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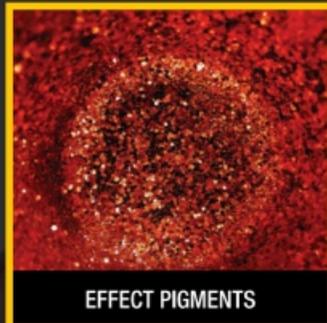


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FROM THE PRESIDENT'S DESK

Mr. Dilip Parekh



Dear Members,

Greetings from Organization of Plastics Processors of India!

We are fast approaching end of the Financial Year 2023-2024.

Recently I visited PLASTFOCUS 2024 at Dwarka, Delhi. During PLASTFOCUS I had interaction with all segments of the Plastics Fraternity. I was happy to note that majority of the companies connected with Plastics were quite happy with their Business Performance in the Current Year. They were also of the view that there were upticks in the Plastics Business and they were optimistic about the future. I extend my best wishes to all OPPI members.

The 12th Edition of our Seminar on - "Crucial Role of Maintenance in Plastics Processing Industry" is scheduled on 22nd March 2024 at India Habitat Centre, New Delhi. I appeal to all our members and particularly to those in North India to attend this Seminar with their Engineering and Maintenance personnel.

PLEXCONNECT 2024 will be held from 7th to 9th June 2024 at NESCO, Mumbai. Organization of Plastics Processors of India is promoting & marketing PLEXCONNECT 2024. Our Members are requested to participate in PLEXCONNECT 2024 through OPPI for the following reasons:-

- A comprehensive showcase for cutting-edge technologies and plastics processing capabilities aligned with global requirements.
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As informed to you we have tied up with Tibro for CHINAPLAS 2024 scheduled from 23rd to 26th April 2024 in Shanghai. CHINAPLAS 2024 is an important event on the Industry's calendar and the starting point for decisions that shape future products, processes and solutions. The Hotels chosen for CHINAPLAS 2024 are near the Exhibition Venue and are of good quality. All members proposing to go to CHINAPLAS 2024 may contact OPPI Secretariat.

With Best Wishes,

Dilip Parekh
President

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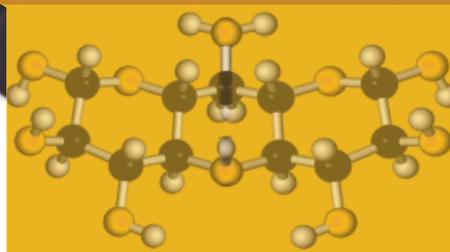
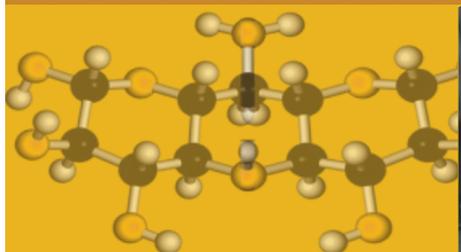
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In CHINAPLAS 2024 it will once again be an important event on the industry's calendar and the starting point for decisions that shape future products, processes and solutions.

Organization of Plastic Processors of India has tied up with Tibro Tours Pvt. Ltd. for CHINAPLAS 2024 packages. All Companies booking Tibro Packages CHINAPLAS 2024 through Organization of Plastic Processors of India will be eligible for discount.

Kindly write to us to secure your travel arrangements on confirmed basis.

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GET IN TOUCH Deepak Lawale, Secretary General, ORGANIZATION OF PLASTICS PROCESSORS OF INDIA



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NEWS FROM INDIA

HC Upholds Imposition of BIS Norms on Plastic Industry



BENGALURU : If a product under 'Make in India ' programme is sought to be exported with 'Made in India' tag, quality insistence from the threshold would ensure the final product meets the necessary global standards, the Karnataka high court said in a recent order.

Dismissing a petition filed by All - India HDPE PP Woven Fabric Manufacturers Association challenging certain quality standards prescribed for plastic manufacturers by the Centre, Justice M Nagaprasanna observed that the country will be able to compete with others only if quality is ensured right from the word go till the finished product under 'Make in India' programme.

“A step towards that will not be interfered with by this court except if the step depicts palpable and

demonstrable arbitrariness, which is neither pleaded nor present,” the judge said, adding: “Except contending cartelization and nexus, no other submission has been made. These submissions are untenable.”

“Quality control in plastic manufacturing always refers to the process of monitoring and inspecting various stages of manufacturing to ensure that the final plastic products meet certain standards of quality. Therefore, every raw material that is sought to be brought under Bureau of Indian Standards (BIS) is only to make it a quality final plastic product, so that it would not become hazardous to the environment and be of use to the general public and meet health and safety standards, including food conduct regulations, as they are widely used in every walk of human life,” the judge added.

The April 15, 2021 notification had said that quality control should conform to the corresponding Indian standard and bear the standard mark under a licence from the BIS as per Schedule I and Schedule II of the Bureau of Indian (Conformity Assessment) Regulations, 2018. The September 26, 2023 notification directed that the

earlier notification which imposed quality standards would come into effect on January 5, 2024.

The petitioner had claimed that imposition of such a clause on the supply of raw material will restrict free movement and sale of the said raw materials and would create a monopoly in the hands of a few in the industry.

On the other hand, deputy solicitor-general of India H Shanthi Bhushan, appearing for the central government and Competition Commission of India, described as false the petitioner's allegation that there is only one player in the market.

Justice Nagaprasanna pointed out that the impugned notifications sought to achieve a seal of Bureau of Indian Standard ('BIS seal') on every raw material that is brought in to the manufacture of a final product.

“The BIS, as observed hereinabove, is a national standards body which permits the development, standardization and quality certification of goods and the certification will be through BIS standard mark. If this is sought to be achieved by the Union of India, through the notification as a policy decision, the high court

exercising its jurisdiction under Article 226 of the Constitution of India would be loathe to interfere with such a policy decision of the government, particularly of economic and quality standards," the judge further observed while rejecting the petition.

Indigenous Equipment Developed for Mechanical Recycling of Waste Thermoplastic Polymers to Composites



Indigenous equipment called single screw extruder developed for mechanical recycling through melt-mixing of waste thermoplastic polymers and inorganic particulate fillers can help manufacture and characterize polymer composites that can be molded to the required shape for making paver blocks, tiles, and bricks.

At present, commercially available melt-mixing equipment are not designed for handling waste thermoplastic polymers that are often adhered by contaminants, as the barrel and screw system are not robust enough.

IIT Bombay has developed an instrument named GoldN (pronounced as Golden) for melt-mixing of waste thermoplastic polymers and inorganic particulate fillers to manufacture polymer composites.

It can carry out melt mixing as a continuous process, particularly in laboratory conditions, to replicate

the real - life conditions as compared to other conventionally available instruments. The researchers at the institute considered some key parameters such as compression ratio and clearance depth to facilitate efficient mixing of waste polymers and fillers.

The above technology, developed with the support of Department of Science and Technology (DST) through Waste Management Technologies, is now ready for commercialization for carrying out melt - mixing operations in a laboratory environment. It can bring down the cost of this instrument to INR 5 lakhs (by 6-8 times at least) by avoiding the complex design and operating tools and including the indigenous fabrication that are required.

The researchers have also developed a TGeosA for obtaining thermogravimetric analyses of the polymer composites obtained from the melt mixing instrument. The setup facilitates a sample size as high as 200 g that can incorporate the heterogeneity aspect of the materials being tested.

Further, a pilot-scale setup for manufacturing polymer composites has been indigenously fabricated. This setup consists of a shredder, a mixer cum preheater, and an extruder to obtain the fresh binder filler composite to shred the plastic waste, mix and preheat plastic waste and IBPs, and melt plastic waste along with IBPs followed by conveying at the end, respectively.

The technology developed by IIT Bombay in collaboration with Belagavi works of M/s. Hindalco

Industries Ltd. (Industry collaborator) is at the TRL-09 and a field - scale plant has been set up.

India Inc Confident of Achieving \$5 Trillion Economy: Deloitte Pre - budget Survey

India Inc is confident of achieving a \$5 trillion economy on the back of Central Government's support in infrastructure investments, additional reforms and enhanced technology adoption, a Pre-Budget Survey by Deloitte Touché Tohmatsu India LLP (DTTI) showed. About 50 percent of India Inc reflects optimism about India posting above 6.5 percent GDP growth in 2024-25, marking the third consecutive year of the fastest growth amongst major economies.

Among industry sectors, automotive (50 per cent), consumers and retail (66 per cent), technology, media and telecommunications (47 percent) and energy, resources and industrials (44 per cent) anticipate high growth.

Nearly 80 per cent of leaders in automotive, consumer and retail anticipate a GDP growth rate above 6 per cent.

The pre-budget Survey, with a comprehensive snapshot of the business community's outlook, provides valuable insights into their expectations, concerns and advocacy areas for policy improvements.

With 230 responses from CXOs across industries, it offers a detailed analysis of critical factors influencing the

economic landscape across various dimensions and growth factors.

Research and Development (R&D), enhanced technology adoption, skilling, tax certainty and increased trade collaboration have emerged as key imperatives for the next five years.

Nearly 99 percent of businesses expect AI to evolve gradually but require strong compliance for ethical practices. About 100 percent of leaders expect the government to prioritise environmental, social and governance (ESG) strategies and initiatives.

Sanjay Kumar, Partner, DTTI said, "As we navigate the challenges and opportunities outlined in the survey, the vision for a digitally empowered India becomes increasingly tangible. Our Survey findings reinforce the importance of innovation and collaboration in pursuing economic excellence, aligning with our national goal of a \$5 trillion economy. Together, through strategic technological advancements, we are poised to elevate the ease of doing business in the country and leave an indelible mark on the global stage".

The survey also highlighted global headwinds and continued cost escalation concerns, which need strategic measures.

Business leaders stressed the importance of targeted skill development, aligning with the CXO survey and positioning India as an attractive, forward thinking economy poised for substantial growth.

