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A NEW POLYMER PHASE

The plastics industry is entering a phase where growth is increasingly linked to smarter materials, circularity, safety and higher value applications.

This issue reflects that change across the industry. From water management and safer PVC products to recycling old vehicles, converting waste PET into engineering material and developing carbon fibre for aerospace, the message is clear. Polymers are no longer viewed only as high volume materials. Their performance, life cycle and ability to create value are becoming equally important.

Our lead story on BirlaNu shows how the pipes industry is moving towards technology led products and wider water management solutions. The focus on leakproof performance, heavy metal free formulations and PVC O points to a larger trend. Polymer products are increasingly being judged not only by price, but by safety, durability, resource efficiency and performance over their full life.

Circularity is another major shift. Our story on automotive plastics looks at the growing challenge of recovering materials from end-of-life vehicles. As the number of old vehicles rises, the industry will have to move beyond simply collecting plastic waste. Better sorting, cleaner recycle and design that makes components easier to separate will become more important. The value of recycled material will depend on how well it can return to demanding applications.

The IIT Bhilai research on discarded PET takes this idea further. A catalyst made from eucalyptus leaves is being used to turn waste PET into a material that can be reshaped, repaired and recycled repeatedly, with potential for 3D printing. It is a good example of how research can turn waste into a higher value engineering material.

At the other end of the performance scale is our story on carbon fibre. India is working to develop indigenous intermediate modulus carbon fibre for aerospace applications. Advanced fibres are part of a wider move towards high-performance aerospace and defence materials. A 120 TPA carbon fibre technology demonstration plant planned in Maharashtra is another sign of this emerging ecosystem.

These developments reflect wider trends in the Indian plastics industry. Sustainability, advanced recycling, engineering plastics, speciality materials, design for recycling and domestic manufacturing are gaining importance. The Plastic Industry Status Report 2025 also points to growth in advanced engineering sectors, circularity and bio based plastics.

The opportunity ahead is not simply to produce more polymers. It is to make better materials, recover more value from those already in use and develop products that solve real problems.

That is where the next phase of the plastics industry could be shaped.

Amit Shanbaug
Editor.



Photography: Vaibhav Nadgaonkar

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FISHING NETS TURNED INTO 3D PRINTING FILAMENT

Chulalongkorn University researchers are developing recycled nylon filament from discarded fishing nets, with possible applications in 3D printing and automotive components.

By Team ET Now Polymers

Researchers at **Thailand's Chulalongkorn University** are working on a way to turn discarded nylon fishing nets into filament for 3D printing. The project aims to address marine plastic waste while creating a higher value use for recycled nylon.

The work focuses on what are commonly called “ghost nets”, or fishing nets that are lost or abandoned in the sea. Such nets can continue trapping marine animals after they are no longer being used. Over time, exposure to sunlight, waves and the marine environment can also cause the plastic in the nets to break down into smaller particles.

Thailand already has some recycling activity for old fishing nets, with fishermen selling used nets to traders. However, the university says the recycled nylon has so far had limited use in higher value applications such as 3D printing. The new research is aimed at creating another market for this material.

The process involves several stages. The collected nets first have to be sorted and cleaned. Materials such as lead, buoys, foam, ropes and other debris, along with soil, sand, rocks and shells, have to be removed. The nets are then washed and dried.

The cleaned nets are shredded into smaller pieces and sorted into suitable plastic flakes. These flakes are then melted and mixed with additives before being converted into recycled plastic pellets.

The pellets are subsequently melted again and extruded into filament. The research team is targeting a filament diameter of around **1.75 mm**, which is a standard size used in Fused Deposition



Modeling, or FDM, 3D printers.

The decision to first convert the recycled nylon into pellets is important because the nets collected from different sources can vary in age, condition and contamination. Pelletising gives the researchers greater control over the consistency and quality of the material before it is converted into filament.

The team is also studying how additives and different formulations can improve the properties of recycled nylon. According to the university, recycled plastics can behave differently from virgin materials, so formulation changes are needed to achieve the required mechanical strength and printability.

One area being explored is the use of the recycled filament for **automotive applications**, including prototype motorcycle components. The university says such applications require materials that combine strength with low weight. Other components and accessories for cars and motorcycles could also be explored as the material is further developed.

There are still several challenges before the material can move towards wider commercial use. Quality

control is one of them because fishing nets collected from different locations can have different levels of degradation and contamination. The cleaning process also requires considerable water and space.

The researchers also see the need for real world testing and formal quality certification to build confidence among potential users of recycled materials.

The project is planned in three phases. The first phase involves developing the production process and formulation and is expected to take around **six to 10 months**. The second phase focuses on scaling up production and market testing and is expected to take another **four to five months**. The final phase is aimed at transferring basic processing knowledge to fishing communities so that they can add value to old nets before selling them for recycling.

For the university, the objective goes beyond producing 3D printing filament. A larger market for recycled fishing nets could encourage greater collection of discarded nets and potentially create additional income opportunities for fishing communities. 🌱



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FSSAI TIGHTENS RULES ON PAN MASALA PACKAGING

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Packaging Amendment
Regulations, 2026



The new packaging rules tighten restrictions on plastic in pan masala, forcing manufacturers to look at alternative packaging materials.

By Team ET Now Polymers

The packaging of pan masala is set for a major change after the Food Safety and Standards Authority of India notified new regulations specifying the materials that can be used for the product.

The **Food Safety and Standards (Packaging) Amendment Regulations, 2026** were notified on **August 10, 2026**. The regulations specify that pan masala can be packed in paper, paper board, cellulose or other naturally derived materials, provided they are completely free from plastic. Tin and glass containers are also permitted.

The rules specifically exclude polyethylene, polypropylene, polyester, PVC and other synthetic polymers, as well as copolymers, laminates, aluminium foil and metallised layers from permitted pan masala packaging.

The move is significant for the plastics and packaging industry because pan masala has traditionally been sold in small sachets and pouches, many of which use plastic-

based materials.

However, the FSSAI notification does not introduce the restriction for the first time. The **Plastic Waste Management Rules, 2016** had already prohibited the use of plastic sachets for storing, packing or selling gutkha, tobacco and pan masala.

The Plastic Waste Management Rules were subsequently amended to specifically address sachets made from compostable and biodegradable plastics. The 2023 amendment also provided conditions for their use in sachets for gutkha, tobacco and pan masala, including mandatory marking and labelling and certification requirements.

The latest FSSAI regulations now place specific packaging requirements for pan masala within the food safety framework.

For packaging manufacturers, this could lead to a shift in material demand. Companies supplying plastic films, laminates and other polymer-based packaging materials to pan masala manufacturers may

need to adapt their products, while paper, cellulose and other permitted materials could see greater demand.

The change also raises a manufacturing challenge. Pan masala packaging needs to provide protection, sealing and adequate shelf life while being suitable for high-speed packaging operations. Manufacturers will therefore need to evaluate alternative materials without compromising these requirements.

For the polymers industry, the development is another example of regulation influencing material selection in consumer packaging.

The FSSAI had first issued the draft amendment for public comments on **April 29, 2026**, before notifying the final regulations in August.

The change could therefore have an impact well beyond pan masala manufacturers, extending to packaging converters, material suppliers and companies developing alternatives to conventional plastic packaging. 📌

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BRICS PUTS RECYCLING BACK ON THE AGENDA

With a renewed focus on EPR, eco-design and recycling infrastructure, BRICS has accelerated circularity while reshaping how plastic waste is managed across emerging markets.

By Pratiksha Marathe

The 18th BRICS Summit, held in New Delhi on September 12–13, 2026, brought together leaders of the expanded 11-member grouping under India's chairship. The summit was held under the theme "Building for Resilience, Innovation, Cooperation and Sustainability", with sustainability and environmental cooperation forming an important part of the agenda. The 11 members—Brazil, China, Egypt, Ethiopia, India, Indonesia, Iran, Russia, Saudi Arabia, South Africa and the UAE—together represent 49.5% of the global population, 40% of global GDP and 26% of global trade.

For the plastics and packaging industry, one of the most relevant outcomes was the bloc's renewed focus on waste management and circularity.

EPR and recycling move up the agenda

The New Delhi Declaration acknowledged the growing scale and complexity of waste generation driven by urbanisation, industrialisation and changing consumption patterns. It called for stronger integrated waste-management frameworks supported by **Extended Producer Responsibility (EPR), eco-design,**



sustainable public procurement, enhanced monitoring, and investment in recycling and recovery infrastructure. The stated objective is to improve material circularity and resource efficiency across member economies.

India already has a substantial EPR ecosystem for plastic waste. As of March 5, 2026, **2,986 plastic-waste recyclers were registered**, with **196.97 lakh tonnes of plastic waste recycled** and an equivalent 196.97 lakh tonnes of EPR certificates generated.

From plastic pollution to circularity

The 2026 agenda builds on commitments made under Brazil's 2025 BRICS chairship. The Rio de Janeiro Declaration recognised the role BRICS countries could play in addressing plastic pollution and called for cooperation on sound plastic-waste management, including capacity building and the transfer of knowledge and technology.

The shift in emphasis is notable. While plastic pollution remained part of the broader environmental conversation, the 2026 declaration focuses more directly on the systems needed to manage waste—collection, recycling, recovery, monitoring and

producer responsibility.

Designing packaging for the next cycle

For packaging manufacturers and polymer companies, the inclusion of eco-design is particularly relevant. Designing packaging with its eventual recovery or recycling in mind can influence material selection, recyclability, use of recycled content and the economics of end-of-life management.

India's own EPR framework already links producer responsibility with recycling and recycled-content requirements. Government data shows that EPR certificates and recycling obligations are increasingly being used as market mechanisms to support recycling capacity and formalise the sector.

India's BRICS Environment Ministers' Meeting in August also identified **circular economy** as one of the four priorities of India's 2026 BRICS chairship, alongside sustainable lifestyles, afforestation and adaptation.

