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Arihant Mehta, President of Pinnacle Industries, shares how the company is redefining automotive seating, interiors and mobility solutions through safety, comfort, sustainability and advanced engineering.

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POLYMERS IN MOTION

The polymers industry is entering one of the most consequential phases in its evolution. Once valued primarily for cost efficiency and performance, plastics are now being redefined by a far broader mandate sustainability, circularity, safety and intelligent design. Across global and Indian markets, materials are no longer passive inputs; they are strategic enablers shaping how mobility is engineered, experienced and ultimately recycled.

From lightweight automotive interiors and advanced seating systems to circular material flows and chemical recycling at industrial scale, polymers are at the centre of this transformation. As clean mobility accelerates and regulations tighten, the industry finds itself at a critical crossroads — where innovation must align with responsibility, and engineering excellence must coexist with environmental intent.

The automotive sector continues to be one of the strongest drivers of change. As OEMs push toward electrification, lightweighting has become a design imperative rather than an optimisation exercise. Advanced polymer solutions are enabling improved vehicle efficiency, better ergonomics and enhanced safety across platforms from passenger vehicles and commercial fleets to rail and specialised mobility applications. At the same time, rising consumer expectations around comfort, interiors and quality are pushing material innovation deeper into the vehicle cabin, making polymers central to both performance and experience.

Sustainability, however, is no longer limited to material substitution or incremental efficiency gains. The industry is witnessing a decisive shift toward circularity. Chemical recycling, long discussed as a future solution, is now moving steadily from promise to industrial reality. Globally, several large-scale plants are operational or under construction, supported by policy frameworks, brand commitments and extended producer responsibility norms. These technologies are expanding the scope of recycling by breaking plastics down to their molecular building blocks, allowing them to be rebuilt into materials suitable for high-performance applications once again.

India, too, is beginning to align with this global momentum. While mechanical recycling remains the backbone of the current ecosystem, growing investments, pilot projects and regulatory clarity are laying the foundation for more advanced circular models. For automakers, this shift is critical. Cleaner mobility is forcing a re-evaluation of how plastics are designed, used and recovered at the end of a vehicle's life. Design for recyclability, mono-material strategies and traceability are gradually becoming part of mainstream engineering conversations.

The race to circularity is now a strategic priority rather than a sustainability add-on. Material suppliers, component manufacturers and OEMs are increasingly collaborating to reduce carbon footprints, increase recycled content and build closed-loop systems that can scale. These efforts align closely with India's broader manufacturing ambitions, localisation goals and push toward responsible industrial growth.

What lies ahead is a more integrated polymers ecosystem one that balances performance with purpose. As this issue of *ET Now Polymers* highlights, the future of plastics will be defined not just by what materials can do, but by how thoughtfully they are designed, deployed and brought back into the loop. The journey is well underway, and the direction is unmistakably forward.

Amit Shanbaug
Editor.



Photography: Vaibhav Nadgaonkar

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Powering the Future of Heavy Equipment, Digitally

A new partnership at Heavy Equipment Connect 2026 highlights how technology is reshaping the way the industry connects, collaborates and grows.

By Team ET Now Polymers

As Saudi Arabia accelerates its industrial ambitions, the heavy equipment sector is evolving just as quickly becoming more connected, more digital and more globally integrated.

Heavy Equipment Connect Forum & Expo 2026, a new three-day event taking place in Dammam this February, is designed to reflect that shift. Backed by key national stakeholders, the forum brings together manufacturers, contractors, investors and policymakers to explore how technology, localisation and innovation are shaping the next phase of industrial growth.

Digital platforms are playing an increasingly central role in this transformation, helping businesses move faster, work smarter and connect more efficiently. As Digital Innovation Partner for the event, MYCRANE



MYCRANE founder and CEO Andrei Geikalo with Hassan Al-Shehri of the National Industrial Development Center at the Heavy Equipment Connect partnership announcement.

will support the development of digital engagement tools aimed at improving how participants network, match and collaborate before and during the forum.

Rather than focusing purely on machinery, Heavy Equipment Connect is positioning itself as a meeting point for ideas, from smarter procurement and data-driven decision-making to sustainability and next-generation equipment solutions. Large-scale outdoor demonstrations, indoor

exhibitions and live demo zones will give visitors a hands-on look at how the industry is changing on the ground.

With Saudi Arabia continuing to invest heavily in industrial capability, the forum offers a timely platform for global and regional players to engage directly with a rapidly expanding ecosystem and to be part of the conversations shaping the future of heavy equipment in the region.

From Platform to Yard: Bringing Equipment Closer to Projects

With its first cranes arriving in Dubai, a digital-first business takes a tangible step into the physical equipment market.

By Team ET Now Polymers

Digital tools have transformed how the heavy equipment industry connects — but when it comes to getting projects moving, nothing replaces having the right machine ready on the ground.

That thinking is behind the arrival of MYCRANE Trading's first physical inventory, due to land at its Jebel Ali yard in early 2026. The initial intake includes a mix of tower, crawler and mobile cranes sourced from manufacturers across Asia and Europe, following months of on-site inspections and verification.

For customers, the shift is a practical one. Holding equipment locally shortens lead times, reduces uncertainty and makes it easier to move from enquiry to execution — particularly for time-sensitive projects across the Gulf and wider region. Each crane has been checked at multiple

stages, from pre-purchase through to shipment and handover, and will arrive with full inspection and safety documentation.

The move also reflects a broader evolution in the market. Buyers and rental companies are increasingly looking for transparency, speed and confidence alongside competitive pricing. By combining digital access with inspected, ready-to-deploy assets, the model bridges the gap between online marketplaces and traditional equipment trading.

While this first delivery marks an important starting point, it's very much the beginning. Inventory will continue to grow through 2026, alongside on-demand sourcing for customers with specific project or fleet requirements — all under the same inspection-led approach.

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Expanding the Reach of Mechanised Concreting

At EXCON 2025, AJAX Engineering highlighted how compact, indigenous innovations can make mechanised concreting practical for a broader construction base.

By Team ET Now Polymers



Mechanised concreting in India has traditionally been driven by large contractors and high-capacity infrastructure projects. Yet a significant portion of construction activity still depends on manual methods, particularly among small builders and emerging contractors. This gap between scale and access is increasingly shaping conversations within the industry and it was clearly reflected in the discussions and displays at EXCON 2025.

Among the companies drawing attention to this shift was AJAX Engineering, which has spent more than three decades building solutions for India's evolving construction needs. Rather than focusing solely on scale, the company's presence at the exhibition underscored a growing emphasis on accessibility bringing mechanised concreting to job sites where space, budgets and manpower are limited.

A key highlight was the introduction of UDAAN, a compact and mobile concrete mixing solution designed for diverse site conditions. With its smaller drum capacity, high manoeuvrability and compliance with newer emission norms, the equipment reflects a deliberate move towards practical mechanisation. The idea is not to replace large systems, but to support contractors who are transitioning away from labour-intensive practices while still needing reliable, repeatable output.

This approach aligns with a broader industry reality. Labour shortages, rising quality expectations and tighter project timelines are pushing builders to rethink how concrete is produced and placed. Smaller, site-ready machines can help bridge that transition, enabling mechanisation without the operational complexity traditionally associated with heavy equipment.

Beyond individual product launches, AJAX

Engineering's showcase at EXCON also reflected the depth of its portfolio. From self-loading concrete mixers and batching plants to pumps, slip-form pavers and even an indigenously developed 3D concrete printer, the company demonstrated how Indian engineering has matured across the concreting value chain. Many of these solutions are not only deployed domestically but are also exported to markets with similar construction challenges, reinforcing the relevance of locally developed technology on a global stage.

Underlying this product breadth is a strong emphasis on precision and quality. AJAX's patented load-cell technology, for instance, addresses one of the most persistent issues in on-site concreting accurate measurement. Consistency in concrete production directly affects structural performance, and technologies that reduce variability are becoming essential rather than optional.

Equally important is the ecosystem that supports these machines once they reach the site. With a wide service network and structured operator training through initiatives like the AJAX School of Concrete, the company is investing in long-term usability, not just equipment sales. This focus on skill development helps ensure that mechanisation delivers real productivity gains rather than underutilised capacity.

As India works towards ambitious infrastructure and development goals, companies like AJAX Engineering illustrate how progress often lies in thoughtful adaptation. By combining indigenous manufacturing, practical innovation and on-ground support, mechanised concreting is steadily becoming more inclusive extending its benefits beyond large projects to the everyday realities of construction across the country.