Interestingly, the survey highlighted that despite effective execution, the Production Linked Incentive Scheme 2.0 has a participation rate of 15 percent, signalling the need for better approach.

Govt Allows Direct Listing at IFSC to Enable Local COs Raise Global Capital

The government permitted the direct listing of Indian companies on the Gujarat International Finance Tec's (GIFT's) international exchanges to boost foreign investments. The Ministry of Finance issued a notification, amending the Foreign Exchange Management Act (FEMA) to permit the listing on the international exchanges in the International Financial Services Centre (IFSC). The corresponding provision to enable listing has also been made to the Companies Act.

In July last year, Finance Minister Mrs. Nirmala Sitharaman made an announcement on the direct listing of Indian Companies at GIFT- IFSC exchanges in the first phase. The move will enable startups and other domestic companies to access the global market and raise capital in foreign currency through GIFT IFSC. Market experts believe that listing at the IFSC exchanges may also help seek better valuation at global standards and increase the investor base with foreign inflow. Both listed and unlisted public domestic companies will be able to issue and list their shares at the IFSC exchanges.

Currently, the framework allows unlisted public Indian companies to list their shares on the international exchange while the Securities and Exchange Board of India (Sebi) is in the process of issuing the operational guidelines for listed public Indian companies.

The India International Exchange and NSE International Exchange are at present the only two permitted international exchanges in GIFT-IFSC. .

Only non-residents and offshore investors will be able to invest in the listed companies, thus domestic mutual funds and investors cannot participate.

The IFSC Authority also issued details on the companies that can file a prospectus for listing at the GIFT City. Companies from sectors where FDI is prohibited will not be allowed to list. Also, the equity shares listed on international exchanges will be counted towards the foreign holding of the company.

"The rules allow Indian public companies to offer their equity shares as a fresh subscription and also allow shareholders of such companies to offer their equity shares (OFS) as modes of listing. The traction that GIFT City garners for companies will help the government as a test case to move to other jurisdictions in the future, if they deem fit," said Manendra Singh, Partner, Economic Laws Practice.

The companies listed at the GIFT City will have to follow disclosure and regulatory requirements specified under the IFSCA (Issuance and Listing of Securities) Regulations, 2021 (ILS Regulations).

"India Betting on Amazing Transformation in Africa in Next Decade": Mr. Jaishankar at Business Forum in Nigeria

Abuja [Nigeria] : Exuding confidence in the growth potential of Africa, External Affairs Minister Mr. S Jaishankar called for further deepening of the India-Nigeria partnership and promotion of business opportunities between the two nations. The EAM was speaking at the India-Nigeria Business Forum in Abuja, Nigeria . "Glad to address the India-Nigeria Business Forum organised by CII and NICCI. Underlined that deepening our economic partnership is key to the expansion of our ties. Encouraged businesses to enhance their networking, identify regulatory and policy impediments and utilize opportunities," Mr. Jaishankar posted on X.

Addressing the event, he said, "If there are some big geopolitical bets India is taking, is on the rise of Africa. We are betting that in the next decade, we are going to see amazing transformation here. Whether it is opening more embassies, encouraging more trade and investments, creating more opportunities for political contacts, getting the system to know each other more".

"That is our objective, because we want to strengthen our relationship with Africa not in the future but from yesterday," he added.

The EAM stressed the further strengthening of India - Nigeria relations while

elaborating on the areas in which the two countries can collaborate.

He said that India would like to bring its experience and learning in Nigeria while assuring Abuja of business opportunities in New Delhi.

"We will continue to push the system, motivate business, address obstacles and facilitate, and look for new opportunity. There are a lot of changes in both countries a very good example is in the digital field, green and clean energy, agriculture," Mr. Jaishankar said.

He added, "A lot of our experience and learning, we would like to bring here. At the same time, I would like to assure Nigerian business that there are opportunities in India too".

Birla Carbon Announces New Greenfield Expansions in Asia

- Birla Carbon will expand carbon black capacity by more than 240 kMT in support of market and key customer growth
- The expanded footprint is aligned with customer expectations to provide sustainable, secure, and innovative solutions globally
- Expansion to take place at new locations in India and Thailand

Birla Carbon, the leader in sustainable carbon solutions, announced the establishment of two new carbon black manufacturing sites in Naidupet, Andhra Pradesh, India, and Rayong, Thailand.

"We are excited to augment our expansion plans in support of key customers in the fast - growing markets of India and Southeast Asia," stated John Loudermilk, President and Chief Executive Officer, Birla Carbon. "These two new state-of-the-art factories will ensure a secure supply of our industry-leading products, quality, and service, allowing our customers to meet their growth ambitions."

Each of the new facilities will have an initial capacity of 120 kMT operational in 2025 with plans to expand to 240 kMT in the future. These two new Greenfield sites will be prioritized based on their locations, demand dynamics in the region, and specific customer needs. Previously announced brownfield expansion plans in Hungary, as well as, the post treatment facility expanding Specialty capacity at Patalganga, India, are progressing on plan.

Birla Carbon will focus on the completion of its expansion initiatives while it continues to evaluate additional capacity requirements in various geographies, in line with its Purpose, to 'Share the Strength ,' driven by customer needs, industry trends, and our ambition to be the clear sustainability leader in the industry.

Multivac Group Celebrates the Opening of Indian Operations

The Multivac Group announced the official opening of its new production site in India. Construction on the approximately Euros 9 million, 107,640- sq foot project was completed in less than two years at the industrial area of Ghiloth, about 75 miles southwest of Delhi. The ultra-modern building complex for sales and Production features a floor space of 10,000sq meters and will go into operation at the beginning of 2024. Initially, around 60 people will be employed at this site. The goal is to optimize supply to customers in India, Sri Lanka and

Bangladesh through regional proximity and shorter delivery times.

The demand for packaging machines for fresh food is constantly increasing in India, Sri Lanka and Bangladesh as supermarkets are gaining in importance alongside traditional local markets. "With our new plant in India, we will be able to provide food manufacturers as well as medical device companies with even better state-of-the-art packaging technology and responsive service thanks to our regional proximity and new production capacity – from production to installation and putting into service, through to maintenance," explained Christian Traumann, CEO.

Assembly of Traysealers and Thermoforming Packaging Machines on 5000 Square Metres.

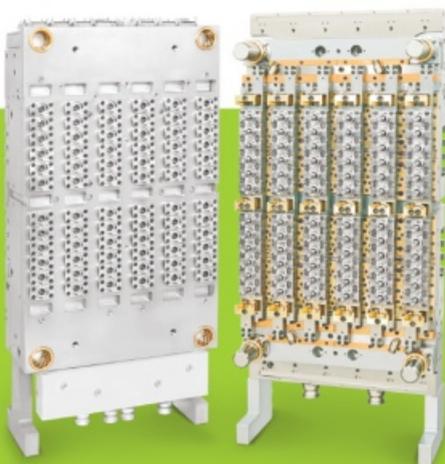
The new plant will go into operation in the second quarter of 2024. In a production area of around 5,000 sqm, Multivac will initially start assembling small fully automatic traysealers and compact thermoforming packaging machines. The production of mould sets and dies for packaging machines is also planned from 2025. The site also has a hall area for the storage of spare parts and consumable material, which Multivac can make available to its local customers faster than ever before.



PET Preforms Molds end Application

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- > Carbonated
- > Pharma
- > Juices
- > Edible Oil
- > Liquor
- > Cosmetics
- > Wide Mouth Jars

High Performance Precision Molds





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PLASTIC PRODUCTS AND NEW TECHNOLOGIES

Napco Develops Heavy Duty Sacks to Pack Petrochemical Resins as Thin as 105 Microns



Challenge: Develop Heavy Duty Sacks to pack petrochemical polymer resins as thin as 105µm

Napco National, a leading manufacturer of plastic and paper packaging solutions based in Saudi Arabia, wanted to downgauge its films used for Heavy Duty Sack (HDS), to provide a solution that offers the sustainability benefits of using less packaging material while lowering the weight of the packaging being transported for petrochemical manufacturers. “Downgauging HDS films from our existing 125µm thickness posed two-fold challenges. First, the thinning down threatened the creep resistance, a major requirement for load stability during stacking, storage, and transportation. Second, the

formulation adjustment to deliver acceptable creep resistance can adversely affect the bag drop performance,” explains Wissam Akiki, General Manager of Napco Modern Sacks. “First - rate technical support was needed to help develop a formulation that would allow downgauging, while providing the required creep resistance and bag drop performance,” adds Akiki. Napco wanted to gain a market advantage as the first packaging company in the Gulf Cooperation Council (GCC) to offer downgauged HDS, which are primarily used by petrochemical companies for polymer resins.

Solution: Exceed™ XP performance polyethylene for thinner HDS while maintaining creep resistance and bag drop performance

Napco National, the world's largest supplier of petrochemical packaging, collaborated with ExxonMobil's polyethylene (PE) business, a leader in driving innovative polymer design. The strength of ExxonMobil's PE technical support — including formulation design and testing— together with Napco National's 70 - years of manufacturing expertise in film conversion, were crucial to the development of a

new HDS film formulation. When reference HDS films are downgauged, higher amounts of high density polyethylene (HDPE) usually must be added to manage creep resistance, but this often negatively impacts bag drop performance. So, ExxonMobil recommended a new formulation that included Exceed™ XP performance PE and HDPE. The synergy between Exceed XP and HDPE provides opportunities to downgauge the film, deliver excellent bag drop performance and maintain creep resistance.