Similarly, for India's packaging and polymer sector, that could mean a greater role for recyclers, technology providers and manufacturers in building the next generation of circular materials and packaging systems. 🌱

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SCIENTISTS FIND NEW WAY TO RECYCLE TOUGH pDCPD PLASTIC

Researchers in the US have developed a chemical process that can break down tough pDCPD plastic while recovering more than 90% of its polymer fragments.

By Team ET Now Polymers

Researchers from The University of Texas at Austin and Sandia National Laboratories have developed a new method to recycle **poly(dicyclopentadiene), or pDCPD**, a strong thermoset plastic that has been difficult to recycle.

The research, uses a chemical process to break down the permanently cross-linked structure of pDCPD. The method can also recover materials embedded inside the plastic, including glass fibres, carbon fibres and electronics.

pDCPD is used where strength, durability and low weight are important. Applications include vehicle bumpers, construction equipment and chemical storage tanks. Unlike many thermoplastics, thermosets form permanent chemical links when they are cured. These links give the material its strength but also make it difficult to melt and process again.

Because of this, pDCPD products have had limited recycling options and can be sent for disposal or incineration at the end of their useful life. The new research looks at a way of breaking the material apart chemically instead of burning it.

The process uses **cyclopentyl methyl ether**, identified by the researchers as a more environmentally friendly processing solvent, along with a **ruthenium based catalyst**. The chemistry uses a process called metathesis to break apart the polymer network.

In simple terms, the plastic is placed in the solvent and catalyst mixture and stirred. Depending on the size of the component, the process can take from several hours to several

days. The pDCPD gradually breaks down and dissolves, leaving polymer fragments that can be recovered for use in new plastic materials.

The researchers reported **more than 90% recovery of polymer fragments** in their experiments. The process also worked on different types of pDCPD produced using frontal, photo and thermal ring opening metathesis polymerisation methods. Importantly, it was also tested on commercial thermoset formulations and fibre reinforced composites.

Another important part of the research is the recovery of materials inside the plastic. The team demonstrated the recovery of glass fibres and pristine carbon fibres. It also showed that embedded electronics could be removed without being destroyed by the recycling process.

This could be particularly useful for composite components, where the value of the material does not come only from the polymer. Carbon and glass fibres are added to improve strength and other properties.

Conventional incineration destroys these reinforcement materials, while the new chemical process is designed to separate and recover them.

The discovery itself came from an unexpected laboratory result. Keldy Mason, one of the researchers, was working on producing pDCPD when the material was exposed to a solvent and catalyst system that was expected to make it more durable. Instead, the material broke down and dissolved. That observation led the team to investigate whether the reaction could be used as a recycling method.

The researchers also carried out a detailed life cycle analysis. According to the study, the process offers a potentially viable alternative to current thermoset disposal and incineration routes and could support a closed loop approach for pDCPD materials.

However, the technology still has challenges to address before it can be used widely. One important question is whether the ruthenium catalyst can be recovered and reused. Doing so would be important for improving the sustainability and cost of the process at industrial scale.

The University of Texas at Austin, Sandia National Laboratories and four of the study's authors have also applied for a US patent covering the technology.

The research offers a possible new route for managing high performance thermoset plastics that have traditionally been difficult to recycle. Instead of treating the material as waste at the end of its life, the process aims to recover both the polymer and valuable materials used to reinforce or build into the component. 

“

Researchers have developed a breakthrough chemical recycling process for pDCPD thermoset plastics, recovering over 90% of material while preserving valuable fibres and embedded electronics.



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Through consistent quality, customised solutions and a strong focus on customer needs, Bharat Carbonates continues to strengthen its presence across industries.

By Team ET Now Polymers



In manufacturing, even the smallest component can make a big difference. The quality of a plastic product, a paint finish, a rubber compound or a sheet of paper often depends on the quality of the raw materials used. For industries that rely on calcium carbonate, consistency is not just important, it is essential.

That is where **Bharat Carbonates** has built its reputation.

The company supplies coated and uncoated calcium carbonate products to a wide range of industries, including plastics, paints, paper, rubber, pharmaceuticals and construction. Over the years, it has focused on delivering products that not only meet quality standards but also help customers improve performance and efficiency.

While calcium carbonate is widely used as a filler material, its effectiveness depends on how it is processed. Bharat Carbonates pays close attention to every stage of production, beginning with the selection of high quality limestone. Advanced grinding and classification systems ensure the required particle size, while regular testing helps maintain consistency across batches.

This focus on quality allows customers to rely on products

that perform consistently in their manufacturing processes.

The company offers both coated and uncoated grades. Uncoated calcium carbonate is commonly used in applications such as PVC products, paper and construction materials. Coated calcium carbonate is designed for more demanding applications where better dispersion and improved compatibility are required.

For coated grades, Bharat Carbonates uses specialised surface treatment technology that enhances the material's performance in plastics, paints and other formulations. The result is improved processing, better product quality and greater formulation efficiency.

Its products are used across a variety of industries. In plastics, calcium carbonate helps improve filler distribution and supports cost effective production. Paint manufacturers benefit from improved whiteness and opacity, while rubber manufacturers use specialised grades to enhance strength and performance. The material is also widely used in adhesives, sealants and paper applications.

A key strength of the company is its customer centric approach. Bharat Carbonates works closely with customers through technical

discussions, product trials and regular engagement to understand their specific requirements. This collaborative approach helps develop solutions that are practical and effective in real manufacturing environments.

The company is also investing in growth and sustainability. In 2025, it expanded its production capacity from 84,000 metric tonnes per year to **150,000 metric tonnes per year**, reflecting increasing demand across industries.

At the same time, Bharat Carbonates has taken steps to reduce its environmental footprint through investments in renewable energy, including a 2.1 MW wind power project and a 1.35 MW solar power facility.

As manufacturing industries continue to evolve, customers are increasingly looking for partners who can deliver quality, reliability and technical expertise. By combining strong manufacturing capabilities with a commitment to innovation and sustainability, Bharat Carbonates is positioning itself as more than just a supplier.

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TURNING PET WASTE INTO ENGINEERING MATERIAL

New technology uses a eucalyptus-leaf catalyst to transform discarded PET bottles into durable, repairable and recyclable materials with 3D printing potential.

By Pratiksha Marathe

Researchers at the IIT Bhilai have developed an innovative technology that transforms discarded Polyethylene Terephthalate (PET) plastic bottles into high-value engineering material that can be reshaped, repaired and recycled repeatedly.

The research was led by **Dr. Sanjib Banerjee** of the Department of Chemistry, IIT Bhilai, along with researchers **Priyank Sinha, Bharatbhushan Meshram and Onkarnath Verma**. The team has also filed an Indian patent application for the technology.

The breakthrough offers a sustainable approach to plastic waste management while supporting circular economy practices and next-generation manufacturing technologies, including 3D printing.

PET is among the world's most widely used plastics, particularly for beverage bottles and food packaging, generating millions of tonnes of waste annually. While PET is recyclable, conventional recycling processes gradually degrade the material's quality, limiting its long-term reuse and value.

To address this challenge, the team developed a green, magnetically recoverable catalyst using waste eucalyptus leaves. The catalyst converts discarded PET bottles into a valuable chemical building block and can be separated using a magnet



for repeated reuse. This makes the depolymerisation process cleaner, more sustainable and cost-effective.

The recovered building block is subsequently converted into a high-performance dynamic polymer that combines mechanical strength with reprocessability, offering significant potential for future 3D printing applications.

A key feature of the material is its ability to soften when heated. It can also be reshaped into a desired form and permanently retain the new shape upon cooling. Researchers successfully demonstrated repeated reshaping into different objects without any significant loss in performance. Unlike conventional thermoset plastics, which cannot be reshaped or recycled after curing, the new material can be repaired and remoulded multiple times, extending its service life and reducing waste generation.

According to Dr. Sanjib Banerjee, conventional thermoset plastics offer

excellent strength and durability, but their inability to be reshaped or recycled after manufacture results in substantial waste accumulation. The newly developed material combines durability with reprocessability, demonstrating how discarded PET bottles can be converted into high-value engineering materials for advanced manufacturing applications.

The technology could find applications in customised plastic components, reusable consumer products, educational models and engineering prototypes where repeated reshaping and repair are advantageous.

The innovation aligns with the GoI's vision under Swachh Bharat Mission, Atmanirbhar Bharat, Make in India and the National Resource Efficiency Policy. By converting plastic waste into value-added materials, the technology has the potential to reduce dependence on virgin plastics. 



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612,000 BOTTLES, ONE HOUSE

A Nova Scotia home shows how recycled PET can be converted into lightweight structural panels with applications beyond conventional construction.

By Team ET Now Polymers



What can more than 600,000 discarded plastic bottles become? In Nova Scotia, Canada, they have been turned into a 2,000 square foot house.

Built by Canadian company JD Composites, the three-bedroom home uses around 612,000 recycled PET bottles as the raw material for its structural insulated panels. The project offers an unusual example of how a material normally associated with packaging can be converted into a lightweight construction system.

The bottles are not simply incorporated into the walls. They are processed into recycled PET foam, which forms the core of the structural panels used to build the house.

The recycled PET material is converted into foam through a process that involves processing the bottles and then extruding the material to achieve the required density. The foam core is then combined with fibreglass and polyester resin skins to create structural insulated panels.

The house consists of about 170 such panels. The panels use recycled PET foam with a density of around 70 kg per cubic metre and thicknesses ranging from 25 mm to 150 mm.

The construction system was designed to combine structural strength with insulation. The closed cell PET foam is resistant to water

and moisture absorption, while the composite construction provides protection against degradation, mould and rot.

One of the more striking aspects of the project was its wind resistance testing.

An individual 8 ft by 8 ft wall panel, measuring approximately 2.4 metres by 2.4 metres and weighing about 36 kg, was tested in a wind tunnel. The panel withstood wind speeds of 326 mph, or around 524 kmph, before the test equipment reached its maximum capability.