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RACE TO CIRCULARITY

The push for cleaner mobility is forcing automakers to reconsider how plastics are designed, used and recovered at end of life

By Team ET Now Polymers

Plastics have become indispensable to modern vehicles. They help cars weigh less, travel farther and perform better, particularly as the world accelerates toward electric mobility. Yet behind this quiet success story lies a growing contradiction. While plastics deliver efficiency and innovation on the road, they remain one of the most difficult materials to recover and reuse once a vehicle reaches the end of its life.

Today, millions of vehicles are dismantled every year, and with them come vast volumes of plastic components. Unlike metals, which are easily separated and recycled, automotive plastics are often complex blends of polymers, fibres and additives. As a result, only a small fraction finds its way back into new products. Most is downcycled, incinerated or discarded altogether. This loss is not just environmental. It is economic. Valuable material is simply disappearing from the system.

The scale of the challenge is significant. Automotive plastics already account for a growing share of global plastic demand, and this share is set to rise as electric vehicles become mainstream. Batteries, lightweight structures and advanced safety systems all rely heavily on plastic materials. Without a rethink, the shift to cleaner mobility risks creating a parallel waste problem that undermines its own sustainability promise.

This tension is now forcing the industry to confront a fundamental question. **What if plastics were no longer treated as disposable materials but as circular assets with ongoing value?** The answer



is beginning to take shape through a combination of regulation, technology and collaboration.

Regulatory pressure is proving to be a powerful catalyst. In Europe, new end of life vehicle rules are set to transform how plastics are used and recovered. Proposed legislation will require new vehicles to include a minimum percentage of recycled plastics, including materials sourced directly from scrapped cars. For manufacturers, this represents a profound shift. Circularity is no longer a voluntary ambition or a branding exercise. It is becoming a legal and operational necessity.

These rules also highlight the realities of the transition.

Policymakers recognise that recycled plastic supply chains are still developing. Temporary exemptions may be allowed where materials are unavailable or prohibitively expensive. Even so, the direction of travel is clear. Automotive plastics must become traceable, recyclable and reusable by design.

Technology is racing to keep pace with these expectations. Traditional mechanical recycling remains important, but it has limitations when dealing with mixed or reinforced plastics. New approaches are emerging that promise to unlock much higher value. Chemical recycling, for example, breaks plastics down into their molecular building

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blocks, allowing them to be rebuilt into materials that perform almost like virgin plastic. This opens the door for recycled plastics to be used in demanding automotive applications, rather than being confined to low grade uses.

Several major material suppliers are already piloting these methods, proving that high performance recycled plastics can return to vehicles in meaningful ways. From structural components to under the hood applications, recycled polymers are beginning to demonstrate that quality and sustainability do not have to be trade offs.

Alongside recycling innovation, attention is turning upstream to how vehicles are designed in the first place. Design for circularity is becoming a guiding principle. This means simplifying material choices, reducing unnecessary additives



“

Automotive plastics are shifting toward circularity through advanced recycling, bio-based alternatives, and design for reuse. Collaboration across the value chain is driving sustainable innovation, turning plastics into assets that reduce waste and retain value.

and making components easier to dismantle at end of life. When parts are designed with their second life in mind, recycling becomes more efficient and economically viable.

There is also growing interest in alternative materials. Bio based

plastics derived from plants or natural fibres offer intriguing possibilities. Some of these materials can reduce carbon footprints while still meeting performance requirements. Although they are not yet widely adopted, they signal a broader shift in thinking about what automotive materials could look like in a circular future.

None of this progress is happening in isolation. Circularity in automotive plastics demands cooperation across the entire value chain. Carmakers, suppliers, recyclers, dismantlers and policymakers must work together to align standards, share data and build trust. Industry coalitions and cross sector initiatives are playing a critical role in breaking down silos and accelerating learning.

This collaborative approach is essential because the challenge is systemic. Improving recycling technology without addressing design will fall short. Setting ambitious targets without building supply

capacity will create bottlenecks. True circularity requires coordination, patience and long term commitment.

What is emerging is a new narrative for automotive plastics. They are no longer seen solely as lightweight enablers of performance, nor as problematic waste at the end of a vehicle's life. Instead, they are increasingly viewed as materials that can circulate through multiple lifecycles, retaining value and reducing environmental impact along the way.

The race to circularity is far from over, but momentum is building. As regulations tighten, technologies mature and partnerships deepen, the idea of plastics as a circular asset is moving from concept to reality. In doing so, the automotive industry has an opportunity not just to solve a waste problem, but to redefine its relationship with materials in a world that can no longer afford to throw value away. 

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INDIA EYES A \$25 TRILLION MANUFACTURING FUTURE BY 2047

With technology-led manufacturing, deep policy support, and rising global demand, India is preparing for its biggest industrial transformation since independence.

By Team ET Now Polymers

India's manufacturing story is entering a new chapter that is more ambitious, more technology driven and far more globally integrated than ever before. A new report by Boston Consulting Group and Z47 titled Digitizing Make in India 3.0 suggests that by 2047, India could lift manufacturing's share of GDP from about 17 percent today to nearly 25 percent powered by five strategic sectors. These include elec-

tronics, defence, automotive and EV, energy and pharmaceuticals which together could anchor a 25 trillion-dollar industrial opportunity.

It is a vision shaped not just by industrial growth but by a national aspiration. The report highlights a shift from assembly led expansion to technology led value creation. Flagship programmes such as Make in India, Atmanirbhar Bharat and the expanding network of PLI and DLI

schemes have laid the foundation for this transformation by strengthening domestic capacity and encouraging innovation across the value chain.

A major turning point is unfolding in electronics and semiconductors. India's semiconductor demand is projected to grow from \$33 billion in 2022 to 117 billion dollars by 2030. This transformation is already visible. More than 99 percent of mobile phones sold in India are now

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manufactured locally compared to just 26 percent a decade ago. The shift shows how India has moved from being an assembly base to becoming a hub for design, innovation and deeper integration with global value chains.

Electronics and semiconductors are foundational to multiple end-sector with India's semiconductor demand projected to grow from \$33 billion in 2022 to \$117 billion by 2030. Ishang Jawa, Managing Director and Partner at BCG, noted, "This is not just about scale; it's about strategic self-reliance. India is no longer just assembling; it is designing, innovating, and integrating into the global value chain."

India's electric mobility story is advancing rapidly as well. EV sales have soared from 50,000 units in 2016 to more than 2 million in 2024 giving the country nearly 9 percent of the global EV stock. With the right push India could emerge as a major exporter of EV components, wiring harnesses, power systems and other high value technologies creating an export opportunity estimated at 100 billion dollars.

Sector-wise Overview

- **Semiconductors:** Market projected to grow from \$ 33B to 117B by 2030
- **Automotive and EV:** India holds 9% of global EV stock with 2.08M vehicles
- **Defence:** 92% of FY25 contracts awarded domestically, exports reached Rs. 23,000 Cr
- **Energy:** India achieved 50% non-fossil power capacity five years ahead of target
- **Pharmaceuticals:** Produces 60% of global vaccines, pharma market to hit \$ 130B



Defence manufacturing, clean energy components and pharmaceuticals are also emerging as strong engines of growth. Each of these sectors benefits from a unique combination of policy support, rising domestic demand and the opportunity to integrate into global supply chains that are seeking diversified and reliable partners.

"India has an unprecedented opportunity to redefine its global position in manufacturing," said Natarajan Sankar, Managing Director and Partner at BCG. "With bold policy moves and accelerating demand in areas like EVs and advanced electronics, India is building both the foundation and the forward momentum to lead across sectors."

India's industrial rise will also be anchored by powerful regional clusters. From the electronics and semiconductor belt stretching from Noida to Chennai to Hosur to the emerging energy and technology hub in Dholera these corridors encourage co location of suppliers, shared testing labs, bonded logistics, skill hubs and faster innovation cycles. These ecosystems reduce costs improve competitiveness and accelerate time to market.

Talent will sit at the heart of India's manufacturing transformation. Mobilising PhD level innovators attracting researchers from global markets and creating stronger engineering and process training ecosystems will be critical for shaping the next generation of deep tech manufacturing. As highlighted in the report building a world class talent engine will enable India to realise its 2047 ambition and strengthen its position in advanced manufacturing.

To achieve this goal the report outlines four key imperatives for India. These include scaling R and D and intellectual property creation expanding design linked incentives building world class cluster ecosystems and deepening private sector and startup participation through stronger procurement pathways and growth stage capital.

