INDIA: THE EPICENTRE OF GLOBAL AUTOMOTIVE INDUSTRY R&D

INDIA IS NOW A THRIVING DESTINATION FOR AUTOMOTIVE R&D, DRAWING GLOBAL RECOGNITION FOR ITS INNOVATION AND STRONG INFRASTRUCTURE. WITH A TALENTED WORKFORCE AND FAVOURABLE BUSINESS CLIMATE, INDIA IS ESTABLISHING ITSELF AS THE PRIME HUB FOR TRANSFORMATIVE ADVANCEMENTS IN AUTOMOTIVE R&D. A REPORT.

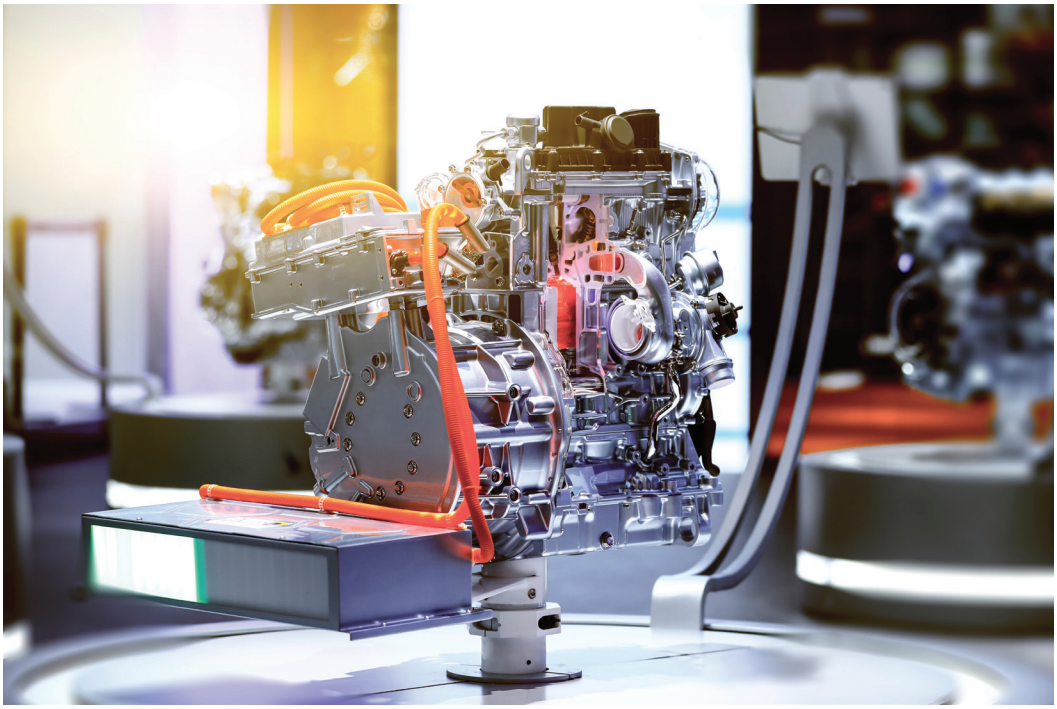
BY **SUJATHA VISHNURAJ**

"Our country's contribution will not only lie in yields and output but also in our capability to solve problems that have previously remained unsolved. Moreover, OEMs firmly believe that India is the ideal location to address these problems." Raghavendra Vaidya, MD & CEO of Daimler Truck Innovation Centre India

In recent years, India has emerged as a prominent destination for R&D activities in the automotive industry. The country's vibrant research ecosystem, a pool of highly skilled engineers, and cost competitiveness have attracted MNCs seeking to leverage India's intellectual capital. With strong potential for growth in areas such as engineering analytics and significant talent in the 'Deccan Triangle' region – encompassing Pune, Bangalore, Chennai and Hyderabad – India is poised to become an auto R&D hub. Raghavendra Vaidya, MD & CEO of Daimler Truck Innovation Centre India, highlights the global impact of India's engineering centres in the automotive industry. These centres are solving problems for India and the world, showcasing India's exceptional engineering talent and ability to adapt to diverse conditions.

India's abundant pool of talented engineers has gained recognition worldwide. These skilled professionals are returning to their homeland, contributing to a thriving intellectual capital base. Their focus on innovation and technological advancements has positioned India as a hub for cutting-edge automotive R&D projects. The availability of this intellectual capital is a major attraction for MNCs, as Indian engineers are highly trained and sought after by top global companies. With competitive costs and a skilled workforce, India remains an enticing destination for companies seeking to invest in R&D and leverage the country's talent pool. According to Dr Balaji Venkataraman, President of TVS Sensing Solutions, India possesses a remarkable talent pool in software development, AI, and EV solutions. Combining localisation efforts, a thriving market, and advanced technological infrastructure catalyses growth and innovation. These factors consistently position India as the preferred R&D hub for industry players.