That figure should not be interpreted as the completed house having been tested at 326 mph. The test was conducted on an individual wall panel. However, it demonstrated the structural performance of the recycled PET composite construction.

The panels also offered a potentially faster construction process. The approximately 2,000 square foot house was assembled using around 170 panels, with the complete structure reportedly put together in about 14 hours.

The material has another important connection for the manufacturing industry. Recycled PET foam is not limited to construction.

The technology is not simply about recycling bottles and putting them into a building. It involves taking a familiar polymer, processing it into an engineered foam and then

combining it with other materials to create a structural composite.

The house also demonstrates the potential for recycled PET to have a much longer second life. A bottle used for a few minutes as packaging can, after recycling and processing, become part of a building expected to remain in service for decades.

The project was conceived as a demonstration of the potential of this construction method. JD Composites has highlighted applications including smaller buildings, shelters, offices, sheds, emergency structures and disaster relief housing.

The approach could be particularly relevant in areas where lightweight construction and resistance to moisture, mould and severe weather are important considerations. At the same time, the Nova Scotia house remains a prototype project and does not mean recycled PET panels can automatically replace conventional construction materials across all building applications.

What it does demonstrate is the ability to take post-consumer PET and move it up the value chain.

Instead of recycling a plastic bottle back into another short life consumer product, the material can be converted into a high-performance foam and incorporated into a structural composite with applications in construction and other industries. 🔄

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MICROPLASTICS: THE NEXT PACKAGING CHALLENGE

New Earth Action assessment finds food packaging can be a direct source of micro- and nanoplastic exposure, highlighting design and use as critical intervention points.

By Pratiksha Marathe

Plastic packaging has long been assessed through the lenses of functionality, cost, recyclability, and waste management. A new study suggests that another dimension now warrants greater attention: the release of micro- and nanoplastics (MNP) from food packaging directly into food.

From Pack to Plate: A Global Assessment of Micro- and Nanoplastics Migrating from Food Packaging into Food was published in 2026 by **Earth Action (EA)**, a research consultancy

focused on plastic pollution and climate change. The report was authored by Marguerite Fauroux, Julien Boucher, PhD, and Sarah Perreard. It represents the first cross-format, globally scaled synthesis of packaging-related MNP exposure.

The assessment reviewed and harmonised more than 20 experimental studies, translating fragmented evidence into a common analytical framework. It combined experimental literature with packaging flow data from EA's Plasteax database and evaluated realistic low-, normal- and high-

emission scenarios. Seven packaging formats were assessed, together covering approximately 66% of global food packaging volumes.

The Problem: Packaging Is Not an Inert Barrier

The central issue is the direct migration of plastic particles from packaging into food. Unlike environmental microplastic sources, where particles may undergo dilution, packaging-derived MNP can enter food at the final point of contact before consumption.

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The report estimates that packaging-related transfer of MNP into food is approximately **~1,050 tons per year globally**. At the individual level, packaging-related exposure is estimated at approximately **~130 mg/person/year**, and may exceed **~1 g/person/year** for very high-use consumers.

The extent of the issue is therefore not adequately captured by mass alone. Smaller particles contribute relatively little to total mass but may be more relevant from an exposure perspective because of their potential to interact with biological systems. The report finds that the majority of packaging-related MNP fall below **150 µm**, while nanoplastics, defined as particles below **1 µm**, are

reflects both high market volumes and sensitivity to the mechanisms that generate particles.

Among the principal stressors, irradiation and light exposure emerge as dominant amplifiers, increasing emissions by up to **one to two orders of magnitude** where applicable. Repeated opening and closing, friction, handling, thermal exposure, hot contents and microwave heating can further increase particle release. Acidic and fatty foods can also influence product-packaging interactions.

This finding is particularly relevant for packaging manufacturers because it shifts the discussion from simply asking *which polymer is being used* to examining *how the entire*

industry, perhaps the most significant finding is that the exposure is not entirely unavoidable. The report describes MNP generation as a structured outcome of material properties, packaging design and real-world stress conditions.

This creates opportunities for intervention without necessarily requiring blanket substitution of plastic materials. Packaging design can focus on high-stress interfaces such as caps, closures and seals, while supply-chain practices can minimise unnecessary exposure to heat, light and mechanical stress. Designs delivering larger volumes of product per unit mass of packaging can also reduce emissions when measured against the amount of product consumed.

For high-volume formats, it proposes consideration of MNP emission limits or disclosure requirements, beginning with PET bottles, rigid PET and flexible PE.



of particular concern because they may enter circulation and interact with cells.

Where Does the Exposure Come From

The report identifies a relatively small number of packaging formats as major contributors. **PET bottles alone account for roughly one-third of total packaging-related MNP exposure**, followed by rigid PET food packaging and flexible PE packaging. This concentration

packaging system behaves under actual conditions of use.

The assessment indicates that ingestion of packaging-derived particles may imply concomitant exposure to **tens of milligrams** of associated IAS and NIAS, with exposure occurring at a comparable order of magnitude to the MNP themselves.

Design Becomes a Key Intervention

For the plastics and packaging

From Compliance to Exposure-Aware Design

For an industry already navigating recyclability & extended producer responsibility, the report introduces another consideration: particulate exposure at the point of consumption.

Its findings suggest that the direct contact of plastic packaging with food, enormous number of units in circulation and repeated exposure to stress conditions make packaging a potentially actionable ingestion pathway.

For packaging manufacturers, converters and brands, the implication is clear. Future packaging innovation may need to consider not only what happens to a pack after disposal, but also what happens to the material **before the product reaches the consumer**. Thus, this shift from designing for containment alone to designing for reduced particle release could become an important next step in the evolution of food-contact packaging. 📌

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BIRLANU LEAKPROOF PIPES: ENGINEERING INFINITE PEACE OF MIND

Arun Kumar Magoo of BirlaNu on managing PVC volatility and building India's most trusted water management solutions.

By Team ET Now Polymers



The Pipes business has seen a period of sharp price movements, but BirlaNu says it has emerged with a stronger and more agile business model. **Arun Kumar Magoo, Chief Business Officer, Pipes, BirlaNu**, says the business is now well placed to build on its growth across plumbing, sanitation, agriculture and infrastructure.

The last few quarters have been difficult for the PVC industry. PVC resin prices increased by more than 50% in March, before falling by nearly 30% in April. Prices then rose again in double digits in July and August.

"Such sharp price movements have a direct impact on channel buying behaviour," says Magoo. When prices rise quickly, distributors often delay purchases because they do not want to hold inventory bought at higher prices. When prices fall, they can again hold back, expecting prices to fall further.

"This creates a challenging environment for maintaining consistent offtake and requires close channel engagement, disciplined inventory management and agile pricing decisions to navigate effectively," he says.

Despite the volatility, Magoo says the Pipes business is in strong health. The business has recorded volume growth at a CAGR of more than 25% over the last six years and has gained market share while building its distribution network.

BirlaNu now has a national presence with more than 100,000 MT of capacity across four manufacturing locations in Haryana, Gujarat, Telangana and Bihar. Its portfolio has more than 20 products and over 3,000 SKUs.

These include CPVC, uPVC, SWR, Silent Pipes, PVC-O, UGD, Foamcore, Pressure, Column, Casing, PPR, HDPE, MDPE, Gas Pipes, Electrofusion Fittings, FHTC Fittings and Water Tanks.

The company is also investing in



its consumer brand. Its campaigns, including '*Kuchh Leak Nahi Hoga*' and '*Every Home is a Castle*', have recorded more than 80 million OTT views, 30 million YouTube views and 50 million social media impressions.

Magoo says these campaigns have helped strengthen the brand and its position in the market.

Technology with a purpose

For BirlaNu, technology is not only about adding a new feature to a pipe. The company wants technology to solve a real problem for customers.

Its TruFit Technology focuses on precision tolerances and leakproof assembly. The technology uses tight dimensional control and precise socket design to improve pipe to fitting alignment.

"Technology creates meaningful competitive advantage when it translates into clear customer outcomes," says Magoo.

He says the value of a leakproof pipe cannot be judged only by its initial price. Durability, lower maintenance and peace of mind are also important.

"For plumbers and contractors, a pipe leakage can result in additional site visits, lost time and reputational cost," he says.

TruFiT is designed to reduce this risk by supporting a more reliable and leakproof installation.

"The ultimate role of TruFiT in our proposition is not simply to add technology to the product, but to solve a real customer problem, reduce the risk of failure and create a stronger basis for customer by offering *Infinite Peace of Mind*," Magoo says.

This approach is also important as BirlaNu moves beyond conventional plumbing pipes and expands its presence across the wider water management market.

One platform for water management solutions

BirlaNu is looking at the business as a broader water management solutions platform, rather than limiting its role to conventional pipe categories. Its portfolio already spans more than 20 product categories across plumbing and sanitation, agriculture, and industrial and infrastructure applications

These include HDPE, MDPE, PPR, Gas pipes, Electofusion fittings and Water tanks, along with its existing pipe categories.

"The rationale is straightforward: customers think in terms of projects and solutions, not individual pipe categories," says Magoo.

The company believes that offering several products through one trusted platform can make things easier for customers and help BirlaNu build deeper relationships.

Its aim is to participate in a larger share of a customer's requirements instead of supplying only one category of product.

"Our ambition is clear, to establish BirlaNu as a trusted consumer brand in water management offering comprehensive portfolio of products and solutions," Magoo says.

Raising the Bar on Product safety

Sustainability and product safety are also becoming a bigger part of the Pipes business.

BirlaNu says it is the first in the Indian industry to adopt Organic Based Stabiliser technology for



its uPVC pipes and fittings. The technology enables a 100% heavy metal free formulation.

The company sees this as particularly important for products used in drinking and domestic water applications.

“We believe this approach will become increasingly relevant as customers, institutions and regulators place greater emphasis on safer and more sustainable materials,” says Magoo.

He says the response from the market has been positive, with customers appreciating the company's focus on sustainability.