India's momentum is real. But sustaining it will require significant investment in upstream capabilities risk capital and technology adoption. By embedding innovation and export readiness into its manufacturing strategy India can convert policy into long term global leadership and move closer to the vision of a Viksit Bharat by 2047. 

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Affordable polymer syringes, IV tubes and disposables from Indian manufacturers empowered mass vaccination, reduced infections and expanded healthcare delivery at unprecedented scale.

By Team ET Now Polymers



When people think of life-saving medical tools, it's easy to imagine high-tech scanners, robotic surgery or cutting-edge vaccines. But some of the most impactful contributors to public health in India are humble, polymer-based devices that most of us rarely notice: disposable syringes, intravenous tubes, blood bags and catheters. These everyday tools, made from specialized plastics, quietly underpin huge swathes of healthcare delivery, especially in mass immunisation and infection control campaigns.

India's capacity to produce low-cost medical disposables is one of the country's unsung industrial achievements. A cluster of domestic

manufacturers have built an ecosystem capable of producing billions of devices annually. At its peak during the COVID-19 pandemic, **HMD was producing around 3.75 lakh (375,000) syringes per hour** in its Faridabad facilities and meeting massive national and global demand. In fact, HMD supplied at least 1.75 billion syringes used in COVID-19 vaccination campaigns worldwide, accounting for more than 13 percent of the **13.3 billion vaccines administered globally**.

For decades, India's public health apparatus has relied on disposable polymer syringes and safety devices to drive immunisation programs for diseases like measles, hepatitis, polio and tetanus. These devices are

designed for single use, dramatically reducing the risk that comes from reuse, a persistent source of infection transmission where sterilisation is inadequate. Auto-disable syringes have a built-in mechanism that makes them unusable after one injection. This simple yet effective design has been endorsed by the World Health Organization and is mandated for all major vaccination drives to safeguard communities against blood-borne diseases.

The impact of this manufacturing prowess is hard to overstate. When India embarked on its massive COVID-19 vaccination campaign the largest in history having abundant, affordable syringes was not a luxury, but an imperative.



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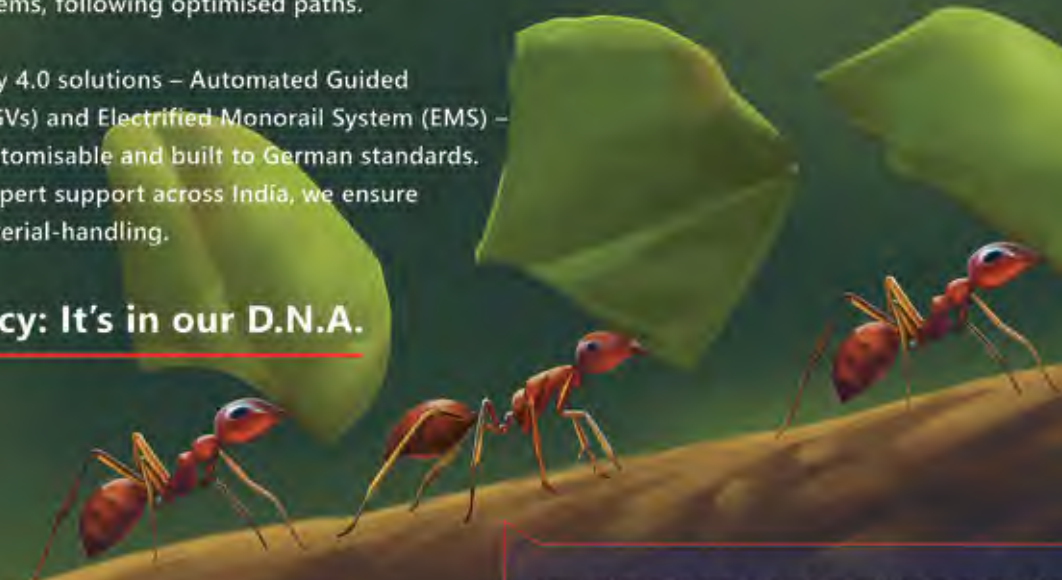
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Without them, even the best vaccine stockpiles would have remained unused. The availability of low-cost syringes ensured that millions of doses could be administered quickly and safely, extending protection deep into rural and urban populations alike.

But syringes are just one part of the story. Polymer science also underpins IV tubing and cannulas that deliver fluids and drugs directly into a patient's bloodstream. These devices, made from medical-grade plastics like high-density polyethylene and PVC, must meet stringent quality standards to ensure biocompatibility and sterility. During the pandemic, Indian manufacturers faced supply pressures when imports of crucial raw materials dipped sharply. To prevent potential production bottlenecks, the government temporarily exempted imported medical-grade plastic from mandatory certification requirements, a move aimed at ensuring continuity of production of essential devices like syringes and IV sets.

The advantages of these polymer devices go beyond cost alone. Plastics are mouldable, lightweight, clear enough for visual checks and, when sterilised correctly, safe for patient contact. Compared to glass, they break less easily, are lighter to transport and contribute far less to procedure times because they require no complex sterilisation cycles. In busy clinics and crowded immunisation centres, these qualities translate to faster throughput and lower overall healthcare costs.

It is not only the government and public programmes that have benefitted. Private hospitals and clinics across India rely on an ever-expanding range of polymer devices: syringes of various sizes, blood collection bags, urinary catheters and surgical drains to provide everyday care. Local manufacturers have expanded product lines to meet these varied needs, competing with multinational firms while keeping prices accessible for Indian health budgets and patients.



These innovations have helped transform India's public health landscape. India's disposable syringes market is projected to continue growing strongly, driven by increasing healthcare awareness, rural healthcare penetration and insurance coverage expansion under programmes like Ayushman Bharat. Initiatives such as the introduction of auto-disable syringes across all national immunisation campaigns and "Make in India" production support have ensured local supply and helped contain costs.

Yet, this success carries an environmental shadow. India generates an enormous volume of biomedical waste, an estimated **743 tonnes per day** with plastics making up a significant share. Much of this waste follows a linear path: used once and then incinerated or landfilled, rather than reused or recycled. Although only the hazardous fraction of healthcare waste is truly dangerous, gaps in segregation and waste management infrastructure mean that much polymer waste threatens both the environment and public health. Experts have called for a stronger circular economy for biomedical plastics to reduce landfill loads and improve sustainability.

Balancing these twin imperatives that is infection control and

environmental protection is a challenge that will define the next chapter of India's healthcare story. Some global trends point to biodegradable or recycled materials for medical disposables, but high costs and performance concerns still limit adoption in cost-sensitive markets like India. Meanwhile, stricter enforcement of segregation and treatment protocols for biomedical waste can reduce the risks posed by polymer disposables after they have served their purpose.

The story of India's low-cost polymer medical devices is ultimately one of convergence: where industrial capacity, public health needs, regulatory policy and human lives intersect. Without these affordable, reliable plastics, landmark achievements like India's large-scale vaccination drives would have faced far greater hurdles. The tubing that delivers lifesaving fluids, the syringe that administers vaccines, and the bag that preserves blood for surgery may not be glamorous, but they are indispensable components of health systems. As India looks to strengthen both its healthcare infrastructure and its environmental stewardship, these humble polymer products demonstrate how materials science can elevate both lives and livelihoods at scale. 



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THE CASE FOR ENDING PLASTIC POLLUTION

A landmark global study shows how redesigning packaging and embracing reuse could almost eradicate plastic pollution by 2040.

By Team ET Now Polymers

Plastic waste has become one of the most visible and damaging symbols of the environmental crisis. From oceans and rivers to farmland and food chains, plastic pollution now touches nearly every ecosystem on Earth. A major new global report suggests this path is not inevitable. With decisive action, the world could cut plastic packaging pollution by almost all within the next 15 years.

The findings come from *Breaking the Plastic Wave 2025*, a comprehensive analysis produced by the Pew Charitable Trusts in

collaboration with international research partners. The report assesses current plastic production trends and outlines a realistic pathway for reducing plastic pollution by up to 97 percent by 2040 if governments, businesses and consumers commit to systemic change.

At present, an estimated 66 million tonnes of plastic packaging waste enter the environment every year. That equates to roughly one garbage truck of plastic being dumped every minute. Without intervention, the report projects this figure could rise dramatically to around 280

million tonnes annually by 2040, driven by rapid growth in plastic production and consumption. Global plastic output is expected to increase from approximately 450 million tonnes today to about 680 million tonnes within the same timeframe.