Results: Thinner HDS enable new business opportunities

What some might view as solutions that will only happen in the future, ExxonMobil PE is making possible today – through our innovative and reliable products, collaborative approach, technology leadership and support, and our unmatched global supply and resources. Why wait for tomorrow to advance your business today? Contact your ExxonMobil PE representative and begin experiencing tomorrow's performance today in your heavy duty sack films. Why ExxonMobil PE? Why today? Used for 25kg polymer resin sacks, the new 105µm film —

which includes Exceed™ XP — replaces the existing 125 micron film, which is based on LLDPE. The ability to downgauge the new film by more than 15% is due to the synergy between Exceed XP and HDPE. The film exhibits excellent creep resistance and maintains bag drop performance, which are both critical for load stability, safety and product protection during stacking, storage, and transportation. “Initially, we thought downgauging an HDS film as low as 105 microns was virtually impossible, as creep resistance and bag drop performance would be jeopardized,” said Mr. Issam Chaaya, Vice President Petrochemical accounts at Napco National. “But, by working together, we have created a differentiated HDS solution, which is at least 15% thinner than the existing HDS. With load stability, safety and product protection maintained, we believe the new downgauged solution provides enormous business opportunities with petrochemical companies in the region.”

AmerCareRoyal® Launches PrimeWare® Compostable Straw: Uniting Performance and Sustainability in a Revolutionary Product

AmerCareRoyal ("ACR"), a leading provider of sustainable packaging solutions, is thrilled to introduce its latest innovation, the PrimeWare compostable straw. Crystal clear and crafted from cellulosic material and bearing the esteemed BPI Industrial Compostability Certification and TUV OK Home Compostable

Certification, this groundbreaking straw combines the performance of a plastic straw with the sustainability footprint of a paper straw.



The PrimeWare compostable straw has been designed to address the pressing need for eco - friendly alternatives to traditional single - use plastic straws. By harnessing the power of advanced materials and cutting - edge technology, AmerCareRoyal has created a solution that exceeds expectations in both functionality and environmental impact. The PrimeWare compostable straw is offered in four in - demand sizes, catering to a wide range of usage needs.

Key Features and Benefits :

- **Unmatched Performance** : The PrimeWare compostable straw boasts the same durability, flexibility, and functionality as a plastic straw. Unlike paper straws that can become soggy and deteriorate quickly, the PrimeWare compostable straw maintains its integrity, providing an exceptional drinking experience.
- **Sustainable and Certified** : With a strong commitment to sustainability, the PrimeWare compostable straw has

obtained both the BPI Industrial Compostability Certification and TUV OK Home Compostable Certification, guaranteeing the highest compostability standards. Made from cellulosic material derived from renewable resources, the PrimeWare compostable straw reduces the strain on the environment, leaving behind no harmful residues and offering a viable solution to combat plastic pollution.

- **Versatile and Available** : Understanding the diverse needs of consumers and businesses, AmerCareRoyal offers the PrimeWare compostable straw in four of the most sought - after sizes. This ensures that the straw meets virtually any usage requirement across various industries, including restaurants, cafes, and foodservice providers. The availability of these sizes reflects the company's commitment to meeting market demands and providing accessible and sustainable options to a wide range of customers.

"The PrimeWare Compostable straw is an exciting addition to the premier line of eco - friendly products, building further on our lasting commitment to sustainability in foodservice packaging products," said Chris Rowe, Vice President of Marketing at AmerCareRoyal.

The PrimeWare compostable straw marks a significant step forward in AmerCareRoyal's ongoing mission to deliver sustainable packaging solutions

without compromising on performance. By choosing the PrimeWare straw, businesses can align with consumer preferences for eco-friendly products while providing an exceptional user experience.

Aptar Closures offers Line of Fully Recyclable Flow Control Dispensing Solutions for Food & Beverage Products



As the industry leader in flow control dispensing solutions for over 25 years, Aptar Closures is pleased to offer a line of fully recyclable flow control dispensing solutions suitable for a wide range of products, most notably food and beverage applications such as condiments and sauces. The company's SimpliCycle™ valve is designed for brand owners seeking to enhance packaging sustainability without sacrificing precise, hygienic product dispensing and consistent consumer satisfaction.

True to its name, SimpliCycle provides ease and function by streamlining mechanical recycling. Comprised of low-density thermoplastic elastomer (TPE), the valves float during the recycling sorting process, separating them from the polyethylene terephthalate (PET) stream; from there, they are recycled in the polypropylene (PP) and polyethylene (PE)

stream. When assembled into a compatible Aptar closure, SimpliCycle creates a fully recyclable solution for use with PET, PE or PP containers.

Most importantly, SimpliCycle offers exemplary product performance, with its exacting clean-cut dispensing that meets or exceeds that of valves composed of conventional, less recyclable resins. Available in multiple sizes and configurations, SimpliCycle can be paired with both rigid and flexible containers for products with a wide range of viscosities, from honey to water. Notably, this includes fat- and acid-based products such as mayonnaise and ketchup.

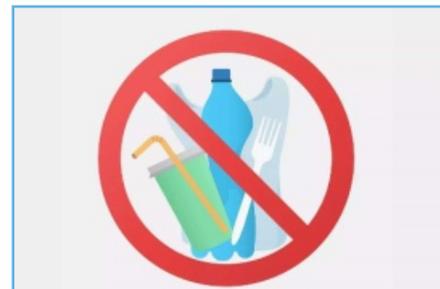
SimpliCycle yields exemplary flow control and consistent flow rate, ensuring users get precise amounts of product when and where they please. Clean product cut off avoids drips, leaks or spills during product use, and inverted storage compatibility helps consumers use the entirety of each package's contents.

SimpliCycle has received Critical Guidance Recognition from the US-based Association of Plastic Recyclers (APR), as well as RecyClass in Europe. Other distinctions include a World Food Innovation Award for "Best Corporate Social Responsibility / Sustainability Initiative", and a coveted WorldStar Global Packaging award.

Dubai Bans Single – Use Plastic Bags

According to Dubai Municipality, the tariff in Dubai is mandatory for all shops, including groceries,

retail stores, restaurants, pharmacies, e-commerce services and delivery services, that provide single-use bags (measuring less than 57 micrometres in thickness) to carry goods.



Dubai has started imposing a 25-fils (6 US cents) tariff for each single-use plastic bag, which is part of the UAE's plan to gradually ban the use of some single-use plastic products by 2024.

The move is "in line with enhancing environmental sustainability and encouraging individuals to reduce the excessive use of plastics," the Dubai Media Office said.

Meanwhile, stores are not obligated to provide free alternatives to their customers. The move by the Dubai government follows Abu Dhabi's decision on June 1 to ban the use of single-use plastic bags across all stores in the capital of the UAE.

Case Study: Creating High Performance, Cost Effective Vacuum Skin Packaging Formulations

Collaborate to create high-performing, cost-effective vacuum-skin packaging.



Traditional ionomer - based vacuum packaging can be easily impacted by ionomer material shortage, hence be expensive to produce. Three companies collaborated to create ionomer - free vacuum skin packaging that is both cost effective and provides high performance attributes. The packaging was developed thanks to the collaboration of three industry leaders. The blown film was produced by GAP, an Italian company with expertise in extrusion lines and bubble technology, combined with bestin - class performance polyethylene from ExxonMobil and Kuraray's most efficient barrier material, "EVAL™ T101B". To demonstrate the high performance and excellent shelf appeal, G.Mondini, an Italian - based leader in packaging food , provided access to their vacuum - skin packaging line, which provides perfect vacuum and full seal around the product. The value chain collaboration brought a cost-effective solution to the market by reducing dependency on ionomers. ExxonMobil's performance polyethylene maintained the same key performance attributes required for a vacuum skin packaging. Exceed™ XP polyethylene provided seal integrity and toughness while Escorene™ EVA resin provided excellent forming properties. Shelf life is provided by EVAL™ EVOH, a material well - known for providing tremendous barrier properties.

Results: What some might view as solutions that will only happen in the future, ExxonMobil PE is making possible today – through our innovative and reliable products, collaborative approach, technology leadership and support, and our unmatched global supply and resources. Why wait for tomorrow to advance your business today? Contact your ExxonMobil PE representative and begin experiencing tomorrow's performance today. The ionomer-free solution delivers excellent shelf appeal, toughness properties such as tear and puncture. It brings an outstanding gloss of 81, and transparency (haze 7,5%). Moreover, exceptional forming performance was demonstrated on a semi - automatic G. Mondini equipment and an automatic Multivac line, enabling cost savings and reducing the dependency on a traditional ionomer-based eference.

Testing and Quality Evaluation of Plastics as Packaging Materials



Packaging has a pivotal role to play in preserving the shelf - life of products and ensuring their intact and uncontaminated deliveries to end consumers. Towards this end, plastic materials have become a popular choice for packaging due to their versatility, durability, and cost - effectiveness. This blog explores the essential aspects of

testing and quality evaluation for plastics used in packaging materials, focusing on both traditional and innovative approaches.

The quality of packaging materials is paramount in ensuring the protection, preservation, and presentation of products while being crucial to preventing environmental harm and potential health risks. Inadequate packaging can lead to contamination, spoilage, and damage during transportation and storage. The quality evaluation process for plastics used in packaging is multifaceted, encompassing mechanical, thermal, chemical, and environmental considerations and can be undertaken through the following testing practices:

1. Mechanical Testing

Tensile Strength and Elongation: Tensile strength testing measures a material's ability to withstand stretching and pulling forces, while elongation measures its flexibility. These properties are crucial for ensuring that packaging materials can withstand the rigors of handling and transportation without tearing or breaking.

Impact Resistance: Packaging materials must be able to endure impact without rupture. Impact resistance testing assesses how well a plastic material can absorb and dissipate energy when subjected to sudden shocks, ensuring it can protect its contents.

Flexural Strength: Flexural strength testing evaluates a material's ability to resist deformation under bending

forces. This is vital for assessing how packaging materials will perform when subjected to different stacking and handling conditions.

2. Thermal Testing

Melting Point and Heat Resistance: Understanding a plastic material's melting point is crucial for determining its suitability for specific packaging applications, especially those involving high - temperature environments. Heat resistance testing ensures that the material maintains its structural integrity under various temperature conditions.

Thermal Stability: Packaging materials should exhibit thermal stability to prevent degradation and release of harmful substances during processing, storage, or transportation. Thermal stability testing assesses how well a plastic material retains its properties when exposed to elevated temperatures.