The relevance of the technology is also increasing in areas where product safety, certifications and environmental standards are important. These include institutional and project led markets, government tenders, certification conscious developers and other projects.

Magoo expects the importance of such sustainability credentials to increase steadily.

PVC-O: The Next Infrastructure Opportunity

Another area that BirlaNu sees as important for the future is PVC-O, or Oriented PVC.

PVC-O uses molecular orientation

to provide a higher pressure rating with a thinner wall than conventional PVC. This means that it can help in efficient water conveyance with lower material intensity.

Magoo sees applications in water supply pipelines and irrigation.

He points to the wider shift that has already taken place in residential plumbing, where polymer based solutions have largely replaced traditional metal pipes because of their performance, durability and economics.

“We believe PVC-O is well positioned to drive a similar transformation in infrastructure applications,” he says.

The company sees PVC-O as an alternative to conventional materials such as ductile iron. According to Magoo, it can offer advantages in lifecycle cost, ease of installation, operational efficiency and long term asset reliability.

BirlaNu has committed capital to the opportunity through a greenfield PVC-O facility.

“India's significant investment in water infrastructure creates considerable headroom for adoption,” says Magoo.

Over the next three to five years, the company expects PVC-O to become an important growth platform for the Pipes

business, particularly in municipal water, irrigation and large scale infrastructure projects.

He says greater awareness, domestic capacity and customer acceptance can help expand the role of advanced PVC solutions in India's water infrastructure.

Government demand remains important

Government led infrastructure and water programmes have traditionally been important for the pipes industry. However, the pace of government spending and project execution has been slower than expected.

Magoo says this moderation has mainly been due to delays in project execution and procedural timelines rather than a change in the underlying infrastructure requirement.

“This has impacted industry wide offtake, including our Pipes business,” he says.

BirlaNu has already built a business in government led infrastructure through products such as HDPE Pipes and Fittings, Electrofusion Fittings, PVC Pipes and Fittings, Column and Casing Pipes, and Functional Household Tap Connection.

The company remains positive about the medium and long term opportunity.

The Jal Jeevan Mission has been extended through December 2028, with budgetary support strengthening. Magoo says this provides greater visibility on the continuation of the programme.

More importantly, the remaining requirement for rural tap water connectivity is still significant.

"The opportunity is therefore structural; the principal variable is the pace at which projects are awarded and executed," he says.

BirlaNu sees government led water infrastructure as a multi year growth opportunity and wants to be ready with the right products, manufacturing capabilities and institutional relationships as execution improves.

Leveraging the Wider Portfolio

The Pipes business is also part of BirlaNu's larger Home and Building Solutions portfolio, which includes Construction Chemicals, Roofs, Walls and Floors.

Magoo says this wider portfolio can create opportunities for the Pipes business because BirlaNu already has relationships with distributors, contractors and project stakeholders across its different categories.

"Established relationships with distributors, contractors and project stakeholders in overall BirlaNu ecosystem provide a strong platform of growth for Pipes business," he says.

The cross selling opportunity can be particularly useful in projects

where customers buy several product categories.

Builders, contractors and institutional buyers can benefit from a broader portfolio and consistent quality standards. For BirlaNu, this can mean a larger share of the overall project value.

Magoo says the portfolio approach is helping the company deepen customer relationships and build a stronger position across the Home and Building Solutions ecosystem.

Three growth pillars

Looking ahead, BirlaNu sees growth coming from several areas rather than from a single market.

The first is deeper penetration in its existing priority markets. The company calls these its "Fortress" markets.

It is working to expand distribution, improve market coverage and convert the growing equity of the BirlaNu brand into stronger customer preference and market share.

A Sales Acceleration Program is being implemented with a focus on demand generation, channel productivity, influencer engagement and share gain across these markets.

At the same time, the company is expanding its institutional business model beyond key metropolitan markets and plans to replicate this across identified demand hotspots across the country.

Infrastructure is the other major

opportunity.

With the commissioning of PVC-O capacity and continued government investment in water supply, irrigation and water management, BirlaNu sees opportunities in municipal, agricultural and large scale infrastructure applications.

The third pillar is premiumisation.

The company wants to increase its presence in higher margin and technology led categories such as Electrofusion Fittings, PVC-O Pipes, Silent Pipes, Foam Core Pipes and Premium Water Tanks.

"These segments not only enhance profitability but also strengthen our positioning as an innovative and differentiated solutions provider," says Magoo.

The next three years

For Magoo, the long term ambition goes beyond becoming a larger pipe manufacturer.

"Over the next three years, we envision BirlaNu Leakproof Pipes evolving from a fast growing pipes manufacturer into one of India's most trusted water management solutions brand," he says.

The company wants its leakproof proposition, TruFiT Technology and newer products such as 100% heavy metal free uPVC Pipes and PVC-O to become central to its market position.

It also wants plumbers and contractors to recommend the brand because its products make installations more reliable and reduce the risk of failures and rework.

For institutional and infrastructure customers, the aim is to build confidence through proven long-term performance.

Magoo believes scale and premiumisation will follow from getting these fundamentals right.

"Ultimately, three years from now, I would like BirlaNu to have earned a clear position in the market: a brand that customers choose with confidence for the quality and reliability of what goes behind the wall," he says. 





MARINE PLASTIC POLLUTION PUTS EPR IN FOCUS

New government data on microplastics, plastic waste processing and the proposed National Marine Litter Policy brings India's plastics value chain into focus.

By Team ET Now Polymers

India is getting a clearer picture of the plastic waste reaching its seas, with new government data pointing to riverine discharge and discarded fishing gear as major sources of microplastic pollution. At the same time, the government says around 232 lakh tonnes of plastic packaging waste have been processed under the Extended Producer Responsibility framework since 2022.

The findings were shared by the Ministry of Earth Sciences in a written reply in the Lok Sabha in July 2026. The Ministry, through the **National Centre for Coastal Research**, is monitoring microplastics, mesoplastics, macroplastics and marine litter at

selected locations along the Indian coast, including Thoothukudi and the Gulf of Mannar.

The latest findings show that synthetic filaments are the predominant type of microplastic found in the areas studied. Riverine discharge and abandoned, lost or discarded fishing gear have been identified as major sources.

At the Thoothukudi coast and Gulf of Mannar, microplastic abundance in sediment was recorded at between 28 and 60 particles for every 50 grams of sediment. The National Centre for Coastal Research has developed a Clean Coast Index based on microplastic and macroplastic data. Both locations

were classified as moderately clean. The government also said that no major microplastic pollution hotspots have been identified in the region based on the available information.

The findings are important because they show that marine plastic pollution is not only a problem of waste lying on beaches. Plastic waste can move through rivers and other waterways before reaching the sea. Fishing activity is another important source, with lost or discarded fishing gear contributing to the microplastic problem.

The government has been building a wider monitoring programme along the Indian



232 LAKH TONNES

**PLASTIC PACKAGING WASTE
PROCESSED UNDER EPR**

(Since 2022 | Ministry of Earth Sciences)



91.27%

**PLASTIC COMPOSITION
IN MUMBAI DEBRIS**

(2025 Survey | intertidal coral habitats)

Source: ET Now Polymers August-September 2026

coastline. Between 2022 and 2025, the National Centre for Coastal Research conducted field surveys along the east and west coasts to assess microplastics and marine debris. On the west coast, 19 transects were surveyed from Porbandar in Gujarat to Kanyakumari in Tamil Nadu. On the east coast, around 25 transects were sampled from Puri in Odisha to Tuticorin in Tamil Nadu.

The 2025 survey also showed the scale of the problem in some coastal areas. In a survey of Mumbai's intertidal coral habitats, plastic accounted for 91.27 percent of the marine debris recorded. The average marine debris density was estimated at 1.60 items per square metre. Single use plastic bags and wrappers were among the major plastic items found.

At the same time, India is trying to improve the collection and recycling of plastic packaging through EPR. The Plastic Waste Management Amendment Rules, 2022 introduced EPR guidelines for plastic packaging. These guidelines place mandatory obligations on producers, importers and brand owners covering collection, recycling, reuse of rigid plastic packaging and the use of recycled plastic content.

According to the latest July 2026 Parliament response, around

232 lakh tonnes of plastic packaging waste have been processed under the EPR framework since 2022. A separate Ministry of Environment and Forests and Climate Change response in March 2026 said that 60,128 producers, importers and brand owners and 3,012 plastic waste processors were registered on the centralised EPR portal. It also reported that around 207 lakh tonnes of plastic packaging waste had been recycled since the EPR guidelines came into force.

The numbers show the growing scale of India's formal plastic waste management system. However, processing waste under EPR and preventing plastic from entering rivers, drains and the sea are closely connected but are not the same thing. The challenge is to ensure that plastic waste is collected before it can escape into the environment.

The EPR framework is also becoming more demanding. Government guidelines provide for rising minimum recycling targets for different categories of plastic packaging. The minimum recycling target for 2026 to 2027 is between 50 percent and 70 percent, depending on the category of packaging. From 2027 to 2028 onwards, the target rises to between 60 percent and 80 percent.

This makes the issue increasingly relevant for the entire plastics value chain. Packaging producers, brand owners, recyclers, waste processors and local authorities will all have a role in improving collection and recycling. Better segregation at source and stronger collection systems will also be important, particularly for low value plastic waste that can be difficult to recover economically.

The next major development could be India's proposed National Marine Litter Policy. The Ministry of Earth Sciences has said that a draft policy has been prepared and shared with the Ministry of Environment, Forest and Climate Change for consultation. The policy could provide a broader framework for dealing with marine litter and bring together efforts across different parts of the waste management system.

For the plastics industry, the message from the latest data is clear. India is moving from simply measuring plastic pollution to building systems for tracking, collecting and processing plastic waste. The next step will be to make sure that these systems work not only after plastic waste has been collected, but also before it reaches rivers, beaches and the sea. 



India is developing indigenous carbon fibre technology as aerospace and defence demand grows for lighter, stronger and more advanced materials.

