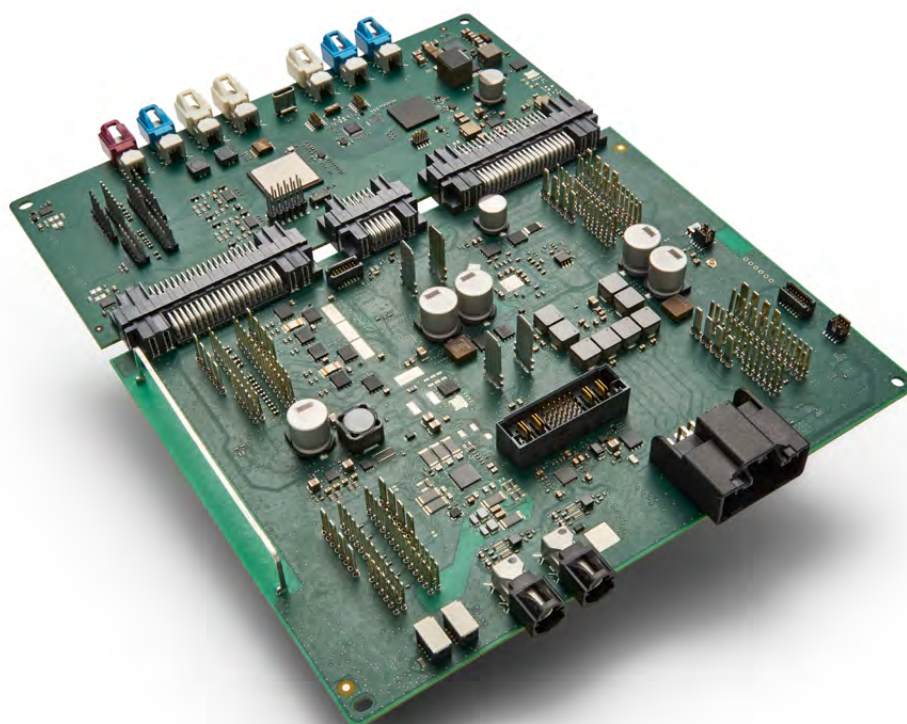
The full value of Marelli's model is realized when regional and domain expertise is combined across business lines to present a single, coherent engineering interface to the customer. To support this, Marelli has implemented global development methodologies—including Minimum Viable Product (MVP) prototyping and digital twin simulation—alongside engineering standards and nearly 100 Best Cost Analytics models covering 85% of purchasing value. Shared components and materials catalogs, standardized Printed Circuit Board (PCB) design and material selection and the ongoing introduction of Electromagnetic Compatibility (EMC) simulation tools further standardize processes and accelerate development with consistent methodology.

Integrated global teams enable Marelli to accelerate innovation, shorten development cycles and deliver customer ready solutions worldwide.

Marelli's Lighting and Electronics teams created a cost-effective and highly versatile zonal Electronic Control Unit (ECU) platform for multiple use cases, including advanced light source control, automatic door control, seat adjustment, audio streaming and suspension functions.

For OEMs, this integrated model delivers faster access to innovation, reduced system complexity and lower development costs, underpinned by consistent quality standards across international programs at a highly competitive price.

In addition to integrated global teams, co-creation with automakers is crucial to accelerating development timelines. By engaging with OEM customers early through joint design workshops and specification discussions, Marelli aligns technical, cost and performance priorities at each program's outset. Together with close day-to-day collaboration, the result is shorter iteration cycles, quicker resolution of technical challenges and significantly reduced time-to-market.



LEVERAGING SUPPLIER PARTNERSHIPS WORLDWIDE

Successful sourcing in the automotive industry requires more than strategic purchasing; it demands trusted partnerships, transparent communication and the ability to orchestrate complex, multi-regional supply chains while maintaining resilience in the event of disruption. With supply chains and Marelli-owned production facilities in North and South America, Europe, North Africa and Asia, Marelli offers its customers a distinct advantage.