One of the most significant conclusions of the report is the central role of reuse and return systems in reversing this trend. These systems are designed to keep packaging in circulation rather than discarding it after a single use. By reusing containers multiple times, the demand for new plastic drops



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sharply, reducing both waste and emissions at the source.

According to the analysis, reuse and return models alone could reduce plastic packaging pollution by nearly two thirds. This includes schemes such as refillable beverage bottles, reusable food containers and deposit return programs that encourage consumers to bring packaging back for cleaning and reuse. Unlike recycling, which deals with waste after it is created, reuse systems prevent waste from existing in the first place.

The report is clear that recycling by itself cannot solve the plastic crisis. Many types of plastic are difficult or uneconomical to recycle, and global recycling rates remain low. Even under optimistic scenarios, recycling cannot keep pace with the growth in plastic production. Instead, the report argues for a broader transformation of the plastic system, combining reuse with reductions in



fertility issues, developmental problems in children and increased risks of chronic diseases such as cancer and diabetes. As plastics break down into microplastics, these substances are increasingly found in food, water and even human blood.

Plastic is also a major and growing contributor to climate change. The production, transportation and disposal of plastics currently generate about **2.7 billion tonnes of carbon dioxide** equivalent emissions each year. If current trends continue, plastic related emissions could rise to more than **4 billion tonnes** annually by 2040, representing an increase of nearly 60 percent. The report estimates that a shift toward reuse and reduced production could cut these emissions by around 38 percent, delivering meaningful climate benefits alongside pollution reduction.

The economic implications are equally striking. Managing plastic waste is expensive, particularly for lower income countries that often receive large volumes of plastic waste without adequate infrastructure. The report estimates that continuing on the current path will significantly increase waste management costs worldwide. In contrast, adopting a system centered on reuse, reduction and smarter material choices could save governments approximately 19 billion dollars each year by 2040 in collection, sorting and disposal costs.

Importantly, the report does not frame its recommendations as theoretical or aspirational. Many of the solutions it promotes already exist in different parts of the world. Deposit return schemes for bottles and cans have proven highly effective in multiple countries, achieving return rates of over 90 percent in some cases. Refill models are already being used for beverages, household cleaners and personal care products, demonstrating that consumers will embrace reuse when systems are convenient and affordable.

What the research makes clear is that incremental change will not be enough. Without strong policy measures, including producer responsibility rules and incentives for reuse, plastic production will continue to rise and overwhelm any gains made through recycling. The next decade is therefore critical. Decisions made now will determine whether plastic pollution becomes a permanently escalating burden or a largely solved problem.

Breaking the Plastic Wave 2025 offers a rare note of optimism in a field often dominated by bleak projections. It shows that the tools needed to nearly eliminate plastic packaging pollution already exist. What remains uncertain is whether governments and industries will act quickly enough to deploy them at the scale required. 

“

A global report reveals plastic packaging pollution could drop by 97% by 2040 through reuse systems, material redesign, and policy action. *Breaking the Plastic Wave 2025* shows existing solutions can curb waste, emissions, and health risks if scaled urgently.

overall plastic use, substitution with alternative materials and targeted bans on the most harmful plastics.

Beyond environmental damage, the report highlights serious health concerns linked to plastics. Plastic products contain more than 16,000 known chemicals, many of which are associated with hormone disruption,



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THE RISE OF THE

The rise of this industry also reflects the rise of some of the major brands – both home-grown and of foreign-origin that focus on excellence, quality, innovation and service

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ENGINEERING

THE FUTURE OF MOBILITY

Arihant Mehta, President of Pinnacle Industries, shares how the company is redefining automotive seating, interiors and mobility solutions through safety, comfort, sustainability and advanced engineering.

By Amit Shanbaug

For Pinnacle Industries, the evolution of mobility is not merely a shift in platforms or technologies. It is an ongoing journey of engineering refinement, design sensitivity and deep understanding of the passenger experience across every mode of transport. Under the leadership of **Arihant Mehta**, the company is expanding its capabilities beyond its traditional strengths and reshaping its identity as one of the country's most forward-looking mobility solution providers. What began as a business rooted in commercial vehicle seating has now grown into a multi-dimensional enterprise that spans railways, passenger vehicles, two wheelers, ambulances, defence mobility and a fast rising EV ecosystem.

Mehta reflects on this transformation with clarity and purpose. He explains that Pinnacle Industries was once recognised primarily as a seating systems and



interiors specialist focused on commercial vehicles. Over the years the company has steadily diversified its product universe by foraying into railways and passenger vehicles and by exploring seating solutions for two wheelers. The intention behind this diversification is driven by a larger philosophy that centres on enhancing the modern mobility



experience. The company wants to build seats that are more comfortable and more advanced and that meet the highest standards of safety. The new generation of products is designed with softer foam, improved ergonomics and a conscious emphasis on comfort which was not always a primary parameter in traditional seating.

A major shift within the organisation is the focus on lightweighting. Seats have historically been heavy and contributed to inefficiencies in both fuel based and electric vehicle platforms. By investing in lighter materials and more refined structures Pinnacle is enabling automakers to improve overall vehicle efficiency especially in electric vehicles where every kilogram matters. The company has also developed moulded seat technologies and is investing in modular layouts that give manufacturers far greater flexibility in packaging and design. For Mehta these changes represent not just innovation but a natural evolution of what the future demands from seating engineering.

Safety sits at the centre of this transformation. As the government tightens safety norms and introduces more rigorous homologation requirements the company has committed itself to ensuring its products are compliant with global and Indian standards. Mehta stresses that safety accessories such as two point and three-point seat belts which were not always available across earlier products are now being





integrated comprehensively. This commitment aligns with the larger push toward safer mobility in India where both regulatory expectations and customer awareness are rising sharply.

The organisation's growth is not limited to conventional mobility. Healthcare mobility particularly ambulances has emerged as one of its most important and meaningful business verticals. Pinnacle Industries has taken a leadership role in upgrading ambulance quality across the country. With several states seeking modernised vehicles that meet higher standards the company has invested significantly in designing and engineering advanced ambulances. Mehta explains that the company has introduced three new variants which include the **AdGen** the **AdGen Ultra** and a specialised neonatal ambulance. The AdGen aligns with the advanced life support category and incorporates superior medical equipment improved stretchers and an overall enhanced layout. The AdGen Ultra represents an even higher benchmark meeting European and American ambulance standards which allows the product to be positioned for both domestic use and international markets.

Developing these ambulances required extensive ground surveys and field studies. The team examined



current shortcomings in older ambulances where wear and tear over a decade often compromised usability and patient comfort. By understanding the real-world challenges faced by doctors, paramedics, and patients during emergency situations Pinnacle has reengineered its ambulance interiors with better materials new finishes improved radiation resistant surfaces and more functional layouts. For the company it is not just a product but an environment where every second and every detail matters.

Even as Pinnacle scales multiple verticals simultaneously Mehta emphasises that the company's

investments are balanced across businesses. The seating systems vertical and the ambulance vertical are equally important and share R&D resources and engineering capabilities. This approach ensures that innovation in one domain often benefits the other whether in materials design or ergonomics.

A defining strength of Pinnacle Industries is its supply chain philosophy. At a time when global sourcing disruptions have impacted many manufacturers the company has built a nearly fully localised procurement ecosystem. According to Mehta **99.99 percent** of the company's sourcing is within India and over the years the company has consistently moved toward Indian vendors and partners. This not only supports national manufacturing ambitions but also ensures greater resilience cost effectiveness and control over quality standards.

The company's growing involvement in defence and paramilitary mobility reflects its ability to design specialised products. Pinnacle supplies seats for defence vehicles through various OEMs. Future opportunities in defence depend on the applications that OEMs supply to the government. Parallel to this the company is also exploring direct entry into the defence sector and is in discussions with multiple organisations to expand its footprint. Mehta is optimistic that the next quarter may bring positive developments in this area.

Sustainability forms another pillar of Pinnacle's long-term vision. Mehta explains that the company has placed significant emphasis on ESG principles and environmentally conscious manufacturing. All plants run entirely on solar power ensuring complete reliance on renewable energy. Materials used in seats



and interiors particularly fabrics and foams are being chosen with greater emphasis on environmental friendliness.

Sustainability expectations have also been extended to vendors who are encouraged to operate with responsible governance and ESG discipline.