By Team ET Now Polymers

India's aerospace industry is entering a phase where advanced materials will matter as much as aircraft design and manufacturing. Among these materials, carbon fibre has a particularly important role. It is light, strong and resistant to corrosion, making it useful for aircraft structures and other demanding aerospace applications.

The question now is whether India can develop and produce enough aerospace grade carbon fibre on its own.

A significant step came in March 2026 when the **National Technical Textiles Mission** approved a project

for the indigenous development of intermediate modulus grade carbon fibre at CSIR National Aerospace Laboratories, or CSIR NAL. The project is part of a wider government effort to develop speciality fibres such as carbon fibre, aramid fibre and Ultra High Molecular Weight Polyethylene, or UHMWPE.

The move is important because carbon fibre is a strategic material for aerospace and defence. It is used with polymers to make carbon fibre reinforced polymer composites. These materials can provide high strength at a much lower weight than many conventional materials.

For aircraft manufacturers, lower weight can have a direct impact on aircraft performance. Composite structures can also offer good corrosion resistance and can reduce the number of parts and fasteners needed in some applications.

India is not starting from zero.

CSIR NAL has already developed carbon fibre manufacturing technology based on polyacrylonitrile, or PAN, a commonly used precursor for carbon fibre. The technology includes the production of PAN precursor fibre, followed by stabilisation, carbonisation, surface treatment,



sizing and winding. NAL says its technology has reached Technology Readiness Level 6.

NAL has developed both standard modulus and intermediate modulus carbon fibre. Its published specifications for intermediate modulus carbon fibre include a tensile strength of 4.5 GPa and a tensile modulus of 265 GPa. The organisation says it is working with a public sector enterprise and a government agency to establish a production plant using its technology.

The development of the material is only one part of the challenge. The bigger question is whether India can create a complete supply chain around it.

Aerospace carbon fibre has to meet demanding requirements for strength, consistency and quality. The fibre is only one part of a composite system. It has to work with the right

resin, prepreg and manufacturing process. The finished component then needs to meet strict testing and certification requirements.

India has already built considerable expertise in composite aircraft structures.

CSIR NAL has developed composite structures for aircraft including the SARAS and LCA Tejas programmes. Its work has covered wings, fuselage shells, horizontal and vertical tails and control surfaces. According to the India Science, Technology and Innovation portal, composite parts developed for the LCA have entered series production. More than 15 LCA aircraft had also flown with composite structures manufactured using NAL technology at the time of the portal's published information.

This experience gives India an important base as it works towards greater domestic production of carbon fibre.

The opportunity extends beyond aircraft.

Carbon fibre composites are increasingly relevant to unmanned aerial vehicles, helicopters, missiles, spacecraft and other aerospace and defence platforms. Their combination of low weight and high strength makes them useful where every kilogram matters.

The growth of India's drone industry could also create another important market. Larger numbers of drones and unmanned systems will require lightweight structures that can be produced consistently and at competitive cost. A domestic carbon fibre supply chain could support manufacturers while also reducing dependence on imported materials.

However, building that supply chain will require investment. Carbon fibre production involves several stages and requires specialised equipment and process control. The precursor itself is important, as are the conversion processes that turn the precursor into carbon fibre.

The next step will therefore be to move from technology development

to commercial scale production.

The government has recognised this requirement. The National Technical Textiles Mission's programme is not limited to carbon fibre. It also covers aramid and UHMWPE, both of which have applications in aerospace and defence. The mission is also supporting research in other advanced technical textile and composite systems.

For India's polymer industry, this creates an opportunity to move further up the value chain.

The traditional plastics industry is largely associated with packaging, consumer products, automotive components and industrial applications. Aerospace materials are a different segment, where performance, consistency and certification are critical. Success in carbon fibre could therefore open doors for Indian companies in advanced composites and high performance polymers.

There is also an opportunity for collaboration between research institutions, public sector companies and private manufacturers. Research institutions can develop materials and processes, while industry can provide the investment, manufacturing capacity and commercial scale needed to take those technologies into regular production.

The aim should not simply be to produce carbon fibre in India. The larger objective is to build an ecosystem around advanced aerospace materials.

That ecosystem would include precursor materials, carbon fibre, resins, prepreps, composite processing, testing, certification and recycling. It would also require skilled manpower and manufacturing facilities capable of meeting aerospace quality standards.

India's existing experience in composite aircraft structures shows that there is a foundation to build on. The new intermediate modulus carbon fibre project at CSIR NAL adds another important piece to that foundation.

The real test will now be scale. 

“WE NARROW THE FOCUS”

Manika Plastech Limited is expanding beyond its core battery casing business as demand rises across packaging, automotive and new applications.

By Amit Shanbaug

Battery casings continue to be the largest business for Manika Plastech, but the company is looking to reduce its dependence on the segment by expanding its packaging and automotive businesses and adding a new product line.

Munjal Nikunj Kapadia, Managing Director of Manika Plastech, said the company is seeing strong opportunities across the businesses it already operates and does not plan to chase growth in unrelated areas.

“While we broaden our horizon, we narrow the focus and execute with discipline,” Mr Kapadia said.

The company currently operates across four main verticals: battery casings, paint pails, thin wall packaging and automotive components.

Battery casings contributed 54% of the company's revenue in the first quarter, making it the largest business. Paint pails and thinwall packaging accounted for 28%, while automotive components contributed 4%.

The thin wall packaging business is one of the areas expected to grow faster. Manika Plastech entered the segment in FY24 and is still operating on a relatively low base, Kapadia expects this business to see strong growth as it expands.

The company also sees room to grow its automotive components business, particularly through its paint shop operation, which largely caters to TVS Motors.

Paint pails remain another

important part of the business, Kapadia said the expansion of these customers' businesses could create additional opportunities for Manika Plastech.

The battery casing business, meanwhile, is expected to remain relevant even as electric vehicles gain ground.

Kapadia believes lithium ion and lead acid batteries will continue to coexist over the next four to five years. Electric vehicle penetration in India is currently around 8% to 11%, according to the reports published by NITI Aayog.

He cited a recent monthly figure of around 4 lakh vehicles sold in India based on initial reports from Society of Indian Automobiles Manufacturers (SIAM).



Munjal Kapadia, Managing Director, Manika Plastech

For Manika Plastech, the battery opportunity extends beyond electric vehicles. Its battery casings are used in passenger cars, inverters and Home UPS systems, telecommunications





towers, Electric Three – Wheelers and Indian Railways.

Kapadia said the company is adding capacity as its customers expand in the segment.

“We believe battery as electric vehicles as like a lithium ion as well as lead acid will continue to coexist alongside each other,” he said.

The company is also preparing to move into a new area of packaging. It plans to enter the ISBM Injection Stretch Blow Moulding technology segment, which will allow it to manufacture PET and R-PET bottles and jars.

The move will give Manika Plastech access to applications in beverages, pharmaceuticals applications, personal care and cosmetics.

The company is increasing its manufacturing capacity at the same time. It currently has six manufacturing facilities and one paint service facility, with total installed capacity of 29,200 metric

tonnes. Capacity utilisation is currently 80%.

The company is also planning to increase its installed capacity to around 38,000 metric tonnes, an increase of close to 30%.

The expansion is planned within the company's existing facilities rather than through new greenfield plants, Kapadia said the company already has the necessary approvals in place.

The aim is to improve capacity utilisation while also gaining from automation and a better product mix.

A key part of Manika Plastech's business is its ability to work with customers before manufacturing begins. The company has an in-house design and development team that works on product design and mould development before moving into production.

Kapadia sees this as a major difference between Manika Plastech and a conventional plastic converting company.

“One thing which differentiates us from a plastic converting company, like a commodity converting company, is our in-house design and development team,” he said.

The company owns the moulds it develops and has built a library of more than 800 moulds. Around 30 designs have been registered by Manika Plastech, giving it intellectual property rights over those designs.

This also helps the company retain customers. More than 43% of its revenue comes from customers with an average relationship of around 10 years.

The company also places its manufacturing facilities close to key customers, allowing it to support just in time supply requirements.

Sustainability is another area where Manika Plastech is working with its customers. The company is developing lighter packaging that uses less material without affecting the required performance.

In FY26, it used around **6,188 tonnes of recycled polymers, which represented approximately 28% to 29% of the total polymers used.**

Kapadia said the use of recycled material is based on customer approved specifications. Large customers have their own quality requirements, and any change in raw material specifications has to be agreed with them.

The company is also increasing its use of renewable power. Around 26% of the power it consumes comes from renewable sources. At its Hosur facility, more than 75% of the power consumed comes from renewable sources. 🌱





PAPER-BASED FLEXIBLES

As flexible plastic pollution intensifies, paper-based alternatives are gaining industry momentum, but technology, cost, recyclability and scale remain critical challenges.

By Pratiksha Marathe

Every second, around **25,000** pieces of flexible plastic packaging, including sachets, wrappers and pouches, leak into the world's oceans. By 2040, this is projected to add up to an additional **20 trillion** items. These numbers highlight one of the most persistent challenges in addressing plastic pollution: small-format flexible packaging remains technically and economically difficult to recycle at meaningful scale.

To overcome this challenge and move towards a circular economy, paper-based flexible packaging is emerging as one potential part of the solution. The **Ellen MacArthur Foundation**, which works to accelerate the transition towards a circular economy, has identified flexible plastic packaging as a strategic priority under its **2030**

Plastics Agenda for Business. Their team examines how the industry is beginning to move from exploring paper as an alternative towards implementing solutions at scale.

Based on their recent report on '**Paper-Based Flexible Packaging**' the Foundation explores the how paper-based alternatives could reduce packaging pollution, alongside efforts to move away from problematic packaging formats wherever possible. The report was endorsed by 48 businesses, NGOs, investors and academics, signalling significant interest across the value chain in developing a credible pathway for paper-based flexible packaging.

Beyond Simply Replacing Plastic

The shift from plastic to paper, however, is not as simple as replacing

one material with another. The report therefore establishes six critical criteria for responsible paper-based flexible packaging. These cover responsible sourcing and production, packaging performance, local recyclability, chemical safety, biodegradability and alignment with a broader circular economy strategy.