We consistently maintain strict quality control across multiple locations. Not every supplier in best-cost countries meets the rigorous standards expected by global OEMs—some, despite their claims, lack proven manufacturing capability. Marelli's local teams perform comprehensive on-the-ground evaluations to ensure each supplier is certified to international automotive quality and safety standards and also adheres to them in practice. We also actively nurture our supply chain, identifying and supporting new entrants to the automotive sector—including those transitioning from other industries—to help them navigate certification requirements and adapt to international standards. Through this knowledge transfer, we enable suppliers to deliver value that goes beyond cost, introducing new technologies and differentiated solutions tailored for OEMs.

With Marelli as a bridge, OEMs enjoy comprehensive technical support should issues arise—a level of assistance that is difficult to achieve from Tier 1 suppliers operating independently in best-cost countries.

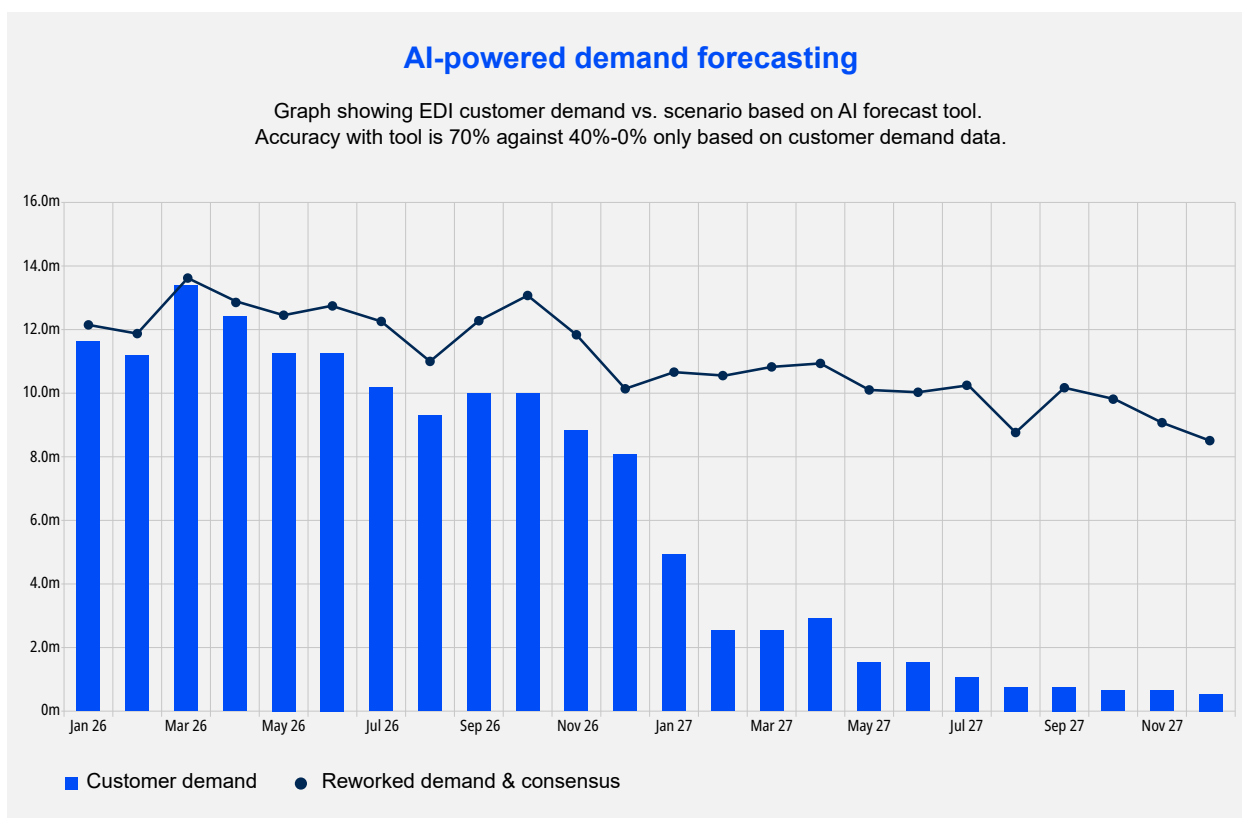
We also encourage co-innovation with suppliers, integrating the agility and breakthrough capabilities of best-cost markets with Marelli's decades of expertise, advanced processes and uncompromising commitment to quality. Recent collaborations include ECU development with ThunderSoft.