The company's design philosophy draws together passenger comfort efficiency safety and quality. These guiding principles shape every product whether designed for a bus a passenger vehicle a two-wheeler or an ambulance. Mehta reiterates that lightweighting is again a key part of this philosophy because even marginal improvements in vehicle weight can significantly improve efficiency for OEMs especially in the electric mobility space.

When asked about the engineering differences between EV and ICE seating Mehta offers a pragmatic view. The engineering process does not change significantly because seating remains fundamentally the same. The only difference lies in vehicle packaging especially battery placement which may influence seating layouts. Pinnacle addresses this through modular seat configurations that adapt easily to different battery pack sizes and positions.

The company's internal transformation is equally significant. Over the next five years Pinnacle plans to dramatically increase automation across its manufacturing operations. The current ratio stands at sixty percent automated and forty percent manual, but Mehta expects the company to reach eighty percent automation within five



years. This shift requires upskilling of operators who are being trained to handle robotics welding systems stitching automation and other advanced manufacturing processes. For Pinnacle automation is about achieving higher safety standards improved quality and consistency across production.

Looking ahead Mehta anticipates substantial disruption in the mobility and commercial vehicle ecosystem over the next three to five years. These disruptions will come from changing customer expectations improved quality consciousness and a strong push for better materials and modern interior designs. OEMs today demand superior fabrics enhanced trims and products that reflect evolving consumer aspirations. Pinnacle is preparing for this shift by developing new products and exploring collaborations including potential joint ventures with European companies. The aim is to

bring technologies to India that may be required in the next five years and to stay a step ahead of market needs.

For Mehta and his team the next three years are a period of accelerated innovation and preparation. Pinnacle is working on new seats new interiors and new technologies that will emerge with a future ready design language. These advances are not merely reactive to market trends but proactive responses to how mobility will evolve in the coming decade.

As Pinnacle Industries strengthens its presence across mobility verticals the company's journey reflects a rare blend of engineering discipline and human centred thinking. Whether it is the softness of the foam the lightness of the structure the precision of a medical stretcher the compliance of a seat belt or the comfort of a paramedic during a critical ride every detail is treated with equal seriousness. 



SHAPING INDIA'S FUTURE IN AUTOMOTIVE PLASTICS

The 9th edition of the ET Now Polymers Global Conference on Plastics in Automotive (GCPA 2025), was held on 27 November 2025 at the J W Marriott, Pune.

By Pratiksha Marathe





partners. Yudo Hot Runner Systems led the event as the Presenting Partner and Covestro India as the Powered By Partner. Yizumi HPM came on board as the Platinum Partner, while Plastiblends India Limited elevated the proceedings as the Gold Partner. TUV Rheinland further added depth to the platform

The Global Conference on Plastics in Automotive has been a leading platform uniting OEMs, polymer innovators, recyclers, and policymakers to shape the future of plastics in mobility. For the last eight years, this event helped in driving sustainable, India-centric innovation and to position the country as a global leader in automotive polymer solutions. And this year, the conference witnessed a seamlessly curated line-up of speakers from automotive and polymers domain, featuring keynote addresses, hall-of-fame recognitions, expert presentations and four high-impact panel discussions that explored the current role of automotive plastics.

Opening: ceremonial gravitas and editorial framing

The event commenced following registration and networking, witnessing around 250 delegates from the industry. Most importantly, the summit drew its strength from the invaluable support of our



(Recipients of Award, L-R): Arvind Goel, Vice Chairman, Tata Autocomp (Hall of Fame); Deepak Thukral, Executive Officer- Supply chain, Maruti Suzuki India (Lifetime Achievement); Ganesh Mani, CEO, Switch Mobility, President & COO, Ashok Leyland (Hall of Fame); Shailendra Shukla, Managing Director, Eaton (Hall of Fame)

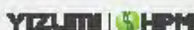
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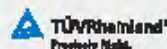
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Panel 1 (L-R): Moderator, Vishal Agarwal, President, Yudo Hot Runner Pvt Limited; Shailendra Shukla, MD, Eaton; Divakar Gokhale, Head of Mobility Business, Covestro; Shailendra Goswami, Chairman and MD, Pushkaraj Group; Sunil Koparkar, MD, IAC group



Panel 2 (L-R): Moderator, Dr Sandeep Waykole, CEO & Director, Accolade Electronics Private Ltd.; Amol Kalekar, Head, Material Testing Laboratory (Senior Manager – Operations), TUV Rheinland; Dr Sameer Joshi, Advisor, Niti Ayog & UN Global Plastic Treaty; B P Shiv, VP & Chief Sales, Marketing & Programs Officer -TAFE; Satyabrata Das, Director Program Management, IAC; Ramesh Varadan, MD, Yizumi Advanced processing Technology Pvt Ltd; Pankaj Jangale, Head Interior Technical development, Skoda-Volkswagen India Pvt. Ltd.

as the Silver Partner. Together, their trust and commitment with the organizing team shaped the direction and quality of the conversations throughout the conference.

An auspicious lamp-lighting ceremony followed, with senior dignitaries on stage including Ganesh Mani (CEO, Switch Mobility | President & COO, Ashok Leyland), Deepak Thukral (Executive Officer — Supply Chain, Maruti Suzuki India), Vishal Agarwal (President, Yudo Hot Runner India Pvt Ltd), Divakar Gokhale (Head

of Mobility Business, Covestro India), Sunil Koparkar (Managing Director, IAC Group), Shailendra Shukla (Managing Director, Eaton), Amit Pendse (Former President, Electronica Plastic Machines Ltd), Ranjan Haldar (Associate General Manager, WWM — Times Group B2B) and Amit Shanbaug (Editor, ET Now Machinist & Polymers).

Amit Shanbaug delivered the official welcome note, articulating the rationale for the conference: plastics and polymer engineering as critical enablers of electrification,

lightweighting and circularity in mobility. His remarks positioned the day's agenda as the practical response to those strategic industry imperatives.

Key addresses and industry honours

The Chief Guest of this conference Mr. Ganesh Mani (CEO, Switch Mobility | President & COO, Ashok Leyland), provided the principal address, reflecting on industry transformation and the operational realities of scaling electric and sustainable mobility in India. Drawing from global learnings, particularly China, he urged the industry to actively absorb customer expectations and translate them into meaningful design and engineering choices. Highlighting the rise of plastics usage from 8.1% in the 1990s to a projected 40% by 2030, he emphasised the vast opportunities emerging across both passenger and commercial vehicle segments—while cautioning that this next phase of growth will demand greater responsibility from industry leaders.

Following his address and as a part of the event's Hall of Fame recognitions Mr. Mani was also felicitated for his immense contribution in the industry. The team also honoured Shailendra Shukla (Managing Director, Eaton), Arvind Goel (Vice Chairman Tata AutoComp Systems) with the Hall of Fame awards.

One of the most emotional highlights of the event was felicitating Deepak Thukral (Executive Officer - Supply chain, Maruti Suzuki India) with a Lifetime Achievement award. Upon receiving this recognition, Mr. Thukral, delivered a special address that resonated deeply with the audience. Having spent decades shaping the supply chain ecosystem of India's largest passenger vehicle manufacturer, his reflections captured both the evolution of the industry and the responsibilities ahead. He spoke about the



Panel 3 (L-R): Moderator, Divakar Gokhale, Head of Mobility Business (Covestro); Amita Deshpande, Founder & CEO, reCharkha; Mrunal Hatwalne, Deputy General Manager - Sustainability, Tata Motors Ltd; Vikas Brahmavar, Director, Trans Water System Pvt Ltd; Dr. Medha Tadpatrikar, Material Recycling Association of India; Vaibhav Jha, Deputy CEO, Ester Industries Limited



Panel 4 (L-R): Moderator, Aditee Patwardhan, GM— Engineering, TATA AutoComp Systems Ltd; Sanjeev Kulkarni, Design & Manufacturing Consultant; Ravindra Gugale - Senior GM Purchase, Tata Autocomp; Gajanan Bhoite, Commodity Head, Mahindra and Mahindra; Ganesh Garkhedkar, Head-Centre of Competence (COC):Material Science, Varroc Engineering Limited

importance of strengthening domestic supply ecosystems, the need for sustained innovation in polymer and material technologies, and the commitment required from both industry and partners to support India's transition toward sustainable and electrified mobility. His remarks were characterised by pragmatism, leadership wisdom and a forward-looking lens—qualities that have defined his tenure and earned him the sector's respect. The felicitation segment of industry stalwarts celebrates leadership and their long-term contributions to India's mobility ecosystem.