The challenge also extends beyond material design. Even an improved paper-based package will not solve the problem if collection and recycling systems remain inadequate. Consequently, material substitution needs to be accompanied by efforts to strengthen effective collection and recycling infrastructure.

Brand Owners Move Towards Deployment

The strongest indication of growing

momentum is coming from major consumer brands that are beginning to translate research into commercial commitments.

Unilever provides one of the clearest examples. According to its senior leadership, the company has committed to deploying around 10 to 15 kilotons of paper-based flexible packaging by the end of 2028. In fact, progress has also been incorporated into its Sustainability Progress Index reward framework, directly linking the initiative to executive remuneration. This indicates that paper-based flexible packaging is increasingly being treated not simply as a future sustainability option but as a business priority requiring measurable implementation.

Likewise, **Nestlé** is pursuing a similar direction as part of its broader effort to reduce its dependence on virgin plastics. The company opened the Nestlé Institute of Packaging Sciences in 2019 to accelerate packaging innovation. The institute collaborates with more than 180 packaging experts, along with research institutions, start-ups and suppliers, to develop alternative packaging materials, including paper.

Mars, meanwhile, has

highlighted the importance of accelerating investment in coating and adhesive technologies. Such technologies are critical because expanding the application range of paper-based flexible packaging depends heavily on overcoming its performance limitations.

Technology Remains the Critical Enabler

Paper alone rarely provides all the characteristics required from flexible packaging. Modern packaging applications can demand moisture and grease resistance, barrier performance and adequate shelf life under challenging conditions.

The central challenge is to provide these functions without compromising recyclability or biodegradability. The report describes achieving this combination as a 'dual end of life' challenge: packaging must deliver the performance required during use while also offering viable pathways at the end of its life.

Technological development is beginning to address this gap. Advances in biopolymer coatings, paper surface modification and barrier technologies are helping narrow the distance between

technical feasibility and commercial viability. Atomic Layer Deposition, an emerging technology capable of creating ultra-thin barrier layers, is showing potential to improve performance and recyclability while using less coating material.

Developers are increasingly exploring agricultural residues and other non-wood feedstocks rather than relying exclusively on virgin wood. Such alternatives can offer significantly lower land-use and biodiversity impacts.

From Vision to Implementation

The transition towards paper-based flexible packaging is therefore entering a more decisive phase. The industry has moved beyond simply asking whether paper can replace plastic and is increasingly focused on how such solutions can be made technically effective, commercially viable and genuinely circular.

The Ellen MacArthur Foundation's six criteria provide a framework for guiding this development, but implementation will depend on coordinated action among brands, suppliers, technology developers, investors and policymakers. The growing commitments from companies such as Unilever, Nestlé and Mars, alongside investments and open-innovation initiatives, indicate that the market is beginning to move in that direction.

Paper-based packaging is not being presented as a universal replacement for plastic. Instead, it is emerging as one potential tool for addressing a particularly difficult segment of the packaging waste problem. As the Ellen MacArthur Foundation puts it, the direction is increasingly clear. The task now is to turn the vision into sustained action. 





ROBOTICS RESHAPES PACKAGING PROCESSING

Rising robotic adoption is set to transform packaging and processing operations through higher productivity, consistency, flexibility and increasingly connected manufacturing systems.

By Pratiksha Marathe

Packaging has always evolved alongside manufacturing technology. From mechanical filling, sealing and labelling equipment, the industry progressed towards automated conveyors, and vision systems. As packaging formats multiplied and manufacturers sought greater flexibility, automation became more connected and data-driven.

Today, the next phase is taking shape through robotics, with intelligent vision, faster operating speeds and improved integration making automated systems increasingly adaptable.

The shift is already visible in the numbers. A recent industry report on *Robotics in Packaging & Processing*, finds that the US robotics market for

packaging and processing was worth more than **\$440 million in 2025**. It is projected to reach approximately **\$800 million by 2031**, representing an average annual growth rate of **10.3%**.

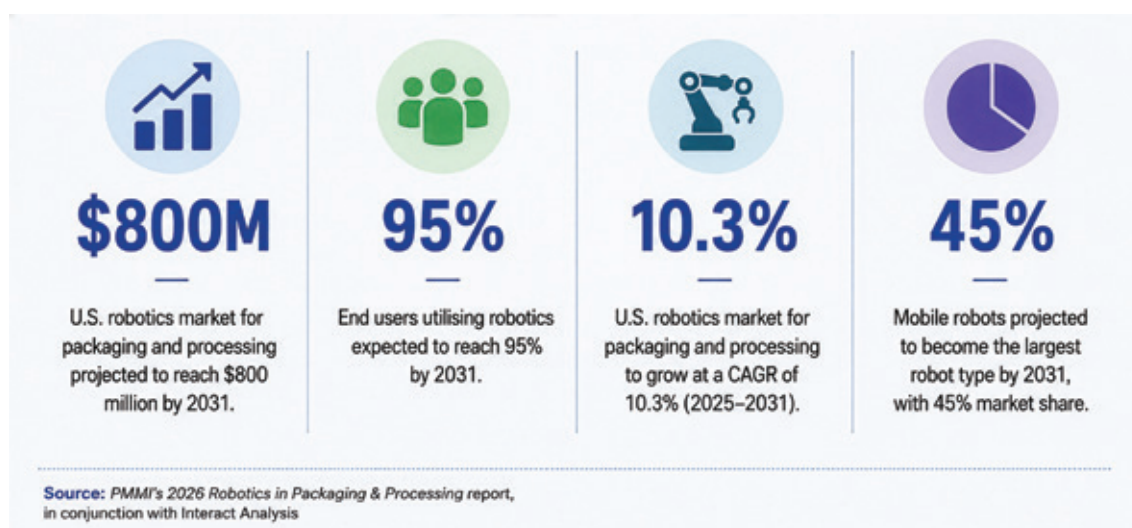
The adoption curve is equally significant. **72% of end users currently utilise robotics** in their operations, a figure expected to reach **95% by 2031**. More importantly, the share of end users deploying robotics extensively across most operations is projected to increase from 5% to 19% during the same period.

Productivity Becomes the Central Driver

The report indicates that robotic adoption is increasingly driven by

operational objectives rather than labour shortages alone. Increasing throughput and productivity, lowering costs, and improving quality and consistency are identified as the top three factors driving adoption among end users. This positions robotics as an enabler of more efficient and repeatable packaging operations, particularly where high-speed and repetitive processes are involved.

The benefits are already visible among existing users. Reducing repetitive tasks for employees, reducing labour costs, achieving consistent product handling, increasing speed and productivity, and achieving repeatable quality rank among the leading post-installation benefits reported by end users.



Integration Will Shape the Next Phase

The next stage of transformation will depend heavily on how effectively robotics can integrate with existing packaging and processing infrastructure. Improved integration was identified by 64% of OEMs/integrators and 65% of end users as one of the technological developments having the greatest impact on the market over the past five years. Intelligent vision capabilities were cited by 60% of OEMs/integrators and 67% of end users, while increased operating speeds were identified by 59% and 44%, respectively.

For the packaging industry, these developments point towards creating production environments where robotics can be deployed more flexibly across both brownfield and greenfield facilities. Easier integration can reduce implementation risk and commissioning timelines, while intelligent vision expands the ability of systems to identify, locate, orient, inspect and handle products. Faster robots can further improve productivity and reduce bottlenecks.

Yet adoption will not be without challenges. High upfront costs, integration with existing equipment and systems, and maintenance and service support remain key barriers. Internal technical skills gaps and operator training are also among the leading challenges after installation.



The U.S. packaging and processing robotics market is projected to nearly double from more than \$440 million in 2025 to approximately \$800 million by 2031, growing at 10.3% annually.

Can AI help transform the packaging process?

AI-powered vision can identify defects, inconsistencies, incorrect positioning or packaging abnormalities at line speed. This is particularly relevant because intelligent vision is one of the three technological developments with the greatest impact on the market.

Secondly, instead of waiting for a packaging machine to fail, AI can analyse equipment data and identify patterns associated with potential failures. This can help reduce unplanned downtime. AI can analyse production data to identify inefficiencies and help optimise throughput, equipment performance and production planning.

Knowledge transfer could also be particularly important as packaging plants deal with skills

gaps. AI systems can help capture machine knowledge, assist operators and make technical information easier to access. The report also states that in May 2026 that 59% of surveyed packaging and processing OEM members were actively using or testing AI, although only 10% had integrated AI into their products or customer-facing services. That tells us AI is real, but its deeper integration into the machinery itself is still developing.

Adoption Gathers Momentum

The transition towards more automated packaging and processing environments is already gathering momentum. **61% of end users** expect to increase robotics investment over the next year, compared with **81% of OEMs and integrators**, indicating continued confidence in the technology. With mobile robots projected to become the largest robot type by 2031.

At the same time, AI is beginning to add an intelligence layer to these automated systems, particularly through predictive maintenance. While its deeper integration into packaging machinery is still developing, the direction is clear: packaging lines are moving towards systems that are increasingly connected, adaptable and intelligent.



CAN AUTO PLASTICS GO CIRCULAR?

As India's end of life vehicle numbers surge, the challenge is to recover automotive plastics and turn scrap into valuable circular resources.

By Team ET Now Polymers

India is finally getting serious about what happens to a vehicle when it reaches the end of the road. The latest push towards organised vehicle scrapping has brought fresh attention to steel, batteries and tyres. But there is another material sitting quietly inside every ageing car that could soon become a major recycling challenge and opportunity: plastic.

A recent **NITI Aayog** report has put the scale of the problem in perspective. India had an estimated 23 million end of life vehicles in 2025. By 2030, that number could rise to 50 million. As millions of old cars, trucks and two wheelers move towards the scrap stream, the question is no longer simply how many vehicles India can dismantle.