3. Chemical Testing

Chemical Resistance: Packaging materials may come into contact with various substances, including food, beverages, and cleaning agents. Chemical resistance testing evaluates how well a plastic material withstands exposure to different chemicals without undergoing degradation or releasing harmful substances.

Migration Testing: Ensuring that no harmful substances migrate from the packaging material to the enclosed product is critical for food safety. Migration testing assesses the potential transfer of substances such as plasticizers, colorants, and stabilizers from the packaging to the product.

4. Environmental Testing

Biodegradability and Compostability: With an emphasis on sustainability at the core of packaging solutions, evaluating the environmental impact of packaging materials is essential. Testing for biodegradability and compostability helps determine the material's ability to break down naturally, reducing its ecological footprint.

Recyclability: Assessing the recyclability of plastic packaging materials is crucial for promoting a circular economy. Materials that can be easily recycled contribute to reducing waste and conserving resources. Testing methods help identify materials suitable for recycling processes.

5. Innovations in Quality Evaluation

Advanced Analytical Techniques: Traditional testing methods are essential, but advancements in analytical techniques, such as spectroscopy and chromatography, allow for more precise and comprehensive analyses of plastic materials. These techniques enable the identification of trace elements, additives, and potential contaminants.

Computer - Aided Simulation: Computer - aided simulation techniques, such as Finite Element Analysis (FEA), are increasingly used to predict the behavior of packaging materials under different conditions. This technology allows for virtual testing, reducing the need for extensive physical testing and accelerating the product development cycle.

Smart Packaging Solutions: Incorporating smart technologies into packaging materials opens new possibilities for real - time monitoring of the packaging's integrity, temperature, and environmental conditions. These innovations enhance the quality evaluation process and provide valuable insights into the material's performance throughout its lifecycle.

While significant strides have been made in testing and quality evaluation, challenges persist. Balancing the need for robust packaging with environmental sustainability remains a delicate task. Additionally, harmonizing global standards for testing and quality evaluation is crucial to ensuring consistency and reliability across the industry. Looking ahead, the future of plastic packaging materials lies in the development of bio - based, recyclable, and biodegradable alternatives. Researchers and industry leaders are exploring innovative solutions that maintain the functionality of traditional plastics while minimizing their environmental impact.

Testing and quality evaluation are integral components of ensuring the safety, reliability, and sustainability of plastic materials used in packaging. From mechanical and thermal properties to chemical resistance and environmental impact, a comprehensive testing approach is necessary to meet the diverse demands of the packaging industry. As technology continues to advance, the development of smarter, more sustainable packaging solutions holds the key to a future where quality and environmental responsibility

go hand in hand. By prioritizing rigorous testing practices and embracing innovative approaches, the packaging industry can pave the way for a more sustainable and secure future.

PIXARGUS Solution for Inspecting High - Gloss Vehicle Trims



- The new Shiny Detection inline module from PIXARGUS is a solution for detecting scratches and bubbles on the challenging high - gloss surfaces of vehicle trims.
- Used with the PIXARGUS ProfilControl 7 Surface system, the inspection module helps producers minimise their scrap rates and production costs.
- The specially developed software of the module is able to even detect dark defects on glossy or matte black surfaces.
- The new Shiny Detection inline module from PIXARGUS is a solution for detecting scratches and bubbles on the challenging high - gloss surfaces of vehicle trims.
- Used in conjunction with the PIXARGUS ProfilControl 7 Surface system, this innovative inspection module helps producers minimise their scrap rates and production costs. A renowned Canadian automotive supplier has been using the PIXARGUS technology made in Germany for many years.
- Called Shadowline, Black Edition or Night Package, the new exterior design packages in glossy or matt black offered by automakers render modernity and style. Moreover, they provide great flexibility for customisation. At the same time, the love for high-gloss chrome finish that gives a car a stylish, luxury look is unbroken.
- However, the design elements also have a less shiny side: They are highly sensitive to physical impact and difficult to inspect due to their high light reflectance and their complex shape.
- Michael Frohn, sales manager at PIXARGUS, said: "The bar in quality inspection of these products is very high. Even the smallest defects - hardly visible to the naked eye - are not tolerated."
- **ProfilControl 7S Shiny Detection: 100% defect detection minimises scrap and costs**
- The Shiny Detection module developed by measuring technology expert PIXARGUS ensures 100% defect detection on high - reflectance surfaces. The specially developed software of the module is able to even detect dark defects on glossy or matte black surfaces.
- "We have more than twenty years of experience in automotive profile inspection.
- Throughout this time, we have continuously further developed and optimised our detection and quality control algorithms," added Frohn. The measuring system expert is convinced: "Our inspection systems help minimise out - of - spec production and avoid complaints."
- **From Würselen to Canada**
- The PIXARGUS system is already successfully in use at a leading automotive supplier in Canada. The specialist in vehicle exteriors and design elements with premium finishes has been using technology from PIXARGUS in surface inspection of vehicle trim products since 2008. At its facilities in Canada the company operates eight PIXARGUS systems to check the quality of their products. For a recent investment in new quality control technology, the supplier again decided in favour of a PIXARGUS ProfilControl 7 Surface Shiny Detection system.
- "The system identifies even the tiniest of flaws in real time. The system helps our customer to take measures to optimise the out - of - spec rate and minimise the scrap costs as a result," said Frohn.
- **The functional principle - structured light and smart software**
- The PIXARGUS Shiny Detection module casts a pattern of structured light onto the high-gloss surfaces of the profiles to be inspected. These light patterns showing on the surface of the profile suppress

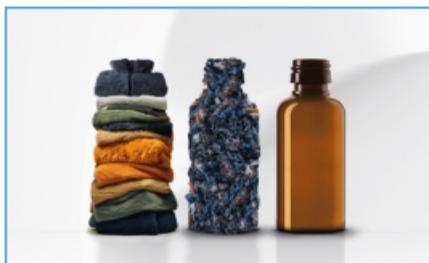
reflection while creating transitions of brightness that allow even extremely small scratches, bubbles or dents to be reliably detected. The system follows the exact contour of the product and inspects it across its entire width. The field of vision can be modulated to also ensure inspection of the curved areas of metal trims.

- **Inspecting in parallel – inline and at any time**
- PIXARGUS developed this inspection tool as an add-on module to its ProfilControl 7 system. Shiny Detection can be flexibly switched in whenever necessary to inspect glossy products or products that are glossy in certain areas. A unique solution that makes it possible to also inspect products with surfaces that consist of different materials, e.g. chrome, foil or rubber, in one parallel process and at high line speeds. Thus, the new add-on module for glossy surfaces saves time and money.

Loop Industries and Bormioli Pharma Unveil an Innovative Pharmaceutical Packaging Bottle Manufactured with 100% Recycled Virgin Quality Loop PET Resin at Pharmapack 2024

Loop Industries, Inc. a clean technology company whose mission is to accelerate a circular plastics economy by manufacturing 100% recycled polyethylene terephthalate (“PET”) plastic and polyester fiber and Bormioli Pharma, an

international leader in pharmaceutical packaging and medical devices, today announced that an innovative pharmaceutical packaging bottle manufactured with 100% recycled virgin quality Loop™ PET resin will be unveiled within the Bormioli booth at Pharmapack Europe 2024.



Bormioli Pharma and Loop Industries aim to introduce market - ready solutions for the global pharmaceutical industry and the two companies began to collaborate over a year ago in order to achieve this goal. Bormioli Pharma tested Loop™ PET resin in its packaging, commissioning to independent third parties' additional analysis to verify extractables levels with different solutions, also taking in consideration the worst - case scenario. The results of these tests set a new benchmark for recycled plastic products within the pharmaceutical industry, as the bottles produced with Loop™ PET resin do not release any substance deemed of toxicological relevance[1].

Bormioli Pharma's EcoPositive offering, gathering low - impact packaging solutions, currently constitutes 50% of their standard catalogue, contributing to position itself among the players with the broadest sustainable offerings on the international market.

In addition to the independent third - party testing commissioned by Bormioli Pharma, Loop™ PET resin was also tested by a worldwide leader in laboratory testing services and on December 13th, 2023 Loop announced that test results confirmed its Loop™ PET resin meets the strict requirements and standards outlined by the European Pharmacopeia (Ph.Eur. 3.1.15, Polyethylene Terephthalate for Containers for Preparations not for Parenteral Uses) and the United States Pharmacopeia (USP , Plastic Materials of Construction) and is compliant for use in packaging applications in the pharmaceutical industry.

“Through this collaboration with Loop we're strengthening our role as a solid, quality and reliable partner for the pharmaceutical industry” stated Andrea Lodetti, CEO of Bormioli Pharma. “Loop Industries shares our values and commitment, and together we made available a new pharma - grade sustainable solution, showing even greater safety standards than traditional ones.”

Daniel Solomita, Founder and CEO of Loop Industries, commented “Through our collaboration with Bormioli Pharma, we have developed an innovative pharmaceutical packaging solution manufactured from 100% recycled virgin quality Loop™ PET resin. This high - quality packaging alternative raises the bar for responsible solutions and helps set a new standard for sustainable packaging in the pharmaceutical industry.”



PLASTIC RAW MATERIALS

JJ Plastalloy Innovates Recycling with Masterbatches that detect Black Plastics



Leading masterbatch manufacturer, JJ Plastalloy, has created a new masterbatch for detecting black plastic during recycling. Black plastic article detectable masterbatches allow existing sorting technologies to detect black plastic articles. This addresses one of the most pressing problems facing the plastics recycling industry. Black plastics are undetectable by the near - infrared (NIR) optical sorters used in most recycling facilities. As a result, this waste often ends up in landfills rather than being recycled.

JJ Plastalloy's masterbatches contain a marker that makes black plastics visible to NIR sorters for the first time. The technology has been verified using the COTREP recycling test protocol. Plastics containing the

newly developed masterbatches can now be detected and sorted along with other plastic waste streams using standard NIR technology. This breakthrough will significantly increase recycling rates and promote more sustainable practices.