Enriching Panel Discussions

The first panel of the conference was on the topic 'Designing Plastics for Indian Realities - durability, repairability & climate resilience' and was moderated by Vishal Agarwal (President, Yudo Hot Runner India). The esteemed speakers in this panel were addressed one of the conference's foundational themes: how to design plastics that are durable, repairable and resilient in India's varied climatic and usage contexts. The panel was chaired by Shailendra Shukla (Managing Director, Eaton), Diwakar Gokhale (Head of

Mobility Business, Covestro India), Shailendra Goswami (Chairman & MD, Pushkaraj Group) and Sunil Koparkar (MD, IAC Group) who contributed their individual sector perspectives that ranged from material selection and validation to manufacturability and aftermarket repair protocols.

The session foregrounded the principle that design choices must move beyond cost-per-piece calculations to include lifecycle durability and climate adaptability, especially for a market with wide operating envelopes.

Insightful Talks

Added to panel discussions were insightful session by each of our partners which provided technical expertise and some practical case studies. Yudo Hot Runner's presentation given by Vishal Agarwal showcased sustainable hot-runner solutions that optimise material use and processing consistency for diversified automotive polymers — a practical answer to the twin pressures of lightweighting and recyclability.

Similarly, Covestro's subsequent presentation, delivered by Diwakar Gokhale, framed 'Driving the Circular Revolution in Mobility' as a systems challenge that combines material innovation, supply-chain design and product stewardship. These presentations offered delegates immediate, vendor-agnostic insights into how supplier innovations can be operationalised by OEMs and tier-ones.

In an insightful session, Plastiblends India Ltd highlighted bespoke engineering plastics solutions and their role in enabling component performance while meeting circularity targets — an example of how supplier capability must align with system-level recycling ambitions.

One of the most insightful segments of the afternoon was by Yizumi, a key global player in injection moulding technology.



Delivered by Ramesh Varadan, Managing Director, Yizumi Advanced Processing Technology Pvt. Ltd., the session explored the rapid technological shifts influencing modern automotive manufacturing. Mr Varadan highlighted how evolving material demands, the need for design precision, and the rise of intelligent, automated systems are reshaping moulding practices across the industry.

Our second panel was moderated by Dr. Sandeep Waykole (CEO & Director, Accolade Electronics), which explored questions specific to EVs: battery enclosures, EMI shielding, flame retardancy and the localisation needs of EV platforms.

The panel brought together Amol Kalekar, Head – Material Testing Laboratory & Senior Manager – Operations, TUV Rheinland), Dr. Sameer Joshi, Advisor to NITI Aayog & UN Global Plastic Treaty, B. P. Shiv, VP & Chief Sales, Marketing & Programs Officer, TAFE, Satyabrata Das, Director Program Management, IAC Group) and Ramesh Varadan, MD Yizumi and Pankaj Jangale, Head Interior Technical development, Skoda-Volkswagen India Pvt. Ltd.. The discussion emphasised that safety and certification pathways must evolve in parallel with material adoption, and that material choices in EVs require integrated testing, regulatory clarity

and cross-industry standardisation to be deployable at scale.

The third panel of this conference pivoted to circularity — an area of acute regulatory and commercial interest. Moderated by Diwakar Gokhale, this panel had the most versatile lineup of speakers including Amita Deshpande (Founder, reCharkha), Mrunal Hatwalne (Deputy General Manager - Sustainability, Tata Motors), Vikas Brahmapur (CEO and Co-Founder, Trans Water System), Dr. Medha Tadpatrikar (Executive Committee Member, Material Recycling Association of India) and Vaibhav Jha (Deputy CEO, Ester Industries). Discussion points included the merits and scalability of mechanical versus chemical recycling, Extended Producer Responsibility (EPR) compliance, and the technical acceptance of recycled polymers in safety-critical parts.

The last panel, moderated by Aditee Patwardhan (General Manager -Engineering, Tata AutoComp Interiors and Plastics Division), took a systemic view: how policies, concentrated skill development, and targeted investment can create resilient polymer clusters in India. Other panelists Sanjeev Kulkarni (Design & Manufacturing Consultant), Ravindra Gugale (Senior GM Purchase, Tata Autocomp Systems Ltd), Gajanan Bhoite (Commodity Head, Mahindra & Mahindra) and Ganesh Garkhedkar (Head-Centre of Competence (COC):Material Science, Varroc Engineering) discussed pragmatic steps to unlock localisation, build supply-chain visibility, and create R&D-driven polymer centres of excellence that combine industry, academia and investor participation. The session concluded with a call for coordinated industry roadmaps and public-private programmes to sharpen India's competitiveness in advanced polymer engineering.

Across all panels and partner sessions, one recurrent theme



and the presenter insights segment closed with an audience Q&A and felicitation of the speakers.

Closing segments: industry programmes, recognition and engagement

The conference closed with a special briefing on one of the flagship events named 'Festival of Manufacturing,' followed by the much-anticipated Yudo lucky draw contest and felicitation of winners by Vishal Agarwal. Lastly, Pratiksha Marathe from the editorial team delivered a vote of thanks, acknowledging the contribution of all the partners, speakers, delegates and the production team for delivering a successful event.

Thus, once again GCPA 2025 became a platform for sector-wide conversation that moved beyond abstract sustainability claims to concrete implementation challenges. A range of issues were discussed like material validation for India's operating conditions; safety, testing and certification pathways for EV components; viable recycling routes that meet automotive quality standards; and policy-driven industrial architecture to scale local capabilities. In the coming years, GCPA will continue to inspire stakeholders in shaping a sustainable automotive future. 🇮🇳



was interdisciplinarity (materials + testing + design + policy), and

the importance of supplier-OEM coordination. Each panel discussion





A PLASTIC THAT VANISHES IN THE SEA

Japanese scientists have created a plant-based plastic that dissolves in saltwater without leaving microplastics behind offering hope for cleaner oceans.

By Team ET Now Polymers

When people talk about plastic pollution they often think of beaches littered with bottles and bags, sea turtles entangled in abandoned fishing nets, or microscopic fragments of plastic found in fish and shellfish. For decades scientists have struggled to imagine a material that could behave like everyday plastic yet not persist in the environment for centuries. Now researchers in Japan have taken a major step toward that possibility by inventing a plastic that dissolves in seawater and leaves no microplastics behind.

The research was led by Professor Takuzo Aida and his team at the RIKEN Center for Emergent Matter Science in Japan. Their findings were published in the *Journal of the American Chemical Society* and reported by international science news outlets. What makes this new material extraordinary is that it retains the strength and flexibility typical of plastics used in packaging, but when it comes into contact with saltwater it breaks down rapidly into harmless components.

Plastic pollution is one of the defining environmental crises of our

time. Conventional plastics, derived from petroleum, are designed to be stable. They resist breaking down, which makes them useful for everyday products but disastrous when they enter nature. In the ocean, plastic can persist for decades or centuries, slowly fragmenting into microplastics that have now been detected in every corner of the planet from the deepest ocean trenches to Arctic ice. These tiny particles infiltrate food chains and are increasingly found in human tissue and bloodstream, with unknown long-term health effects.



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Most so-called biodegradable plastics do not solve this problem, because they degrade only under specific industrial conditions and still linger in marine environments. Many of them simply break into smaller pieces that still qualify as microplastics, perpetuating the pollution cycle. The breakthrough lies in a fundamentally different design.

At the core of this innovation is a **plant-based polymer made from carboxymethyl cellulose, a derivative of cellulose, the most abundant organic compound on Earth.** Cellulose is what gives plants their structure and is already widely used in food and pharmaceutical products. By combining this natural polymer with a safe, biodegradable crosslinking agent composed of positively charged guanidinium ions, the scientists created a material that holds together strongly under normal conditions yet dissolves when exposed to saltwater.

The secret lies in what are known as “salt bridges,” electrostatic attractions between negatively and positively charged components within the plastic’s structure. These salt bridges give the material its strength and flexibility in everyday use. But when the plastic meets saltwater, the high concentration of ions disrupts these bonds, causing the material to fall apart. Because all the ingredients are FDA-approved and naturally derived, the resulting fragments do not become persistent microplastics. Instead, they can be metabolised by microbes or safely integrated into the local ecosystem without toxic residue.

Early versions of the plastic were too brittle to be practical. However, the team discovered that adding choline chloride, an organic salt also approved for use in food, dramatically improved flexibility. By adjusting the amount of choline chloride, they could fine-tune the material’s properties from hard and glass-like to highly elastic, stretchable up to 130 per cent of its original

length. This tunability means the plastic could be adapted for a wide range of applications from flexible films to packaging materials.