It is also about how much of the material inside them can be recovered and used again.

Steel already has a clear place in this conversation. It has an established scrap market and can be recovered at scale. Plastics are far more complicated. A modern vehicle contains polypropylene, ABS, polyamide, polyurethane, PVC and several other polymers. They are used in bumpers, dashboards, door trims, lighting systems, under bonnet components, electrical parts and interiors. Add coatings, fillers, metal inserts, foam, textiles and adhesives, and recycling becomes much harder than simply throwing the material into a shredder.

That is where the real challenge lies. Recovering plastic is one thing,

Recovering it at a quality that allows it to be used again in demanding applications is quite another.

India already has a sizeable plastic recycling ecosystem. But automotive plastics need a more specialised approach. A mixed plastic stream can always be processed into a lower value product. The bigger prize is to separate materials early enough and clean them well enough to produce recyclate that can go back into automotive or other high-performance applications.

The NITI Aayog report shows that India's formal vehicle recycling ecosystem itself is still developing. **Registered Vehicle Scrapping Facilities processed around 72,000 vehicles in FY 2024 25**, while the informal sector continues to handle

a significant share of the market. A survey across 17 states and Union Territories covering more than 200 informal scrapping units estimated their annual scrapping capacity at roughly two lakhs to three lakh vehicles.

The economics explain part of the problem. According to the report, a registered scrapping facility with the capacity to process 20,000 vehicles a year can require capital expenditure of around Rs. 14 crore, including land and machinery. Such facilities can become viable at scale, but utilisation remains a challenge. For advanced plastic recovery, the requirements go further. Vehicles need to be dismantled carefully, components identified and segregated, polymers sorted, cleaned and then processed or compounded to restore the required properties.

This is why auto plastic recycling is not merely a waste management business. It is increasingly a materials business.

The informal sector will also remain part of the picture for some time. It has built strong networks and knows how to extract value from old vehicles. Simply trying to replace it may not be practical. The NITI Aayog report instead points towards the gradual formalisation and integration of the sector. That approach could also work for plastics. Informal dismantlers could become an important first link in the chain, separating valuable components before the remaining vehicle enters a formal recycling system.

The government and industry will also have to make formal scrapping financially attractive. NITI Aayog estimates that the EPR mechanism could help bridge the revenue gap between formal and informal scrapping by around Rs. 5,500. The report also examines carbon credits as a possible additional revenue stream, estimating a

potential value of around Rs. 2,000 per vehicle, subject to robust methodologies and verification.

For the plastics industry, however, the bigger opportunity may begin even before a vehicle reaches the scrap yard.

Automakers have traditionally designed vehicles for performance, safety, comfort and manufacturing efficiency. Circularity could add another consideration: how easily can the vehicle come apart? Clearer material identification, simpler component design and greater use of compatible materials can

end of life of their products.

Electric vehicles add another layer to the story. Battery recycling gets most of the attention, and rightly so. But an EV is not just a battery on wheels. It also contains plastics, electronics, lightweight materials and composites that will eventually have to be dealt with. NITI Aayog has noted that EV sales in India rose from around 50,000 in 2016 to 2.08 million in 2024, with the government targeting a 30 per cent share of EVs in total vehicle sales by 2030.

If India is building a circular mobility ecosystem, the discussion cannot stop with batteries.

The real opportunity is to see an old vehicle not as scrap but as a future source of raw materials. Steel already has a well-established value proposition. Plastics still need one.

The numbers suggest that India does not have the luxury of waiting. With the end-of-life vehicle stock expected to rise from 23 million in 2025 to 50 million by 2030, the country will need a much more organised approach to material recovery.

For auto plastics, the next phase will be about moving from recycling by weight to recycling by value.

The goal should not simply be to ensure that plastic is removed from an old vehicle. It should be to recover the material at the highest possible quality and keep it in the economy for longer.

That will require vehicle makers, dismantlers, recyclers, compounders and material suppliers to work far more closely than they do today. But if India gets that ecosystem right, the growing vehicle scrapping challenge could create an entirely new source of secondary raw materials.

An old car, after all, may have reached the end of its life on the road. Its plastic does not necessarily have to reach the end of its life with it. 



make recovery far easier. A clean polypropylene component has a better chance of returning to the material loop than a part made from several bonded materials that are difficult to separate.

Globally, that is where the conversation is moving. The focus is shifting from simply adding recycled content to vehicles towards designing materials that can also be recovered after use. Better sorting technologies, recycled engineering plastics and closed loop systems are becoming increasingly important as automakers look at both the carbon footprint of virgin materials and the



INDIA'S EV REVOLUTION COULD BE A BIG MATERIALS OPPORTUNITY

As India electrifies two wheelers, three wheelers and commercial fleets, plastics and advanced polymers could become critical to affordable mobility.

By Team ET Now Polymers

India's electric vehicle revolution is not going to look like China's, Europe's or the United States'. And that could be very good news for the plastics and polymers industry.

Across much of the world, the EV story has largely been driven by passenger cars. Bigger vehicles, larger battery packs and longer driving ranges have shaped the demand for new materials. India, however, is building its electric mobility market around a very different set of vehicles and use cases.

Electric scooters. Three wheelers. Delivery vehicles. Buses. Affordable passenger EVs. Fleet vehicles.

That distinction matters because every vehicle creates a different materials requirement.

The latest **Global EV Outlook 2026 from the International Energy Agency** offers a strong indication of where India is headed. Electric two and three-wheeler sales in India grew by more than 30 percent in the first quarter of 2026. The IEA sees electric two and three

wheelers as particularly attractive in emerging economies where fuel price sensitivity is high, and mobility needs differ from developed markets.

For India's polymers industry, this could be one of the most important shifts in automotive demand over the coming decade.

The opportunity will not simply come from replacing metal with plastic. It will come from developing lighter, safer, more durable and more specialised materials for an entirely new generation of vehicles.

India's EVs need to be affordable first

The Indian market will place enormous pressure on vehicle manufacturers to control costs. That is where plastics and polymer compounds could become increasingly important.

Electric vehicles already face the challenge of carrying expensive batteries. Reducing weight elsewhere in the vehicle can help improve efficiency and extend range. But in India, lightweighting is not just

about performance. It is also about economics.

Manufacturers need materials that can reduce component weight, simplify assembly and potentially consolidate multiple parts into a single moulded component.

Engineering plastics and polymer compounds are particularly well suited to this challenge.

They can be used across body panels, interiors, lighting systems, electrical components, cable management, connectors, battery housings and thermal management applications. The real value for the polymers industry, however, lies in developing materials that can meet increasingly demanding performance requirements.

EV components need to withstand heat, vibration, moisture and electrical stress. They must offer insulation where high voltage systems are involved. Battery related applications also require greater attention to flame retardancy and thermal stability.

For polymer suppliers, therefore,

the next opportunity may not be volume alone.

It may be value added materials.

Two wheelers could become a major polymers story

India's two-wheeler market could be especially significant.

Unlike a conventional car, an electric scooter is built around a compact architecture where every kilogram and every component cost matter. Battery packs have to be protected, electrical systems have to be insulated, and the vehicle must remain affordable for a mass market. That creates demand for specialised polymers across multiple applications.

Battery casings and covers, electrical connectors, charging components, cable insulation, lighting systems and body panels all represent areas where polymers can play an important role. The scale could be considerable.

According to the IEA, the two and three-wheeler segment remains the most electrified road transport segment globally. In India and China, the world's two largest two-wheeler markets, sales of electric two wheelers and three wheelers reached a combined 8.4 million units in 2025.

India's mobility transition could therefore generate polymer demand across millions of smaller vehicles

rather than being concentrated only in premium electric cars. That is an important distinction.

The industry may have to think less about the materials used in a luxury electric SUV and more about developing high performance but cost-effective solutions for scooters, rickshaws and commercial fleets.

The battery pack is becoming a new materials platform

The biggest change in an electric vehicle is, of course, the battery. And the battery pack is becoming a major area of opportunity for advanced materials.

Globally, EV battery deployment reached 1.2 TWh in 2025, an increase of almost 30 percent from the previous year, according to the IEA. But batteries are not simply an opportunity for companies producing lithium, graphite or cathode materials. They also need a wide range of supporting materials. Polymers are used in separators, binders, insulation systems, thermal interface materials, cable protection, seals, gaskets and other components surrounding the battery system.

Battery pack design is also evolving rapidly.

The IEA notes that innovations such as cell to pack and cell to chassis designs are helping improve overall energy density by reducing intermediate components. Cooling

plates are also being used to improve the speed of thermal management in battery packs.

As battery architecture becomes more integrated, materials will have to perform multiple functions at the same time. A component may need to be lightweight, flame retardant, electrically insulating and thermally stable. This is where commodity plastics will increasingly give way to engineered materials and specialised compounds.

LFP and sodium ion could reshape material demand

Battery chemistry will also influence the kind of materials ecosystem India builds.

The IEA says lithium iron phosphate batteries accounted for more than 55 percent of global EV battery deployment in 2025. In emerging markets and developing economies, LFP batteries now power two thirds of electric car sales.

LFP batteries are attractive because of their lower cost. The IEA estimates that LFP battery packs were more than 40 percent cheaper on average than nickel manganese cobalt alternatives on a per kWh basis in 2025. For a market such as India, affordability will be critical.