As a result, Marelli can deliver a program from nomination to start of production (SOP) in under a year, supported by access to specialized technology suppliers across multiple regions. This approach has already accelerated delivery across product programs, including advanced lighting systems and ECUs.



China is a critical part of this ecosystem, particularly in the supply of electronics, where dense supplier networks and competitive cost structures support rapid sourcing and iteration. Research shows that Chinese automotive manufacturers operate with cost structures up to 50% lower than global peers. By integrating these supply chain and cost advantages within a broader international framework, Marelli enables OEMs to benefit from speed and the diversification to lower costs without compromising quality or resilience.

To ensure OEMs are never over-reliant on any single geography or supplier, Marelli has implemented AI-driven supply chain planning capabilities⁴ to manage the approximately 350,000 component variations sourced from more than 2,500 suppliers and transformed into 50,000 finished products worldwide. Cross-checking Electronic Data Interchange demand forecasts against upstream supply constraints and downstream market data improves finished-product supply forecast accuracy up to 70%, minimizing excess inventory and component shortages.



With demand forecasting extending up to 24 months and scenario-based simulation to mitigate disruption, Marelli can balance speed, cost and resilience internationally, integrating highly competitive suppliers in China and other best-cost countries while maintaining alternative component options from different locations.

COST-EFFICIENT INNOVATION

OEMs today face structurally different challenges from the past, with excess production capacity driving down margins and vehicle retail prices that have dramatically outpaced average income over the last decade. As subsidies for electric vehicles are phased out and competition from new markets intensifies, automakers must find ways to reduce their cost base while simultaneously funding the shift to SDVs and electrified vehicles.

Marelli prioritizes cost-efficient innovation to ease these pressures. Digital twin technology shortens validation loops and reduces the need for physical prototypes; zonal architectures consolidate multiple ECUs into a single controller; and hardware is optimized so that more affordable components, applied intelligently, deliver most of the benefit of state-of-the-art technology. The examples below demonstrate how these principles translate into measurable reductions in Bill of Materials (BoM), weight, energy use and total cost of ownership.

Marelli's LeanConnect and ProConnect platforms combine Marelli China's expertise in system design and core software with European colleagues' consolidation of cluster, infotainment and connectivity functions into a single Connected Cockpit Module. Refined through rapid iteration cycles in partnership with a local module supplier, this technology is now adopted by a leading European OEM.



Affordable 5G RedCap was developed by Marelli China in collaboration with international teams and a local 5G module supplier to support over-the-air updates and future software expansion without the cost and complexity of full 5G implementations. The result is reliable, energy-efficient connectivity for entry- and mid-level vehicles deployed across global markets.



LeanExhaust further illustrates Marelli's cost-efficient innovation in action. Up to 50% more affordable than current production exhaust systems, LeanExhaust is optimized to accommodate battery packs and integrates a three-way catalytic converter and gasoline particulate filter close to the powertrain for more compact, lighter packaging, thus reducing CO₂ emissions. Developed in Japan, LeanExhaust is now deployed in global OEM programs and accounts for the majority of new programs secured through Marelli's Green Technologies business.

Smart Single Valve e-Shocks are a recent innovation developed on the LeanRide platform by Marelli Europe's suspension and handling experts. Based on a patented semi-active design, the innovative shock absorbers provide an equivalent tuning range and comparable damping performance to dual-valve shock absorbers with a single electro-hydraulic external valve. The result is a cost saving of up to 12.5% and 1.2 kg weight saving per shock absorber.

Marelli's access to comprehensive and competitive supply chains in best-cost countries accelerates cost-efficient innovation. We collaborate with technology and supply partners throughout the evolving ecosystem, progressing from effective cooperation to strategic partnerships to satisfy both domestic and international markets.



LOCAL EXPERTISE, GLOBAL IMPACT

Marelli's polycentric operating model empowers teams to innovate where domain expertise is strongest before scaling those innovations globally—driving faster development, smarter sourcing and more sustainable products for automakers everywhere. Our long-standing presence in China is particularly beneficial, giving our integrated teams first-hand exposure to the speed and efficiency required to accelerate industry-wide change everywhere. Together with expertise from other challenger territories, lessons learned allow Marelli to deliver cutting-edge solutions at speed, on budget and ahead of expectations—as the following case studies illustrate.