Perhaps most striking is how fast this material dissolves in seawater. In laboratory tests with artificial seawater, thin films of the plastic completely degraded within a matter of hours without any detectable microplastics. That is a dramatic contrast with traditional plastics, which can take decades to decompose even into microscopic pieces.

The potential environmental

Scaling up production, ensuring cost-effectiveness, and adapting manufacturing processes so that the material can be incorporated into existing supply chains are significant challenges. Researchers also need to assess performance in real-world marine environments and over longer periods before commercial deployment.

Nevertheless, the development represents a rare moment of optimism in the fight against plastic pollution. It shows that materials science can offer innovative solutions



impact is enormous. Oceans are estimated to receive millions of tonnes of plastic every year. Much of it floats, degrades into microplastics, and enters the bodies of marine animals and eventually humans. A material that behaves like plastic in daily life but vanishes upon entry into the sea could dramatically reduce this flow of waste. It could transform how manufacturers think about packaging and single-use products, especially for items at high risk of entering waterways.

Of course, there are still hurdles to overcome before this new plastic can be widely used.

that reconcile human needs with environmental sustainability. From the sandy beaches of tourist hotspots to the coral reefs rich in biodiversity, the world could one day be built with plastics that protect rather than harm the ecosystems they touch.

The aim is not just technical achievement but responsibility. Today’s children will inherit the environmental legacy of decisions made now. Creating materials that disappear harmlessly rather than persist forever is a step toward a future where plastic as a material no longer stands in opposition to the natural world. 🌱

SCALING CIRCULAR PLASTICS

Chemical recycling is moving from promise to industrial reality as new policies and large plants reshape global and India-focused circularity efforts.

By Team ET Now Polymers

Chemical recycling is no longer an emerging concept on the sidelines of the sustainability conversation. It has stepped decisively into the mainstream, supported by major industrial investments, accelerating policy frameworks and the urgent need for practical solutions that lower the environmental impact of plastics. The Plastic Energy Sustainability Report for 2025 reflects this moment clearly. It captures a sector crossing an inflection point where innovation, regulation and climate responsibility are aligning in powerful ways.

Plastics have long occupied a complicated place in environmental discussions. They are associated with pollution and waste, yet they remain essential in almost every modern sector. A recent study referenced in the report underlines this complexity. It shows that plastics have lower lifecycle greenhouse gas emissions than many alternative materials across most major applications including packaging, automotive components and building products. Eliminating plastics entirely is neither realistic nor always climate friendly. The real challenge lies in how we handle plastic after it has been used and how we reduce its carbon footprint throughout its life.

Plastic Energy's own story mirrors this shift toward circularity. From operating its first commercial plants in Spain in 2016 and 2017, the company has grown into a global platform for advanced recycling. In 2024, it achieved mechanical completion on two large joint venture projects, one in the Netherlands with SABIC and another in France with TotalEnergies. These sites represent



some of the largest chemical recycling plants in the world. In mid 2025, the Netherlands plant produced its first recycled oil, known as TACOIL. This milestone showed that the technology was ready not only for commercial deployment but also for integration into mainstream petrochemical infrastructure.

The company emphasises that scale is critical for impact. Chemical recycling, like other industrial processes, becomes more efficient as plants grow larger. The long term vision described in the report involves building facilities with ten times the current production capacity so that recycled feedstock can replace virgin fossil oil at the same level required by large crackers. Moving towards this vision would shift circular plastics from a niche activity to a core part of global materials production.

The environmental case for scaling up is supported by the company's updated life cycle assessment, also known as an LCA. Released in early 2025, the LCA shows that recycling one tonne of mixed plastic waste using its TAC process can cut carbon emissions by up to 78 percent compared with incineration with energy recovery, which is still the dominant method of disposal in many parts of Europe. With electricity sourced entirely from renewable energy, those savings rise to 89 percent. These findings matter because global recycling rates remain low and plastic production is projected to double or even triple by 2050. Mechanical recycling alone cannot handle the wide range of plastic types and contamination levels found in today's waste streams. Chemical recycling offers a complementary

route that can manage difficult plastics while producing feedstock clean enough for high quality and food grade applications.

Policy momentum is strengthening this technological progress. Europe set a major precedent with the Packaging and Packaging Waste Regulation, which became law in early 2025. It includes mandatory recycled content targets for packaging and creates a framework that will rely heavily on chemically recycled feedstocks. One significant requirement is that non PET contact sensitive packaging must contain 25 percent recycled content by 2040. The United Kingdom has also confirmed the use of a fuel use exempt mass balance system under its Plastic Packaging Tax. This system provides a consistent way of calculating recycled content for chemically recycled materials and improves industry confidence in investing in new capacity.

Global developments are also underway. Negotiations on an international plastics treaty continue under the United Nations. Although countries have not reached full agreement, there is growing alignment around the importance of extended producer responsibility, known as EPR, and mandatory recycled content standards. Both policy tools are seen as key drivers for accelerating recycling technologies and improving waste management worldwide.

The report also calls attention to developments in India. India has been strengthening its own extended producer responsibility framework under its Plastic Waste Management Rules. It is also moving toward clearer recycled content pathways, a direction that mirrors European trends. This alignment is significant because India generates high volumes of plastic waste and faces challenges in managing mixed and contaminated plastics. Chemical recycling offers

one potential route to help meet future recycled content requirements, especially for the fast moving consumer goods sector and the growing packaging industry. As India tightens compliance mechanisms, the demand for high quality recycled material is likely to increase.

Alongside policy and infrastructure, the company highlights notable progress in digitalisation. Its Advanced Control System has been built through years of operational experience at the Seville and Almeria plants. This system uses real time analytics and automation to improve plant efficiency and provide accurate traceability for feedstocks as they move through the recycling process.

additional circular products rather than waste residues.

The report further highlights progress in workplace safety, diversity and community engagement. The company's Plan Engage programme continues to strengthen its safety culture while generating charitable contributions tied to employee participation in safety initiatives. Plastic Energy has also set goals for increasing female representation across the company and within its executive team by 2027. Its partnerships with research institutions including Loughborough University and involvement in the SEARCULAR project demonstrate a commitment to knowledge sharing and marine plastic recovery efforts.

Looking ahead, the coming year is expected to be defined by the start up and stabilisation of the SPEAR and TEPEAR plants. Beyond these operational milestones, the company intends to continue improving energy efficiency, reducing emissions from the TAC process and turning more by products into valuable commercial materials. Policy developments such as the finalisation of mass balance accounting rules in Europe and forthcoming industrial packages are likely to accelerate investment and deployment across the sector.

The 2025 sustainability report captures a pivotal moment for the industry. The foundations of a circular plastics economy are becoming more visible with large scale plants, clearer policy frameworks, digital traceability tools and expanding community engagement. As countries including India strengthen their extended producer responsibility rules and prepare for recycled content requirements, the conditions for growth in chemical recycling are falling into place. What was once a promising technology is rapidly becoming a central solution in the future of sustainable plastics.



Such digital tools will become increasingly important as regulators and customers push for clearer verification of recycled content and environmental performance.

Innovation also extends to by product utilisation. During the TAC process, fillers within waste plastics can be recovered and transformed into a material called TACFILLER. This product can replace a portion of carbon black in rubber compounds. It offers manufacturers a recycled option for applications that traditionally rely on virgin carbon black and mineral fillers. This broadens the benefits of chemical recycling by creating

A Modular AMR Built for Fast and Flexible Automation

The new autonomous mobile robot, ReBeLMove Pro, unveiled by igus brings customisation, easy configuration and quick deployment to factories seeking cost savings and higher productivity in material handling.

By ET Now Polymers

Modern production environments face constant pressure to improve efficiency and reduce costs. Automation is no longer optional but a strategic necessity, especially in areas like material handling and intralogistics where repetitive tasks consume significant labour time. Recognising this shift, igus has introduced the **ReBeLMove Pro**, a modular autonomous mobile robot designed to make factory automation easier, more affordable and highly adaptable for a wide range of operations.

The ReBeLMove Pro has been developed as a solution that companies can integrate into their processes even without previous automation experience. At a starting price of just €39,800, it is positioned to be around 25 percent more cost effective than many standard competitor models. This cost advantage is especially important for small and mid sized companies that need automation but hesitate because of high upfront investment.