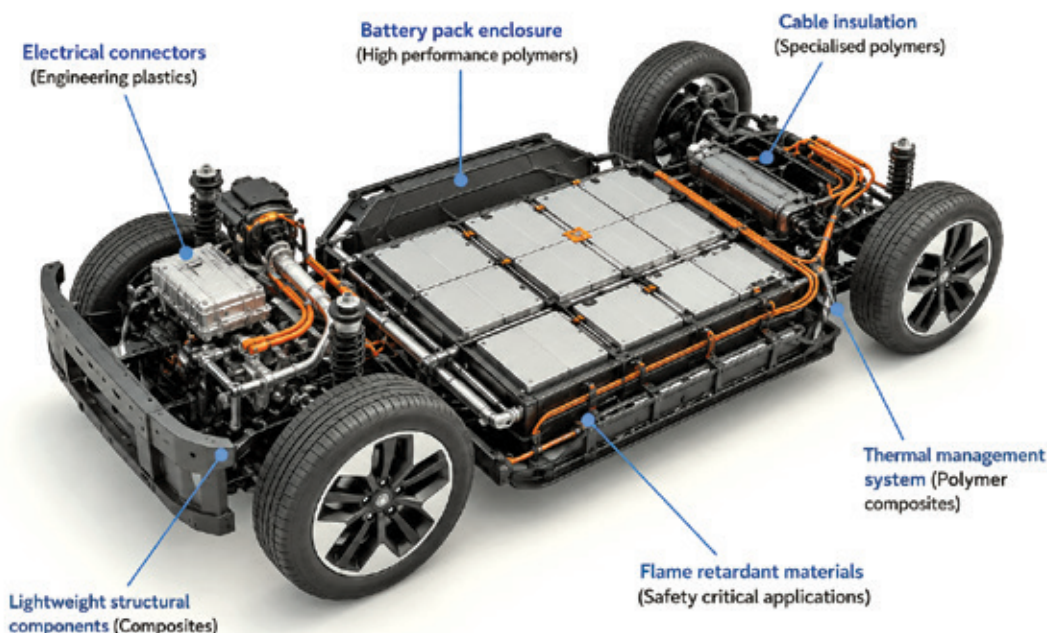
At the same time, sodium ion batteries are beginning to emerge as another technology worth watching. The IEA expects them to be particularly suited to small range electric cars, urban light commercial vehicles, two and three wheelers and industrial equipment.

Those are precisely the segments where India could see some of its strongest EV growth.

For the polymers sector, each new battery chemistry and design creates fresh requirements for separators, binders, insulation and protective materials.

The question for Indian companies will be whether they can participate in these higher value material applications rather than remaining suppliers of standard automotive components.





Battery swapping creates another opportunity

India's growing interest in battery swapping could also create a specialised demand for polymers.

A swappable battery is handled far more frequently than a fixed battery pack. Its housing has to survive repeated insertion and removal. Connectors need to remain reliable. The casing has to provide protection against impact, moisture and everyday wear.

This could create opportunities for high-performance polymer compounds, reinforced plastics, specialised sealing materials and advanced connector systems.

The same applies to delivery fleets and commercial three wheelers, where vehicles may operate for long hours every day. In these segments, durability can be just as important as lightweighting.

Recycling will become the next big materials challenge

The growth of electric mobility will eventually create another major opportunity for the polymers

industry: recycling.

As more EVs enter the market, the automotive sector will have to deal not only with battery recycling but also with the recovery of plastics and other materials from vehicles.

The challenge will be greater because EVs are increasingly using specialised and multi material components. The industry will therefore need better systems for identifying, separating and recycling engineering plastics and polymer compounds.

Designing components for recyclability could become increasingly important.

India already has a significant plastics recycling ecosystem. The next step will be to develop more sophisticated circular systems for automotive and EV applications where performance requirements are much higher.

That could become an important area for polymer processors, recyclers and material developers.

India should build a materials advantage

The biggest opportunity is clear.

India does not need to build

exactly the same EV supply chain as China. Its mobility market is different, and its materials strategy can be different too.

The IEA expects emerging markets and developing economies to account for a growing share of global EV battery deployment, with India among the countries driving that expansion. India's advantage lies in scale.

Millions of electric scooters. A rapidly growing three-wheeler market. Electric buses. Commercial fleets. Affordable passenger vehicles. Each of these will need lighter and more specialised materials.

For the plastics and polymers industry, therefore, the EV transition is much more than an automotive story. It is an opportunity to move up the value chain.

The winners will not necessarily be those producing the most polymer.

They could be the companies developing the right compound, the right flame-retardant system, the right lightweight component or the right recyclable material for India's unique mobility needs. 

Lubrication Free igus Bearing Aims to Reduce Overhead Conveyor Failures

The new hybrid ball bearing combines stainless steel and high-performance plastic to improve reliability in dusty industrial and logistics environments.

By Team ET Now Polymers

Dust and particles can create serious problems for overhead conveyors used across industrial and logistics operations. When dust settles on conventional metal ball bearings, it can lead to deposits, increased friction and sluggish movement. In severe cases, this can result in equipment failure and costly downtime.

igus has introduced a new hybrid ball bearing from its xiros series designed to address this challenge. The bearing combines stainless steel with high performance plastic and can operate without lubrication. This helps make it more resistant to dirt while reducing maintenance requirements.

Overhead conveyor systems are widely used to move goods and workpieces between production and storage areas while making efficient use of available space. As manufacturers and logistics companies look to improve efficiency, reducing downtime has become increasingly important.

“Design engineers are currently endeavouring to make these systems more efficient as users are increasingly less accepting of downtime and breakdowns. Even short interruptions can cause high costs and delays,” says **Marcus Semsroth, Head of Business Unit xiros Polymer Ball Bearings at igus.**

According to Semsroth, replacing conventional ball bearings used in conveyor trolleys can be one way to improve system reliability.



igus has developed a new hybrid ball bearing made of stainless steel and maintenance-free high-performance plastic especially for demanding applications on overhead conveyors.

The new hybrid bearing is designed to provide smoother operation while reducing maintenance.

Designed for dusty environments

Most overhead conveyors use standard metal ball bearings. These bearings are generally degreased and filled with low friction oil to reduce friction during operation. However, the oil can escape through the seals and attract dust and other particles.

This can be particularly challenging in dusty working environments, including textile manufacturing. As particles collect around the bearing, deposits can build up and affect its movement. Over time, this can increase the risk of failure.

The new igus hybrid bearing is designed to work without lubrication. It uses xirodur B180, a high performance plastic that allows low friction dry operation. This reduces the bearing's sensitivity to dirt and removes the need for regular lubrication.

The outer race is also designed to run with low friction on aluminium profiles. Conventional steel bearings can require an additional plastic outer component for such applications, making the overall solution more complex and expensive.

Stainless steel and plastic combination

The bearing uses a combination of materials to balance load capacity with low friction operation. Its inner race,

which experiences the highest surface pressure, is made from stainless steel. The load balls are also made from stainless steel, using a different alloy.

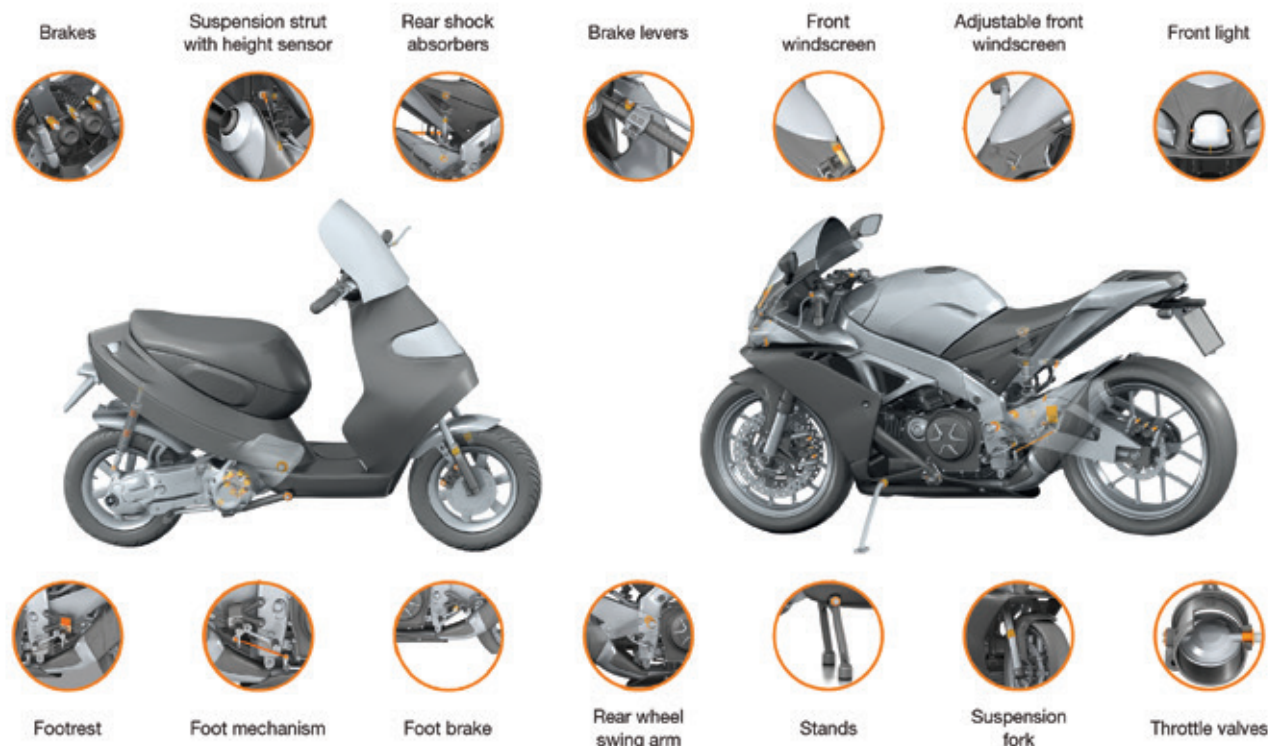
The cage is made from iglidur J3, a high performance polymer with additives that improve strength and sliding properties.

This hybrid construction gives the new bearing a load capacity of up to 39kg. While conventional metal ball bearings can support higher loads of around 80kg to 100kg, igus says the new bearing can meet the requirements of a wide range of applications in industry and logistics.

Potential applications include furniture manufacturing and packaging systems, where reliable movement and low maintenance can help improve overall efficiency.

The new ball bearings are available in three variants with inner diameters of 8mm, 10mm and 12mm. A version with a spherical outer race is also available, allowing smooth operation in aluminium profiles. 

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