“At JJ Plastalloy, we strive to develop innovative solutions that reduce environmental impact,” says Shivam Bansal, Director. “The newly released black plastic article detectable masterbatches exemplify our commitment to investing in R&D that advances sustainability and creates a greener future,” he adds. JJ Plastalloy also offers a wide range of colour and additive masterbatches, as well as other speciality products for plastics manufacturers.

Kandui's Revolutionary Thermo-chromic Masterbatches: Colour - Changing Innovation for Fibres and Moulded Items

These masterbatches have an activation temperature, which helps toggle the end product's colour. This property is often utilised in the coding of fabrics, adding a security feature to the original branding.



Ashwin Agarwal, managing director, Kandui Industries, explained, “When a top textile customer asked our R&D team for a counterfeiting solution, after substantial deliberation, we came with the idea of producing the selvage of the fabric in such a manner that on the application of heat (ironing), its colour would change. The original colour would reappear at room temperature.”

The company took about a year to create the masterbatch. It faced a twofold challenge in the product's creation – tackling the heat sensitivity of pigments and achieving a smaller pigment particle size.

“As the thermo-chromic pigments available in the market are extremely heat - sensitive, the molecules get destroyed in the extrusion process. Hence, we thought of applying a heat-resistant coating on the pigments. This enables the preservation of the pigment properties up to a temperature of 260 - degree Celcius. The

pigment supplier helped us tackle the second challenge, making the particle size small enough to run in low denier applications,” said Agarwal.

Besides textile, the other application segment of the product includes moulded items such as toys. “This technology has become more popular in children's bottles, wherein refrigeration, the product changes its colour, creating a playful experience for kids,” he added.

The key sessions during the two-day online event include topics such as extending the shelf-life of packaging, automation and manufacturing innovations in food and beverage processing, eCommerce in the food processing industry, mitigating disruption in the supply chain with predictive analytics, and regulatory impediments and reforms for new product development among others.

The speakers for the event include Dr Rajesh Mache, chief scientist, food packaging technology and head technology transfer, CFTRI; Rushikesh Aravkar, associate director, Food and Drink Mintel Consumer Reports South APAC, and FSSAI directors P Muthumaran and Sagar Kurade among others. The event will see participation from top brands such as Marico, Amazon, Britannia, ITC, Mother Dairy, HUL, Parle Agro, Godrej Industries, Everest Food Products, MTR Foods, CavinKare, and Carlsberg India.

The virtual show is supported by organisations such as ASPA, SIES, IFCA, AFSTI – Mumbai chapter, and AIFPA among others.

SABIC Announces Final Investment Decision for the SABIC FUJIAN Petrochemical Complex



SABIC FUJIAN Petrochemicals Co. Ltd, a 51:49 joint venture between SABIC Industrial Investment Company (wholly owned by SABIC) and Fujian Fuhua Gulei Petrochemical Co., Ltd. (holding by Fujian Energy and Petrochemical Group) decided to build the Complex in Fujian's Gulei Industrial Park. With an estimated total investment of RMB 44.8 billion (USD 6.4 billion), it is another centerpiece of SABIC's investment footprint in China and by far the largest foreign investment in Fujian. The complex will consist of a mixed feed steam cracker, with an expected annual ethylene capacity up to 1.8 million tons, with a series of world-class downstream facilities, including ethylene glycol (EG), polyethylene (PE), polypropylene (PP), polycarbonate (PC), and several other units. The construction of the project targets to complete in 2026.

Abdulrahman Al-Fageeh, SABIC CEO said: “The FID is a significant milestone for SABIC's business expansion and development in China. The project aims to support our goal of diversifying our feedstock sources and establishing a

petrochemical manufacturing presence in Asia for a wide range of products, and the FID decision fully reflects SABIC's commitment to provide solutions to our customers and maximize shareholders value. Building on this, we will continue to capitalize on our partnerships to expand our footprint and continue to contribute to the targets of Saudi's Vision 2030

The construction and subsequent operation of the project is using nine of SABIC's leading technologies to meet our customers and markets evolving demand for high-end chemical products for applications in electrical and electronics, artificial intelligence, smartphones, telecommunications, healthcare, automobile and advanced materials.

The FID marks the second key milestone related to SABIC's joint ventures in recent years, following the start of commercial operation for a new polycarbonate plant at the SINOPEC SABIC Tianjin Petrochemical Co. Ltd. (SSTPC) joint venture in 2023. Building on the progress of these joint ventures, SABIC will continue to leverage its technology and innovation to provide more market-facing products for customers while helping to strengthen economic development within petrochemical industry.

Evonik Launches High-Performance Phosphate Methacrylate Visiomer® Hema - P 100

VISIOMER® HEMA-P is a polymerizable flame-retardant comprising a combination of a

PLASTIC RAW MATERIALS

phosphoric acid and methacrylate moiety. The phosphate function is responsible for the flame - retardant properties.



The methacrylate group readily polymerizes and leads to a non - migrating agent. A single - flame source test was conducted on acrylic polymer emulsions confirming the flame-retardant properties of VISIOMER® HEMA-P 70M containing emulsions. It is particularly well suited for transparent applications, such as WB coatings for wood, paper and textile applications. ADHESION PROMOTION

VISIOMER® HEMA-P is a well-known adhesion promoter in applications like adhesives or coating resins. As functional comonomers, VISIOMER® HEMA-P products enable superior adhesion to polar surfaces like minerals, glass, and metals.

Corrosion Protection

Corrosion protection, an important requirement for coatings, is a challenge to maintain in waterborne systems. Our studies on acrylic emulsions with 7 wt% of VISIOMER® HEMA-P 70M demonstrate enhanced corrosion resistance compared to resins without any anti - corrosion agent.

Hema-p Products For Composite

Flame Retardant Properties

VISIOMER® HEMA-P products can be used as co - reactive diluent in UPR or VE composite resins. Its phosphate moiety is responsible for its flame - retardant properties. Additionally, being a methacrylate monomer it is polymerizable and therefore a non - migrating flame retardant additive.

VISIOMER® HEMA-P products can be used to formulate non-halogenic and filler - free flame-retardant composite materials.

Improved Resin - glass Fiber Adhesion

As an adhesion promoter, VISIOMER® HEMA-P improves the adhesion of the composite matrix to the glass fibers and results in an increased ILSS (Interlaminar Shear Strength). It helps to improve the strength - to - weight - ratio in glass - fiber reinforced composites. We look forward to supporting you in finding the best solution for your next challenge in polymer design.

Japan: Scientists Develop Self - healing, Stronger and Partially Biodegradable Plastic



Scientists in Japan have developed a new version of plastic which is not just stronger and stretchier

than the traditional version but also partially biodegradable. Besides, it can remember complex shapes which can be restored once it is heated. Sustainable plastics

Scientists worldwide for long have been pursuing the goal of creating an eco - friendly alternative to traditional plastic due to its devastating impact on the environment.

Now, researchers at the University of Tokyo have successfully created "sustainable plastic," which is based on an epoxy resin vitrimer.

What are Vitrimers?

Vitrimers represent a relatively recent category of plastics known for their impressive strength at low temperatures, while also possessing the unique ability to be reshaped numerous times when exposed to higher temperatures. Nonetheless, they do have a notable drawback - extreme brittleness, as they cannot be stretched far before breaking.

To address this issue, researchers introduced a molecule called polyrotaxane into the plastic synthesis process, resulting in a novel plastic variant they've dubbed VPR, an abbreviation for "vitrimer incorporated with polyrotaxane."

CAI Performance Additives Launches Lubricant Additives for Polyester Applications

CAI Performance Additives announced the launch of ST-PA229C™ series of lubricant additives for polyester applications. ST-PA229C™ outperforms traditional lubricants such as CBT, EBS, silicone, Montan wax, and others in terms of comprehensive performance.



PLASTIC MACHINERY

Rajoo Continues its Substantial Investment in Research and Development



Rajoo continues its substantial investment in research and development, ensuring that you stay at the forefront of your industry.

Addressing sustainability at its core, Rajoo Engineers achieves a significant milestone by becoming the first in Asia, and indeed one of the few globally, to materialize the ambitious goal of creating a comprehensive solution system capable of producing recyclable barrier films. Yes! Now, you can manufacture barrier films with all the necessary properties, while being confident that your films no longer contribute to environmental harm.

You will have the chance to explore cutting - edge advancements, including the rPET sheetline extrusion dryerless technology, multistation thermoformer, EVA

sheet extrusion system for renewable energy, and extrusion coating and lamination line during PLASTFOCUS 2024. These remarkable advancements will share the spotlight with some of Rajoo Bausano's finest engineered products:

- Twin screw technology for UPVC/CPVC Pipes, O-PVC Pipes, PVC compounding, and WPC boards/profiles.
- Double exit die head technology for CPVC pipes.
- CSD die head technology for HDPE/PPR pipes.
- Single screw technology for HDPE/PPR pipes, PP-Silent and PEX pipes, and polyolefin profiles.

Feeder Screws in Polymer Compounding

The process of polymer compounding employs two methods i.e., volumetric and gravimetric feeding for achieving the accurate and efficient transfer of raw materials into the extruder while compounding. Volumetric feeding involves the measurement of materials based on their volume, typically using devices such as



screw feeders or rotary valves. This method is suitable for bulk materials with consistent properties, but may prove to be less precise when dealing with variations in material density. On the other hand, gravimetric feeding relies on measuring the mass of materials, offering greater accuracy by accounting for density fluctuations.

Gravimetric feeders, employing load cells or weighing systems, continuously monitor and adjust the material flow to maintain precise proportions in the compounding process. The choice between volumetric and gravimetric feeding depends on the specific requirements of the polymer compounding application, with gravimetric systems often preferred for applications demanding higher precision and consistency in material ratios.