The robot itself is compact and robust. Measuring 795mm in length, 560mm in width and 195mm in height, the four wheeled transport platform weighs 60kg and is finished in the black and orange colour scheme that is typical for igus. Despite its small footprint, the AMR delivers strong performance. It travels autonomously at speeds of up to 2 metres per second, carries loads of up to 250kg and can pull up to 900kg when used for material handling tasks. A single battery charge lasts for a full eight hour working shift, which makes it suitable for continuous factory operation.

The standout feature of the ReBeLMove Pro is its modularity. Users can add a variety of attachments to convert the AMR for different



The ReBeLMove Pro serves as a platform for various superstructures, from order-picking systems to intelligent shelving systems to collaborative robots with conveyor belts. (Source: igus GmbH)

needs. These include height adjustable conveyor belts and an articulated cobot arm that can support assembly workstations. It can also be fitted with a trailer for material transport or a shelving unit with light signals to improve order picking productivity. The platform is capable of operating outdoors, which broadens the range of possible use cases. igus has already deployed the robot within its own production area, using it as a shuttle to move products from injection moulding machines to downstream assembly. This internal application helped automate a formerly repetitive and unattractive manual task. The company reports that a complete container handling system, including interface integration, was designed and implemented in only two months.

In addition to its affordability, the ReBeLMove Pro aims to cut costs related to commissioning and integration. According to igus, many companies pause their automation plans because system integrators and complex software licences increase expenses. With the ReBeLMove Pro, the setup process is simplified.

During an initial round trip, the robot generates a 3D digital map of its environment. It uses LIDAR sensors, 3D sensors and a RealSense camera to map 200 square metres in under three minutes. Once mapped, the robot navigates autonomously without relying on physical tracks or floor markers.

Programming is also user friendly. Movements can be defined in about 15 minutes through software that requires no coding skills. Integration with existing systems is equally straightforward because the AMR supports open interfaces such as IoT, VDA 5050, REST, SAP and ERP. It is also compatible with several external fleet management systems including Fleetexecuter, Kinexon and Naise.

With low investment, quick setup and simple operation, igus estimates that companies can achieve a return on investment within twelve months. The ReBeLMove Pro, priced at €38,900, brings flexibility and reliability into material handling while staying significantly below the cost of typical AMR solutions that often start at €50,000.

Inside Bharat Carbonates: Quality, Customization & Growth

Bharat Carbonates supplies tailored coated and uncoated calcium carbonate grades with stringent quality controls and collaborative technical support for diverse industrial applications.

By Bharat Carbonates Private Limited

Bharat Carbonates manufactures two primary product families namely coated calcium carbonate and uncoated calcium carbonate powder that serve paper, plastics, pharmaceuticals, rubber, paints and construction. Coated grades are formulated to improve compatibility, dispersibility and performance in polymer and paint systems; uncoated powders act as economical mineral fillers for PVC pipes, paper and other industrial products.

To ensure consistency across grades and batches, the company applies an end-to-end quality programme: raw limestone is inspected at intake for feedstock purity; process monitoring controls particle-size distribution, moisture and particle morphology with modern micronisation and classification systems; whiteness and brightness are measured routinely to meet optical specifications for paper and coatings; analytical chemical testing verifies purity and composition; and packaging and shelf-life protocols preserve product stability in storage and transit.

Product Differentiation Strategy

Bharat Carbonates sets itself apart through deliberate investments in raw material sourcing, purification, particle engineering and coating technologies. The company supplements domestic feedstock with imported raw materials and applies purification steps to achieve the elevated purity required by demanding industrial and pharmaceutical customers. Precision micronisation and fine grinding produce narrow particle-size distributions and controlled morphology so grades can be engineered to specific performance targets. For coated grades, the

firm uses high-quality imported stearic acid and specialty coating chemistries to improve dispersibility, impart hydrophobicity and enhance compatibility with organic polymers. Advanced analytical testing and surface-modification techniques are used to validate coating coverage, adhesion and consistent functionality across batches. Automation and continuous process monitoring further secure uniformity and speed customization when customers require it.

Application Advantages Across Sectors

Bharat Carbonates' grades are engineered for targeted, measurable benefits:

- **Plastics:** Coated calcium carbonate improves dispersion in polymer matrices, enhances mechanical properties and enables cost-effective formulations for PVC profiles, cables and masterbatches.
- **Paints & Coatings:** Surface-treated grades increase whiteness, opacity and dispersibility, improving adhesion, texture and resistance to defects in premium coatings.
- **Rubber:** Tailored particle-size distributions and coating chemistries reduce agglomeration, improving filler dispersion, elasticity and compound strength.
- **Adhesives:** Coated powders support bonding, cohesion and formulation stability in adhesives and sealants by ensuring even distribution and favorable surface interaction.
- **Paper:** Fine, high-purity grades deliver improved brightness, opacity and printability, contributing to smoother

surfaces and superior aesthetic quality in finished paper products.

R&D and Process Innovations

In-house research and development and continuous process improvement underpin product performance and manufacturing efficiency. Bharat Carbonates invests in analytical testing laboratories and surface-modification research to refine coating chemistry and to quantify performance attributes such as coating coverage, surface area and particle interaction with polymers and binders. Automation, advanced process controls and continuous monitoring reduce batch-to-batch variability and accelerate response to custom requests. R&D outputs are linked to process optimization projects that target energy efficiency, waste minimization and improved throughput, enabling practical gains in both sustainability and cost efficiency.

Customer Collaboration & Support

Bharat Carbonates operates as a technical partner rather than a simple supplier. Its technical team engages customers through site visits, diagnostics and iterative dialogue to identify production issues and define performance objectives. Dedicated analytical testing validates composition and functional performance; clear reporting and interpretation help customers make informed formulation or process changes. The company routinely conducts pilot-scale trials and field validations, collects iterative feedback, and refines grades prior to full-scale adoption. Logistics coordination and field services ensure laboratory recommendations

translate effectively to production environments, reducing implementation risk and delivering measurable improvements.

Growth and Sustainability Vision

Bharat Carbonates is focused on measured growth, capacity scaling and sustainability integration. In 2025 the company increased production capacity from **84,000 MT/year to 1,50,000 MT/year** by adding new production lines, positioning it to meet rising demand. Renewable energy

investments — a 2.1 MW windmill and a 1.35 MW solar facility — contribute to reduced carbon intensity and lower operational emissions. Combined with process optimization and waste-reduction initiatives, these investments reflect a strategic commitment to responsible expansion. The company is preparing to leverage its quality credentials and custom-grade capabilities to approach new regional customers across the Asia-Pacific through strategic partnerships and customer-focused market development.

Thus, by combining disciplined raw-material inspection, precise particle engineering, premium surface treatments, applied R&D and hands-on customer collaboration, Bharat Carbonates delivers reliable, application-focused calcium carbonate solutions. Its recent capacity expansion and green-energy investments support a responsible growth strategy designed to meet industrial demand while maintaining consistent product performance and environmental stewardship.

HPCL Expands Petrochemical Presence through HRRL

Hindustan Petroleum Corporation Limited (HPCL) is steadily strengthening its footprint in the petrochemical sector through its joint venture, HPCL Rajasthan Refinery Limited (HRRL). HPCL holds a 74% equity stake in HRRL, while the Government of Rajasthan owns the remaining 26%.

HRRL is in the final stages of commissioning a world-class greenfield refinery-cum-petrochemical complex at Pachpadra, Rajasthan. The facility

is expected to become operational soon and will have a crude refining capacity of 9 MMTPA, along with a petrochemical production capacity of 2.4 MMT. The complex will focus on manufacturing key petrochemical products such as Polypropylene (PP), Polyethylene (PE), and aromatics.

With a petrochemical intensity index of 26%—the highest in India—the HRRL complex is designed to address the country's rising demand for petrochemicals while significantly reducing India's

reliance on imports in this sector.

The refinery will be equipped with a state-of-the-art Dual Feed Cracker licensed by M/s Technip FMC, with a capacity of 1003 KTPA. HDPE and LLDPE will be produced through swing units comprising two lines with a combined capacity of 958 KTPA, licensed by M/s Univation Technology, USA. These flexible swing lines will enable HPCL to swiftly respond to changing market demand across polymer grades while optimizing operational efficiency and product mix. Polypropylene will be produced on two lines with a combined capacity of 1073 KTPA, licensed by Novolene, Germany. In addition, the complex will produce approximately 0.4 MMT of liquid petrochemicals, including Benzene, Toluene, and Butadiene.

HPCL has already introduced its polymer brand, HP DURAPOL®, and is actively working to establish a strong presence for the brand across key markets.



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