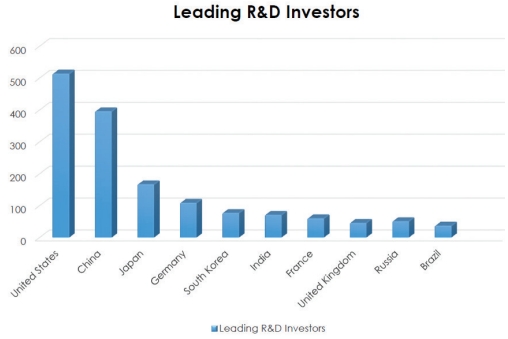
Several MNCs have already shifted or are in the process of shifting their R&D base to India. This is due to the country's growing research ecosystem, which presents a significant opportunity for companies looking to invest in R&D. Arun Krishnamurthi, MD & CEO of AXISCADES Technologies Ltd, concurs and



emphasises, "India provides a cost-effective setting for R&D endeavours, enabling companies to optimise expenses and allocate greater resources to innovation. The collaborative ecosystem in India, with its partnerships with startups and academia, grants access to a wide range of ideas and industry resources. Furthermore, the government's supportive policies, infrastructure, and a burgeoning domestic market create a favourable environment for automotive R&D within the country."

The Indian auto components industry is poised for rapid growth, projected to reach a turnover of $200 billion by 2026. The increasing presence of global automobile OEMs in India has led to a substantial localisation of components. From April 2000 to December 2022, the FDI inflow into the Indian automotive industry amounted to $34.1 billion. Shreshth Mishra, Co-Founder of Simple Energy, highlights the vast market potential for EVs in India, driven by a population of over 1.3 billion people. This presents a valuable opportunity for companies to develop and validate their EV technologies in real-world scenarios, tapping into the growing demand for sustainable transportation solutions.

Furthermore, the Indian government's supportive policies and initiatives, such as the FAME program, provide incentives and subsidies to EV manufacturers while facilitating the establishment of charging infrastructure. Nishit Behera, ED, RSB Transmissions (I) Ltd, agrees and emphasises the importance of R&D in the rapidly growing EV market. With significant budgets allocated for R&D hubs and technical