Speed meets precision: head-up display cost optimization



When a premium European OEM asked Marelli to reduce BoM cost for its innovative head-up display concept, Marelli China reviewed each component and material against the OEM's technical specifications. Weekly meetings brought together Marelli design engineers from Europe and China, best-cost engineers from Marelli's Chinese-based global team and local purchasing experts.

Marelli engineers optimized the original design and also worked closely with international suppliers. Marelli China's optical labs ensured prompt feedback to suppliers, facilitating rapid sample updates. By leveraging the strengths, best practices and processes of our global teams, we accelerated implementation and verification while preserving the original design and performance requirements.

The project achieved a guaranteed BoM cost below the customer's original best-cost target and was completed in just 12 weeks.

Fast-track development with CI/CD

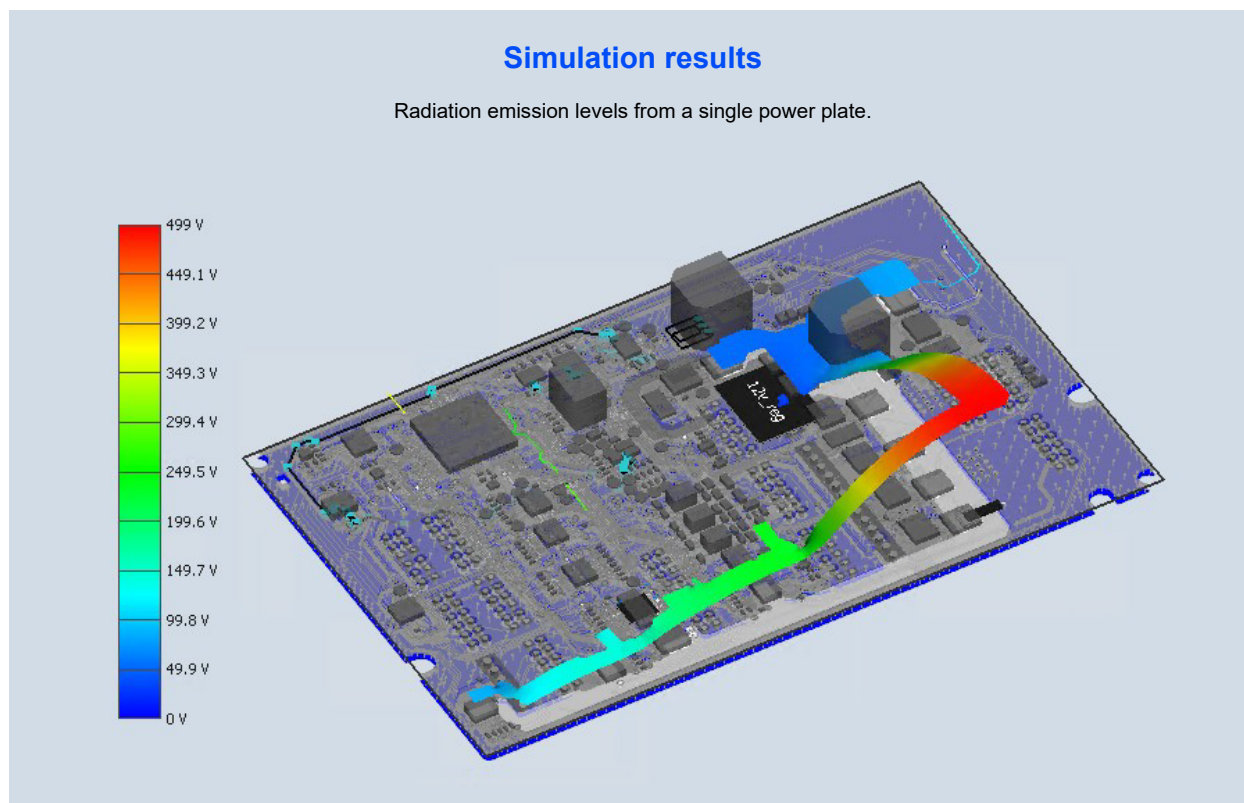


In 2023, Marelli began introducing advanced continuous integration and continuous delivery/deployment (CI/CD) practices to streamline the software development lifecycle.