In the delicate balance of material handling and conveying systems during polymer compounding, feeders hold immense importance. To exhibit the characteristics for

which the polymer is being tailored for, it is important for the compounding extruder to precisely meter the required quantity of raw materials as given in the material recipe chart on a continuous basis. Of course, the properties are still dependent upon proper melt mixing inside the screw barrel assembly with a variety of factors involved such as: melt and zone temperatures, melt pressure, torque, etc. among others. In feeders, a very important component i.e., feeder screws play a pivotal role in the seamless movement of diverse substances such as minerals, polymers, glass, etc in various forms such as powders, granules, resin, etc. In this blog, we will delve into the feeder screw designs, dissecting the intricacies of spiral, concave, and auger configurations, unravelling their unique characteristics, and shedding light on the myriad applications that make them indispensable.

1. Spiral Feeder Screws: The spiral feeder screw is characterized by a continuous helical flight wrapped around a central shaft. The passageway is unobstructed for the ingredient to move unrestrictedly along the screw flights. The reduced surface area minimizes ingredient adhesion, altering the volumetric geometry of the screw. Material transfer occurs with minimal shear. However, a drawback is that aerated ingredients tend to overflow past the screw flights more easily. These screws are versatile and are used in conveyor systems, feeders, and material handling setups where horizontal or inclined transport of bulk materials in pellets or granule shapes is important.

2. Concave Feeder Twin Screws: The concave feeder twin screw introduces a unique twist with its trough or channel, specifically designed to cater to cohesive or sticky materials. Twin concave screws, co-rotating and self-wiping, minimize the adverse impact of adhesive powders as the material flows around their flights. These solid screws feature a lower volume in their flights compared to spiral and blade screws, resulting in high shear, particularly in the short screw tube designed to mitigate negative effects. Ideally suitable for powders with feed rates below 5 ft³/hr, twin concave screws have a wider cross-section than single screws, reducing the risk of bridging during the transition. Moreover, their higher screw speeds, facilitated by a larger inlet and lower flight volume, effectively diminish the drawbacks due to a pulsating flow.

3. Auger Feeder Screws: Auger feeder screws take on a more nuanced role with their tapered or conical shape, featuring a larger diameter at the material inlet and a smaller diameter at the discharge end. Renowned for precision, these screws find their niche in applications demanding controlled volumetric feeding and metering. Twin augers are employed for pellets and pellets / powder mixture whereas single auger screws are used for poorly flowing powders. The selection of a feeder screw for a particular application is no random decision.

Careful consideration of material properties, flowability, abrasiveness, cohesion, and throughput requirements is

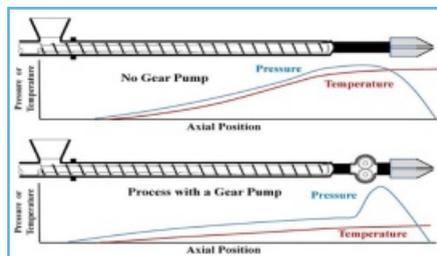
imperative. The art of proper design and sizing is the key to unlocking the potential of these screws, ensuring efficient material handling, reliable feeding, and minimizing wear on equipment. The journey does not end with design considerations. The construction material of the feeder screw is a critical factor, considering the nature of the handled material and the environmental conditions. Durability and corrosion resistance become paramount for longevity and optimal performance.

In the context of material handling, feeder screws, whether they are spiral, concave, or auger in design, emerge as indispensable components. Other factors such as agitators (flexible walled / external paddle or internally stirred) and screw trough also have their roles to play in furthering positive feeder performance. Understanding their unique features and applications empowers compounding industries to make informed decisions, ensuring not only seamless material transport but also achieving efficiency in compounding operations. As we navigate the expansive terrain of feeder screws, it becomes evident that choosing the right design is not just a technical consideration; it's the key to unlocking their full potential in diverse industrial applications.

Is a Gear Pump Right for Your Single - Screw Operation

As with everything else, there are pros and cons, but more of the former. They provide processors

higher rates while decreasing the temperature of the extrudate while enabling downgauging.



A gear pump positioned between an extruder and downstream equipment can improve the performance of a line. The advantages include the mitigation of pressure surges and as a result flow surges from the extruder; plus a decrease in the discharge temperature by generating part of the pressure required for the die by the pump, which reduces resin consumption and enables rate increases.

For example, if the extruder is operating with low - frequency discharge pressure oscillations, the gear pump and control algorithm will provide a nearly constant outlet pressure and flow rate to the downstream equipment such as a die. Stable operations with a gear pump will enable plant personnel to operate at the lower thickness specification limits for sheets or films, and thus reduce the resin consumption per unit of product.

If a gear pump is contributing to the generation of the discharge pressure for the downstream equipment for a single - stage extruder, the metering section of the screw will operate with a higher specific rate compared to a process without a pump. Extruders that operate at a higher specific rate will generally operate at a lower discharge temperature. A gear pump used with a two -

stage, vented screw can enable higher operating rates while not causing material to flow out the vent port. Gear pump-assisted extrusion does have some disadvantages, including higher capital costs and operational complexity for the line.

The increased complexity is the control of the process. Here, the rate is set by the speed of the gear pump, as shown by Figure 1. Gear pumps are designed to operate at a specific volumetric rate or $\text{cm}^3/(\text{hr}/\text{rpm})$. The specific volumetric rate or volume per revolution is a design specification for the pump. Setting the speed of the pump and knowing the melt density of the resin sets the rate for the line. To maintain the same rate from the extruder, the controller on the pump adjusts the screw speed to maintain a set point pressure on the inlet side of the pump. The inlet pressure is often referred to as the suction pressure. If the inlet pressure becomes less than the set point pressure, the controller will increase the screw speed. Likewise, if the pressure becomes too high, the controller will decrease the screw speed. For properly designed systems, the screw speed will only have relatively small changes to compensate for slight changes in the pump inlet pressure. But for extrusion processes that are not operating properly and show severe flow surging, the screw speed will have large variations. The discharge pressure from the pump is higher than the inlet pressure and is controlled by the pressure requirements of the downstream equipment.

Gear pumps operate by metering molten resin from the low-pressure inlet side of the pump, and then

discharging at a higher pressure to the downstream equipment, as shown by the schematic in Figure 2. The inlet pressure is high enough to force resin in between the gear teeth. As the gears are rotated, the material between the teeth is trapped between the teeth and the body of the pump. At the discharge side of the pump, the intermeshing gears displace the resin and force it out through the discharge flange.

Starlinger: Closed - Loop Technology for Woven PP Bags



Sustainability in the Bag

A closed loop for bags made of woven polypropylene (PP) tapes is at the core of Starlinger's 'Circular Packaging' concept. For processing post - consumer recycled PP, Starlinger developed the eqoCLEAN filter module for their PP tape extrusion lines. It consists of a SPB single-piston power-backflush filter, a melt pump and a second filter unit called HS 2.0 filter and enables the inclusion of high shares of post-consumer recycled PP as well as of CaCO_3 . The SPB filter has four filter screen cavities and processes polyolefins such as PP or PE.

The regular automatic high-pressure backflushing procedure cleans the filter screens while the line operates at full production

speed, increasing filter screen lifetime and reducing machine downtime significantly. With this technology, it is possible to establish a closed loop for industrial plastic packaging such as woven plastic bags and FIBCs.

Storopack's Mini Touch Machine Suitable for Diverse Film Types



- Storopack's new AIRplus Mini Touch machine is a versatile air pillow system capable of processing different types of film up to 400 mm in width, providing flexibility in packaging applications.
- The AIRplus Mini Touch features a user-friendly touch display that can be positioned on the front or back of the machine.
- The intuitive interface allows users to configure the machine quickly, offering three modes to choose from: manual, length-dependent, and automatic.

'Storopack's new AIRplus Mini Touch machine is suitable for different types of film and offers fast, intuitive operation thanks to its touch display, which can be positioned on the front or back. Storopack's AIRplus Mini Touch is an all-around system and can process different types of film up to 400 mm in width. The air pillow system comes with a

touch display, which can be positioned on the front or back of the machine. Thanks to the display's intuitive user interface, users can configure the machine with ease in no time. There are three modes to choose from: manual, length-dependent, and automatic. The machine also has a preinstalled library, allowing users to choose parameters for individual film types.

AIRplus Mini Touch is compatible with all COMFORT.PROTECT modules from Storopack. Convenient AIRplus Mini Touch offers a touch display with adjustable position, which is a benefit when it comes to machine configuration and servicing. Even if the machine is integrated and less accessible on all sides, the display can be positioned for easy access.

Relationship of Cooling Time in Plastics Injection Molding With HDT / VSP



The importance of Heat Deflection Temperature (HDT) and Vicat Softening Point (VSP) as crucial thermomechanical properties can hardly be disregarded in the complex realm of plastic processing. Unravelling their effect on the cooling characteristics during plastics processing is key to achieving optimal performance and maintaining dimensional stability. In this blog, we'll explore how HDT and VSP relate with

the cooling process, and help in shaping plastics from the moment they are melted to the final, solid state during the injection molding process. HDT is a crucial parameter that measures the ability of a plastic material to withstand a specified load at elevated temperatures without undergoing deformation. It is often a decisive factor in applications where dimensional stability under heat is paramount. HDT is determined by subjecting a plastic specimen to a load while gradually raising the temperature until the material deforms in a specified quantity.

HDT is the temperature at which a given polymer test bar will be bent by 0.25 mm under a given load. It can be measured with either method A (1.80 MPa), B (0.45 MPa), or C (8.00 MPa) as per ISO 75. Furthermore, VSP is another critical temperature-related property that characterizes a plastic material's resistance to deformation under a specific load. Unlike HDT, VSP is determined by observing the penetration of a needle into the plastic specimen at an increasing temperature. VST is defined as a temperature in °C at which a circular indenter of 1 sq.mm flat cross section area penetrates in a sample of minimum 3 mm thickness immersed in oil bath heated at 50 +/-5°C per hour heating rate at 5 kg load, by 1 mm. If any of these parameters are changed, VST results will not be reliable. Let us move on to the process of injection molding, a widely used manufacturing process in which plastic materials are melted, injected into a mold, and then cooled and solidified to produce a wide range of plastic parts and products. This process is commonly employed for mass production of identical items, making it an efficient and cost-

effective method for creating various plastic components. An injection molding cycle consists of melting the material in the screw barrel assembly, injecting it into the mold, holding the pressure, cooling / solidification and ejection of the article while the machine gets itself ready for the next cycle to begin. The cooling time in the cycle is often the highest of all the steps and may well go up to 80-85% (depending of a lot of factors) of the injection molding cycle.