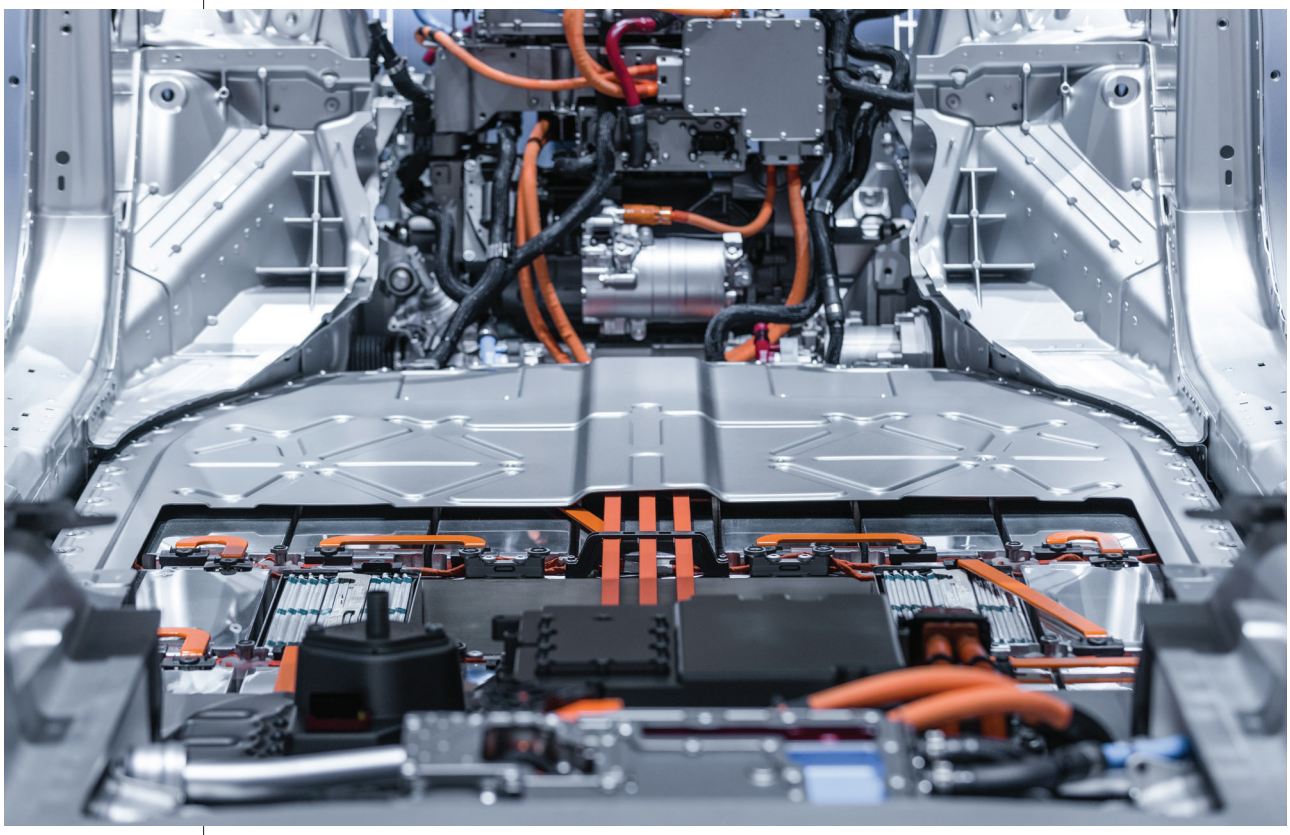


support from the Automotive Research Association of India, R&D has become a crucial element in driving innovation and development in the industry.

Companies such as General Motors, Ford, Hyundai, and Bosch have set up state-of-the-art facilities, focusing on various aspects of automotive R&D, including design, engineering, testing, and development of advanced technologies. According to Chandrasekar Krishnamurthy, BorgWarner's Global Engineering Director for Systems, Software, and Engineering Excellence, India benefits from a strong IT infrastructure and stable connectivity, enabling seamless collaboration between India and the rest of the world. This global connectivity serves as a catalyst for cross-border cooperation, allowing Indian entities to effectively engage with international partners, share knowledge, and contribute to global innovation efforts. It highlights the importance of India's technological capabilities and ability to facilitate communication and collaboration in the global automotive industry.

"The sector's capability in application engineering and manufacturing excellence plays a crucial role to address the challenges of an evolving sector which includes a rapid shift towards the adoption of EVs and autonomous driving solutions."
Dr Balaji Venkataraman, President of TVS Sensing Solutions

"India's talent pool is robust, with approximately 5.1 million engineers, including 1 million focused on ER&D activities, and around 600,000 professionals in software, embedded systems, and electronics."
Arun Krishnamurthi, MD & CEO, AXISCADES Technologies Ltdi



" Companies can establish their R&D hubs in India to access the expanding Asian market, benefit from cost-effective operations, and leverage the country's robust supply chain network. "
Shreshth Mishra, Co-Founder, Simple Energy

Through R&D investments, Indian companies have successfully overcome intense competition by developing innovative products that match international standards in terms of quality and affordability. This has granted them a competitive advantage in the global market. Raghu Muttige, Director and Head of Dana India Technical Centre, highlights the significance of skills in the automotive sector. The demand for professionals with expertise in mechatronics, a convergence of STEM disciplines, is particularly appealing. As vehicles become more complex, the need for mechatronics specialists grows in the automotive industry. This convergence of STEM disciplines, precisely the demand for mechatronics professionals, strengthens India's position as an attractive R&D hub for the automotive industry.

'MAKE IN INDIA' INITIATIVE & AUTOMOTIVE R&D

The 'Make in India' initiative strives to establish India as a global manufacturing and innovation hub. By facilitating investments, enhancing infrastructure, and opening new sectors to foreign capital, it fosters an environment conducive to R&D. The initiative emphasises the development of a skilled workforce and encourages entrepreneurship, further promoting R&D activities in India. Additionally, the government's policies allow for automatic FDI in most sectors.

The combined efforts of 'Make in India' and supportive policies attract investments and contribute to the growth of R&D, making India an attractive destination for innovation and manufacturing. Raghu highlights that the 'Make in India' initiative fosters a supportive environment for companies setting up R&D centres. This is achieved through streamlined regulations, improved ease of doing business, and incentives for local manufacturing and technology development.

Moreover, India boasts top-notch testing centres like ARAI, iCAT, NATRiP, and VRDE, equipped with state-of-the-art facilities for comprehensive testing and validation. These factors contribute to an ecosystem that encourages R&D activities and enables companies to thrive in their innovation pursuits. The PLI scheme, across 14 key manufacturing sectors, was launched in 2020-21 as a big boost to the Make in India initiative. The PLI Scheme incentivises domestic production in strategic growth sectors where India has a comparative advantage. This includes strengthening domestic manufacturing, forming resilient supply chains, making Indian industries more competitive and boosting the export potential.