Working closely with European colleagues, the Marelli software team in China began with a rapid proof of concept for CI/CD, establishing a minimum viable process within three months. During this period, the team implemented continuous integration and testing processes on a dedicated CI/CD server, creating fast feedback loops that prevented issues across multiple branches and reduced integration costs.

The approach was then rolled out for all new projects managed from China, including door and seat control ECUs. Developers now integrate new code into the mainline on a daily basis, with automated builds and test cycles immediately identifying conflicts and module interface issues. This provides rapid feedback to developers, reduces late-stage integration issues and typically doubles or triples software delivery speed, while also enhancing overall quality. The methodology was developed in China, adopted by Marelli's technical R&D center in India and is now being rolled out across engineering locations worldwide.

Simulation-led design excellence



Marelli has optimized and standardized its approach to EMC and thermal design through advanced simulation platforms embedded within the electronics development tool chain.

Through close collaboration with Cadence®, a leader in computer-aided engineering and simulation technology, Marelli China benefits from strong technical support and early adoption of new functional developments. Integrated into layout and circuit design processes, these tools enable a virtual Design-for-EMC environment using power integrity, signal integrity and EMC simulation. This allows EMC performance to be verified at each product life cycle quality gate, reducing EMC optimization cycles by 50% (from two to one) and minimizing repeated testing and additional sample builds.

Thermal simulation further optimizes design, reducing heat sink size and allowing PCB layers to be reduced from six to either two or four while simplifying packaging and housing.

In ECU design, lower operational thermal losses reduce energy consumption and lower Scope 3.11 emissions, which account for approximately 50% of Marelli's total Scope 3 emissions. By halving product energy requirements, Marelli could potentially save more than 20% of overall Scope 3 emissions.

CONCLUSION

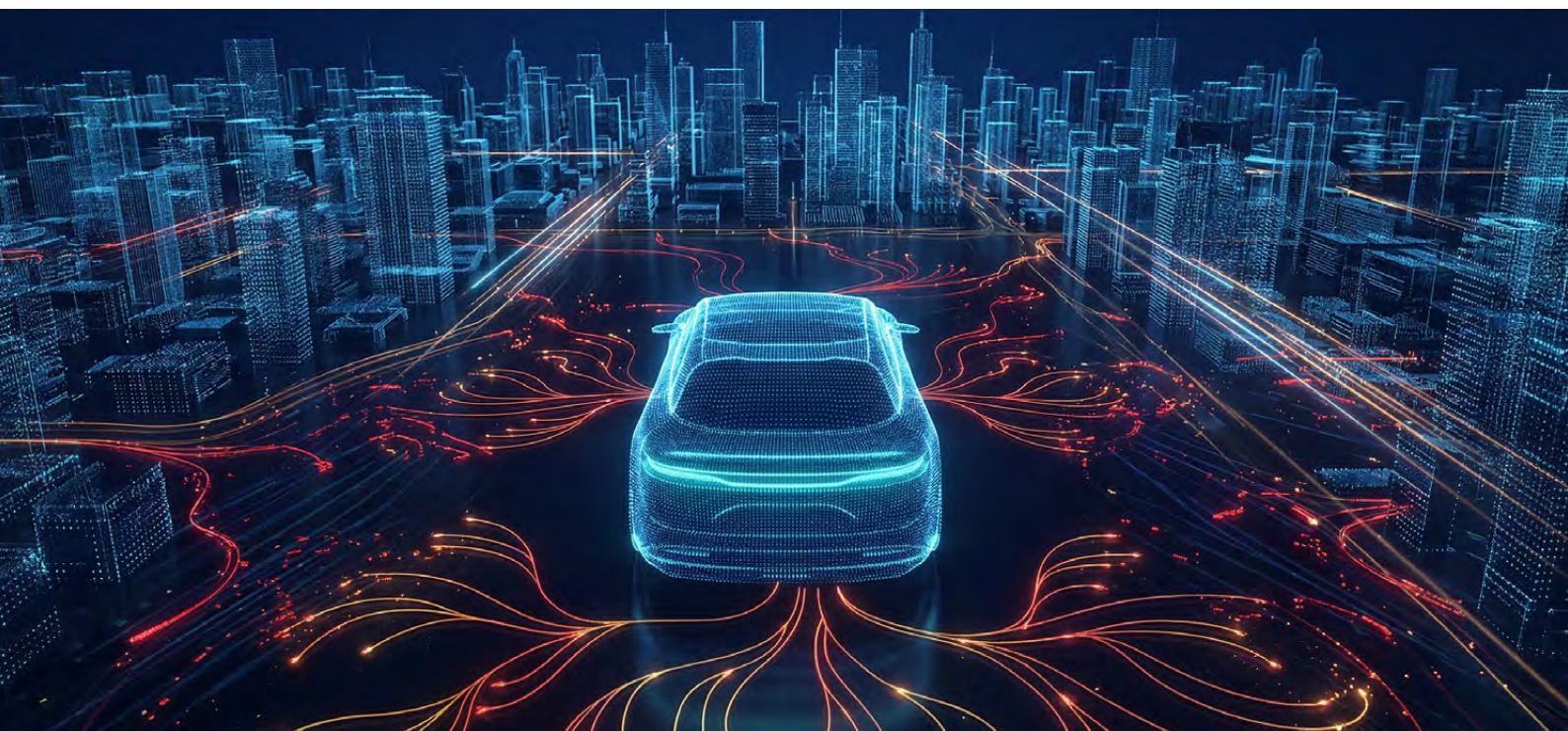
Marelli's global, polycentric strategy makes us the ideal strategic OEM partner to address the combined challenges of accelerated development, intensified competition and the introduction of ever more sophisticated and increasingly electrified vehicles.