Let's revisit the topic of the relevance of HDT and VSP for cooling during injection molding. The variable "T" in the equation above represents the surface temperatures of the melt, mold, and ejected part, denoted by the alphabet. It is essential to acknowledge that the melt temperature is the point at which the material transitions from a solid to a liquid state. This distinction can be challenging to articulate for amorphous polymers, while it tends to be more straightforward for semi-crystalline ones. Moreover, the mold is maintained at a temperature where the melt temperatures are high.

This temperature regulation contributes to achieving the best surface finish replication of the cavity surface. The third value corresponds to the temperature during ejection, which aligns with the Heat Deflection Temperature (HDT) of the material. From a manufacturing perspective, it is crucial for the ejection temperature to be below the HDT. Therefore, a 20% buffer in cooling time is incorporated into the calculated value. This addition is necessary to ensure that the part doesn't distort under the action of the ejector assembly,

wherein the pin might exert force on the part in a balanced or unbalanced manner, potentially lacking support at one end. In cases where consumers observe deep pin marks or experience pins tearing components during the manufacturing process, it is advisable to reassess the values and engage with the raw material provider, especially if certain parameters are missing.

This proactive approach ensures a more accurate understanding of the molding conditions and aids in addressing potential issues related to cooling, ejection, and part distortion. The understanding of these thermomechanical properties intricately shape the plastic behavior from molten to solid states, exerting a profound influence on the cooling process during injection molding. Both HDT and VSP, help understand the resistance of plastics to deformation under a specific load and provide insights into its behavior during cooling and solidification. As we get into the injection molding process, cooling time emerges as pivotal, with calculations influenced by HDT and VSP ensuring distortion-free solidification during ejection.

This meticulous approach, incorporating a buffer, optimizes the cooling phase, enhancing the overall efficiency of injection molding. The comprehensive mathematical formula considers parameters such as part thickness, thermal diffusivity, and surface temperatures, empowering manufacturers to produce high - quality plastic components with precision. This informed understanding enables proactive mitigation of potential issues related to cooling, ejection, and part distortion, fostering

excellence in injection molding practices within the dynamic landscape of plastic manufacturing.

UFlex Shows Advanced Machine Tech at Plastfocus 2024



Multinational Flexible packaging and solutions company UFlex is featuring its advanced machine technology in PlastFocus 2024 at Yashobhoomi (IICC), Dwarka, New Delhi, from 1-5 February 2024. Recognized as an ideal platform for the plastics and packaging sector, Plastfocus 2024 will feature UFlex; state-of-the-art machine technology, primed to redefine industry standards.

At Stand A51, Hall 1, UFlex is highlighting its CI flexo and Combi Lamination machines.

CI flexo machines: UFlex presents its CI flexo machines, including the first - ever made - in - India gearless central impression flexo printing machines, introduced in 2017. Building on this legacy, UFlex has ventured into manufacturing a central impression, up to 10 colors, 800-1600mm web width CI flexo printing press.

This collaboration with Italy-based Comiflex has resulted in a machine that offers a printing speed of upto 400metres/minute. The system is equipped with modern connectivity to UFlex's

service team for remote monitoring, diagnostics and troubleshooting ensuring real time assistance to clients.

Mixing in Plastic Extrusion



The importance of extrusion compounding in polymer processing can be underscored from the fact that the efficacy of the final product hinges on the precision of mixing during the extrusion process. The dry mixing of polymer materials and additives, a key process among various nuances involved, demands a meticulous approach requiring a uniform dispersion of additives throughout the base polymer(s). This involves overcoming the challenges posed by certain solids additives, such as mineral / glass / metal fillers, which resist shearing due to their non - melting or non - softening nature. Single - screw extruders, commonly employed in the industry, exhibit a plug-like flow, emphasizing the significance of effective dry mixing principles. The laminar flow of polymers in single screws, coupled with predominant down-channel shear distribution, limits axial redistributive mixing. While aggressive localized mixing occurs within screw channels during and after melting, achieving large-scale redistributive effects remains a challenge, especially for additives that do not undergo a phase change. The behavior of a

twin-screw compounding extruder differs significantly from that of a single-screw extruder, offering advantages in addressing the challenges associated with mixing of polymer materials and additives.

Twin-screw extruders are designed with two screws that intermesh along their length, creating a continuous flow of material. This design inherently overcomes the plug-like flow observed in many single - screw extruders. The intermeshing screws facilitate efficient conveying, dispersive mixing, and distributive mixing throughout the extruder. Unlike the predominant down-channel shear distribution seen in single-screw extruders, twin-screw extruders provide enhanced axial mixing capabilities. The screws interpenetrate and counter-rotate, promoting thorough mixing in both the axial and radial directions. This feature proves beneficial in achieving large-scale redistributive effects, making twin - screw extruders more adept at handling additives that resist shearing. Twin - screw extruders offer multiple shearing zones, highlighted by the mixing elements present along the length of the screws. These zones contribute to intensive mixing, especially during the melting process. The increased opportunities for shearing and mixing enable effective dispersion of additives, including those that do not undergo a phase change.

The versatility of twin-screw extruders allows for various screw configurations, such as co-rotating and counter - rotating screws, and different element designs. Processors can tailor these configurations to optimize mixing based on the specific

characteristics of the materials being compounded. The inherent mixing capabilities of twin-screw extruders make them well-suited for handling non-melting additives. The screws' ability to impart both dispersive and distributive mixing ensures a more homogenous blend, even with materials that resist deformation.

A frequently underestimated facet of extrusion compounding pertains to the intricacies of the feeding mechanism, a pivotal element influencing the commencement of effective dry mixing. The solids-feeding region spans from the hopper to multiple flights down the screw, where polymer and additives mix to form a densely compacted mass. This initial phase is notably susceptible to challenges such as segregation and de-mixing, underscoring the criticality of a meticulous selection and optimization process for the feeding mechanism to ensure seamless and successful extrusion compounding. The effectiveness of screw design in achieving substantial redistribution of non-melting additives may be constrained despite the existence of various screw geometries and mixer designs. Single screws, in particular, often encounter challenges in delivering the desired macro mixing due to limitations in axial redistributive capabilities. Consequently, processors are urged to carefully assess screw design, considering the specific characteristics of the materials being processed. Simultaneously, the risks of de-mixing or separation arise from any movement in the polymer-additive mix, be it through rolling, sliding, vibrating, or flowing. To mitigate these segregation risks, selecting an appropriate feeding mechanism becomes crucial,

aiming to minimize movement and ensuring a uniform and steady flow of materials into the extruder for optimal mixing performance.

Achieving optimal dry mixing necessitates a proactive approach in addressing challenges associated with non-melting additives. Processors must be cognizant that the initial mixing is not necessarily the mix that reaches the screw. Key considerations include proximity to screw flight entry, feeding mechanism design and assessment for segregation. Performing mixing as close as possible to the screw flight entry mitigates the risks of segregation and de-mixing in the solids-transport system. Furthermore, the design of hoppers and piping, along with alterations in particle characteristics, can significantly impact segregation. Bulk-handling equipment, influenced by particle density, shape, and size, should be selected and configured to minimize segregation risks. Conducting bench tests, such as shaking a can with the mix and assessing segregation upon pouring, provides valuable insights into the potential challenges of the chosen mix.

The precision of mixing in extrusion compounding is paramount for achieving high-quality polymer products. Dry mixing, a crucial step, demands thorough attention, especially when dealing with non-melting solids additives. Single-screw extruders, common in the industry, face challenges in achieving effective dry mixing, emphasizing the need for improved principles. Twin-screw compounding extruders provide a dynamic solution with intermeshing

screws, enhanced axial mixing, and multiple shearing zones, making them adept at handling additives resistant to shearing. The intricacies of the feeding mechanism must not be overlooked, as the solids-feeding region is susceptible to segregation and de-mixing. Careful selection and optimization of the feeding mechanism, along with assessing screw design effectiveness, are crucial for optimal mixing performance. Achieving optimal dry mixing requires a proactive approach, considering proximity to the screw flight entry, feeding mechanism design, and segregation assessment. Processors can enhance their extrusion compounding processes by adopting an informed and proactive approach, ensuring the production of homogeneous blends and high-quality final products.

Hot Runner System for Commodity Resins



Mold-Masters' EcoONE series hot runner system is optimized for processing commodity resins for simple, cost-sensitive applications.

Mold-Masters has launched the EcoONE series hot runner system for processing commodity resins for cost-sensitive applications such as consumer goods, small home appliances, basic automotive components, electronic peripherals/accessories and more.

The EcoONE series system offers a wide range of standard nozzle options with a nozzle shot range capacity of less than 5 g up to 3,500 g, in lengths ranging from 50 to 300 mm. There are five standard non-valved and five standard valved gating options. Manifolds are available in one to eight drop configurations with custom pitch options. Currently, it is available as a manifold system only and is expected to be shipped and delivered in three to four weeks.

The EcoONE series system is also field serviceable to minimize downtime and operating costs. The system's nozzles use replaceable brass heater sleeves while manifolds incorporate push-in heater elements. As these are standard components, inventory is on hand and available through the Mold-Masters Mastercare global service network. System components are covered for up to two years under the product's global warranty.

Movacolor Launches New MDS Volumetric Feeder for Optimised Material Handling



- Movacolor introduces its MDS Volumetric Feeder, an additional solution to the company's modular dosing and blending concept.

- Its innovation targets plastic manufacturers who are looking to optimise their material handling and increase their operator efficiency.
- The MDS Volumetric Feeder allows for reliable dosing, with the capability to handle a wide variety of materials, from granular to microgranulate and free-flowing powder up to 70 degrees Celsius.