These efforts are helping to boost India's attractiveness as an R&D hub for multinational corporations. By promoting local innovation, improving the regulatory environment, and promoting collaboration between industry and academia, the

'Make in India' initiative is helping to create a climate favourable to R&D investment in the country.

GOVERNMENT SUPPORT AND INITIATIVES

The Indian government has introduced several initiatives to encourage investment in R&D. Chandrasekar notes that the government promotes collaboration among academia, industry, and research institutions for research and innovation. Additionally, the Indian government allows 100% Foreign Direct Investment (FDI), enabling international players to establish their facilities independently.

In recent years, the Indian government has introduced various initiatives to foster R&D in the country. The 'Make in India' initiative, launched in 2014, aims to boost manufacturing and establish India as a global innovation hub. The 'Atal Innovation Mission' promotes entrepreneurship and innovation, while the 'Smart Cities Mission' facilitates sustainable urban development.

Arun also highlights the government's support for the automotive industry through initiatives like the Automotive Mission Plan, PLI scheme, and NEMMP, showcasing its commitment to long-term growth and electric mobility. These favourable conditions provide a solid foundation for innovation, collaboration, and technological advancements in India's thriving automotive sector.

These initiatives encourage local innovation, improve the regulatory environment, and promote collaboration between industry and academia. The government has also provided tax incentives for companies investing in R&D activities. These efforts are helping to boost India's attractiveness as an R&D hub for MNCs. Raghavendra emphasises that the Indian government provides excellent infrastructure for companies to establish engineering centres. The supportive policies, including favourable tax regimes and ease of doing business, create a conducive environment for export-oriented units. Furthermore, the government's initiatives to enhance engineering talent within the education system contribute to the growth of the services industry, not just in the automotive sector but also in intellectual property and ideas. Raghavendra highlights that this support from the government has always been present, and it is increasingly progressive, reflecting the commitment to foster innovation and drive the industry forward.

Incentives, tax benefits, and funding schemes have have further fuelled the growth of India as an R&D hub in the automotive industry. Dr Balaji adds, "The government also supports strengthening education infrastructure by expanding the network of centrally funded institutions and providing GST concession for research. Premier engineering institutes like the IITs play an important role in producing the finest engineering talent and introducing relevant courses in emerging domains of the automotive landscape such as electrification and shared mobility."

There are few other initiatives undertaken by the Indian government to support the growth of the automotive industry in India. For example, the National Automotive Testing and R&D Infrastructure Project (NATRiP) focuses on developing India as an R&D hub by setting up R&D centres at a cost of USD 585 million to enable the industry to adopt and implement global performance standards. As the automobile becomes increasingly software-defined, India's Engineering, Research & Development (ER&D) sector has a chance to script a similar story, with the share of automotive in the $36 billion Indian ER&D market at about 20%.

NATRIP

The NATRiP is a government-funded initiative to establish world-class automotive testing, homologation, and R&D infrastructure in India. With a total investment of Rs 3727.30 crore, NATRiP seeks to enhance India's global competencies in the automotive sector by seamlessly integrating the Indian industry with the global automotive landscape. The project includes the setup of four greenfield facilities: the International Centre for Automotive Technology (iCAT), Global Automotive Research Centre (GARC), National Automotive Test Tracks (NATRAX), and National Institute of Automotive Inspection, Maintenance & Training (NIAIMT).

In addition, existing facilities, such as the Automotive Research Association of India (ARAI-Pune) and the Vehicle Research & Development Establishment (VRDE-Ahmednagar), have been upgraded with advanced technologies. NATRiP aims to position India prominently on the global automotive map and foster testing, validation, and R&D capabilities to support the industry's growth. Here is how iCAT &

" The transition towards EV & hybrid vehicles has opened new avenues for R&D in areas such as battery technology, charging infrastructure, and energy management systems. "
Raghu Muttige, Director and Head of Dana India Technical Center

GARC support the automotive R&D in the country.

- **ICAT**

  iCAT, the International Centre for Automotive Technology, is a renowned institution located in Manesar, India, that specialises in testing, certification, research, and development services for the automotive industry. As a division of NATRIP Implementation Society (NATIS) under the Ministry of Heavy Industries & Public Enterprises, Government of India, iCAT plays a pivotal role in supporting the adoption of global performance standards by the Indian automotive sector.