Breadth is our strength. Marelli operates more than 150 sites worldwide focused on R&D, engineering and manufacturing, supported by cross-domain expertise and a comprehensive supplier network in best-cost countries. Together, this gives us the infrastructure and knowledge base to scale innovation at speed.

Our combination of global integration with local autonomy delivers a uniquely balanced operating model. We empower regional centers of excellence such as China and India to fast-track development and access cost-efficient innovation, while coordinated teams worldwide ensure knowledge transfer, seamless consistency between projects and delivery to the most rigorous international quality and safety standards. We also actively nurture our supply chain partners, co-creating innovations in deeply embedded collaborations and frequently supporting new entrants to the automotive sector with process and certification requirements.

Marelli protects against local or global disruption by design. We strategically develop alternative design architectures and multi-source components to avoid over-reliance on a single supplier or component and use advanced, AI-enabled planning tools to orchestrate multi-regional supply chains. The result is a mix of speed, affordability and resilience for the benefit of our customers.

By partnering with Marelli, automakers leverage a unified global network that adapts to local dynamics while upholding uncompromising international standards—ensuring clarity, continuity and competitive advantage across every program.



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Innovation @Speed.

At Marelli, we believe speed is the new currency in automotive. In a world defined by shifting consumer expectations, rapid tech evolution, and intense competition, getting to market faster isn't just an advantage — it's essential.

Marelli empowers automakers to move with speed and purpose. As a trusted technology partner, we offer scalable platforms, software-defined vehicle enablement tools, production-ready solutions, and fast innovation cycles designed to shorten development timelines and unlock early market opportunities.

We enable speed-to-market in four distinct ways:

- **Platform Products** – Tiered, modular hardware and software solutions engineered for speed, scalability, and smart customization.
- **Software-Defined Vehicle Enablement Tools** – Supporting future-focused E/E architectures with flexible hardware, decoupled software, and cloud virtualization tools that accelerate development.
- **Ready-to-Offer Technologies** – Proven, production-ready innovations built for immediate integration and impact.
- **Minimum Viable Product Innovation** – From concept to working prototype in as little as 90 days, our agile innovation process enables co-creation with automakers for rapid product development.

This paper highlights how Marelli brings together the rapid innovation and competitiveness of best-cost countries with global market expertise—delivering advanced solutions worldwide that are fast, cost-effective and resilient, underpinned by consistently high quality.