  With a focus on electric vehicles (EVs) and FAME-II Testing, iCAT actively contributes to the government's e-mobility mission. The Tyre Test Lab at iCAT, accredited by NABL (ISO 17025) and approved by the Bureau of Indian Standards (BIS), operates as a Centre of Excellence, equipped with advanced capabilities such as Dual Station Endurance Test Rig and Tyre Rolling Resistance Test Rig, conforming to ECE R117 & AIS:142 standards.

- **GARC**

  The Global Automotive Research Centre (GARC) is a cutting-edge test centre established under NATRIP, a project by the Ministry of Heavy Industries and Public Enterprises, Government of India. GARC holds the authority as a testing agency under CMVR 126 by the Ministry of Road Transport & Highways, facilitating certification testing and R&D support for vehicle and component manufacturers.

  Equipped with comprehensive R&D and Homologation Test Facilities, including Test Tracks, GARC certifies vehicles, systems, and components according to national and international standards. It has also established dedicated facilities for the development and certification testing of electric and hybrid vehicles, in line with the government's FAME-India Scheme. GARC envisions becoming the premier centre for Automotive Certification and testing. At the same time, its mission revolves around being a solution provider in automobile research and testing, focusing on Passive Safety, EMI/EMC, and Automotive Infotronics.

INDIA HAS 5.1 MILLION ENGINEERS; I MILLION ENGINEERS FOCUSING ON ER&D ACTIVITIES; 600,000 PROFESSIONALS IN SOFTWARE, EMBEDDED SYSTEMS AND ELECTRONICS

PATH AHEAD

Arun is optimistic about the future. "The future of India's automotive R&D landscape holds great promise, driven by trends like the shift towards cleaner mobility, connectivity and cloud computing

advancements, and the importance of upskilling and reskilling. The focus on technologies like EVs, battery advancements, and connected and autonomous systems will shape R&D efforts.

India will continue to attract global and Tier-1 automotive OEMs due to its expertise in CASE technologies. Investments in R&D, government support, and a thriving ecosystem will further fuel the growth and competitiveness of India's automotive R&D sector," he says. Chandrasekar also is of a similar opinion. He says, "India's automotive R&D landscape is poised for a promising future, driven by key trends and developments. With a focus on electric and sustainable mobility, India is investing in EV technology, charging infrastructure, battery advancements, and smart materials.

Additionally, integrating connected and autonomous vehicles, enabled by AI, IoT, and data analytics, will spur intensive R&D investments. Advanced manufacturing and Industry 4.0 will reshape processes and supply chains, while collaboration, partnerships, and India's thriving startup ecosystem will foster innovation. Upskilling and talent development initiatives will ensure a skilled workforce to meet the industry's evolving demands as India emerges as a global R&D hub."

Raghu says about India's strong presence in frugal engineering and cost optimisation, which can drive R&D initiatives for affordable and value-driven products. Localisation and customisation of technologies will cater to the unique Indian market while maintaining cost competitiveness. "The rise of technology in the auto components manufacturing sector globally and its by-products, such as mobility, connectivity, fuel efficiency, electric cars and autonomous driving, have brought a huge playfield for the Indian manufacturers to compete and innovate. The Indian auto component sector is already driving innovation and increasing its R&D investments," Nishit concludes.

CONCLUSION

India's strong talent pool, supportive government initiatives, and growing auto components industry make it an attractive destination for automotive R&D. With the growing software-defined nature of automobiles, there lies a tremendous opportunity for India's Engineering, Research & Development (ER&D) sector to make a mark.

The Indian government has recognised the importance of R&D in the automotive sector and has introduced several initiatives to promote and support research activities. Incentives, tax benefits, and funding schemes have been implemented to encourage companies to invest in R&D infrastructure and talent development.

Another factor driving India's success as an R&D hub is the collaborative approach taken by companies, research institutions, and academia. Collaborative efforts foster knowledge exchange, accelerate innovation, and address industry challenges. Partnerships between Indian automotive companies and global players have resulted in joint research projects, skill development programs, and technology transfers, further enhancing India's R&D capabilities.

The country's emergence as a new R&D hub for the automotive industry is a testament to its potential as a global leader in innovation and research. MT

" India is now a Silicon Valley of East" as we have a vast, innovative and technical pool of talented wisdom touching every corner of the domain in research and development of the automotive sector, as is evidenced by their wide presence with global giants. Besides, the dawn of EVs at full throttle brought India to be a most favorable destination with wide sops and fiscal incentives "
Nishit Behera, Executive Director, Business Development & Strategy
RSB Transmissions (I) Ltd