Movacolor launches the all new MDS Volumetric Feeder, an additional solution to her modular dosing and blending concept. This innovative feeder sets the standard in volumetric dosing. It targets plastic manufacturers in search of a cost-effective solution to optimise their material handling and increase their operator efficiency.

Movacolor's first volumetric unit was introduced in 1997 and has proven its worth in a variety of applications. Over the past decades, Movacolor engineers have continuously improved its functionality to ensure it meets the changing industry needs. Now, the company has said it's time for the next phase of innovation: the all new MDS Volumetric Feeder.

This new volumetric dosing solution - backed by the tagline 'Volumetric Dosing Done Right' - is developed for plastic manufacturers that require a high performing dosing unit at a cost-effective price.

Klaas Talsma, product manager at Movacolor stated: "We believe this product will become the new standard for volumetric feeding across the plastics industry. With its new intuitive touch screen in combination with

the latest controlling software technology, we have developed a unique solution for this market segment."

The MDS Volumetric Feeder allows for reliable dosing, with the capability to handle a wide variety of materials, from granular to microgranulate and free-flowing powder up to 70 degrees Celsius. It proves its value in easy operation, minimising overdosing and as a result saving on material and process costs. The MDS Volumetric Feeder comes with an efficient and reliable stepper motor, a rigid dosing house, a stainless-steel hopper and a robust neckpiece. Optimal blend homogeneity is accomplished through inline dosing using a centralised insert within the neckpiece.

All the dosing tools from Movacolor's MDS Balance product range will also be available for the MDS Volumetric Feeder, providing customers with the flexibility to choose the most suitable dosing tool for their specific process. The stepper motor and selection of dosing tools offer an RPM range from 0.1 to 200 in 0.1 RPM increments and the capacity to dose up to 72 kg/h.

Thanks to its intuitive design, this dosing solution allows a swift 60-second cleaning and material change through a discharge valve and easy motor, hopper and dosing tool release. As a result, downtime and changeover time can be minimised.

The VoluTouch

The MDS Volumetric Feeder includes a dedicated newly developed 4.3" VoluTouch controller. This capacitive

touchscreen controller can manage up to two units and is equipped with intuitive functionalities such as easy recipe management. A wireless web interface allows for data and recipe transfer. The VoluTouch controller can seamlessly connect with an extruder's tacho signal, initiate the injection moulding machine in timer mode, and features a relay mode. This ensures smooth integration with any production line.

The MDS Volumetric Feeder is part of Movacolor's modular dosing concept and can be combined with other units and/or specifically tailored to fit the requirements of your production process.

Availability and Delivery Time

The availability of Movacolor's new MDS Volumetric Feeder will vary by region. The product has been launched in the Asia-Pacific region on January 25, 2024 and will be introduced to the North - and Latin American market on May 6, 2024 during the NPE exhibition in Orlando, FL. The EMEA launch will follow shortly after. The delivery time will be approximately 2-3 weeks from the date of purchase.

Niigata Lowest - priced Japanese Injection Molding Machine



- Available sizes: 55 tons to 500 tons
- Easy - to - learn controller

- Low Pressure Molding - Standard
- Scientific Molding - Standard
- Remote Monitoring – Standard

Achieve greater productivity with fewer machines. Niigata all-electric injection molding machines dramatically increase your output compared to even the most efficient servo hydraulic machines. All electrics are amazingly fast and quiet. Your cycle times shrink 10%, 20%, 30% and more.

You have less scrap. Niigata's are ready for full production after the first cycle, so there is less regrind, and you aren't losing cycles, and time, getting into full production.

The incredible precision of Niigata's digital electric injection molding machines ensures perfect parts cycle after cycle. Niigata's repeatability helps you reduce waste and manufacture more in a fraction of the time.

Niigata makes only all-electric injection molding machines, and this is the 8th generation of all-electric machines, available in multiple sizes from 55-500 tons.

MD - Series: 5-Year Warranty

Niigata Machine Techno USA Inc. warrants new MD-Series machines to be free from defects in materials and workmanship.

3D Printer Manufacturer Now Offers Bio - Based, Recyclable Printing Materials

This collaboration gives customers a highly efficient process that eliminates production waste,



minimizes energy consumption and enables flexible, localized, on-demand production with a smaller environmental footprint.

The Industry, a Finnish manufacturer of large-scale 3D printers, is now offering the patented bio-based and recyclable Sulapac materials for its customers. This partnership is said to empower businesses to make a positive impact on the environment while boosting efficiency and exceeding customer expectations.

The collaboration between the Helsinki-based material innovation company Sulapac and the Swedish 3D printing expert The Industry opens up new avenues for circular economy and climate action. It brings together cutting - edge expertise in biomaterial development and industrial engineering with shared values of innovation, sustainability and quality

Manufacturing with The Industry's next-generation 3D printers is a highly efficient process that eliminates production waste, minimizes energy consumption and enables flexible, localized, on-demand production. Choosing sustainable Sulapac as the printing material over conventional plastic lowers customers' environmental footprint even further.

Made of biodegradable biopolymers and sustainable fillers such as wood from industrial sidestreams,

Sulapac materials have a low carbon footprint. They are safe for people and the planet throughout the life cycle with zero persistent microplastics or toxic substances left behind. Also, Sulapac materials are recyclable by design and can be made with recycled content.

In addition to requirements for environmental responsibility, the materials selected for The Industry's material library must fulfill strictly defined technical criteria. Sulapac Flow 1.7, a beautiful wood- composite, and Sulapac Universal Heat 30, a bio-based material with good heat endurance and ability to stand high pressure, have performed extremely well in comprehensive testing conducted by The Industry, both in terms of mechanical properties and processability.

“We are very proud of our partnership with Sulapac due to the exceptional quality of their materials and their seamless compatibility with our MAGNUM printer,” says Jonas Carlsson, CEO of The Industry Sweden. “As we always strive to give the best to our customers. We truly believe that materials like Sulapac will have a strong positive impact on sustainable global production.

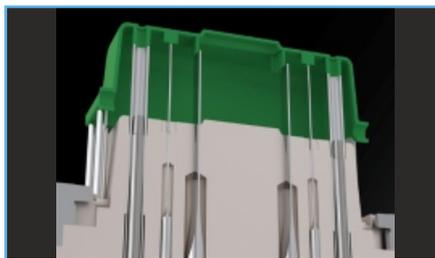
“In our experience, modern businesses are constantly searching for new materials that can convey a premium look and feel,” Carlsson adds. “After running multiple tests on our MAGNUM printer, we can say without a doubt that Sulapac managed to live up to the expectations and we can only foresee a positive increase in demand for their materials across various industries working with additive manufacturing technologies.”

Sulapac Flow 1.7 and Universal Heat 30, both food-contact compliant and industrially compostable certified, are now among the recommended feedstock materials for MAGNUM printers, The Industry's spearhead product. Companies can also order products printed from Sulapac.

Sulapac can be used in 3D printed furniture, prototypes, machine parts and design items, and more. Sulapac Universal Heat finds additional applications, including industrial molds for die casting, cement casting, die molding and pressure molding.

“Thanks to the cooperation with The Industry, we have started to discover the variety of possibilities for Sulapac materials in 3D printing,” says Emmi Randell, Sulapac head of business development. “Their technical fit and unparalleled sustainability features combined with the many benefits of 3D printing offer endless opportunities for companies willing to lead the way towards a cleaner future.”

Ejector Pin Selection Guide



A review of materials, treatments and coatings to help determine the proper pins for optimized plastic part ejection. The most frequently used component of a mold's ejection system is the ejector pin, which includes variations such as sleeves and blades. Part size,

draft angle, shape complexity, vertical wall height and the type of plastic being molded all contribute to determining the appropriate pin type, location and quantity. Due to extensive use, ejector pins are sometimes considered a commodity item — something that is indistinguishable between suppliers of the same types of pins. However, ejector pins are not truly commodity items because there is no “one pin type fits all” solution.

To help guide your selection process among the various types available, this article reviews the materials, treatments and coatings used to produce ejector pins and best practices for using them.

Ejector Pin Basics

To perform optimally, ejector pins must possess certain fundamental characteristics, including a high degree of strength, toughness and wear resistance, and the ability to retain edges. More application-specific characteristics include hot hardness, which is the material's ability to retain hardness at elevated temperatures, and varying degrees of corrosion resistance and lubricity, depending upon the type of molding application.

Geometric accuracy is another fundamental requirement for a pin's performance and life. Ejector pins must be manufactured to tight tolerances and specifications. Roundness, straightness and high-quality surface finishes are all critical to function or premature flashing and galling, for example, may result.

It's the combination of material, treatments and coating that make a pin suitable for a given application. However, enhancing

one or more of these characteristics may require compromising the effectiveness of others. Leading ejector pin manufacturers work continuously to find the best combination of characteristics that will provide higher pin performance in answer to customers' needs.

Material Benefits

Becoming familiar with the materials used for manufacturing ejector pins and their properties will help mold designers and moldmakers make better choices. Here are some of the most used materials and their qualities.

- **H13:** A chromium-molybdenum hot work tool steel offering an excellent combination of strength and toughness. Its hot hardness and thermal shock resistance values are the highest among the various materials used. Hardness values can reach 54 HRC, which is slightly lower than some other through-hardened steels. However, the lack of wear and corrosion resistance is overcome by the addition of surface treatments. Due to its unique combination of required properties, this is probably one of the most widely used materials for ejector pins globally.
- **Through - hardened, cold-work:** Ejector pins, blades and sleeves are also manufactured from O1, A2 and some other high-carbon cold-work tool steels. They are through-hardened to around 60 HRC, offering good wear resistance and making them suitable for molding commodity plastics and various materials that do not require high mold temperatures.

- **Through - hardened, high - temperature:** Belonging to the high-speed steel (HSS) category, M2 steel offers excellent strength with medium toughness. Like H13, it has high hot hardness and thermal shock resistance. M2 steel is through-hardened and can achieve up to 64 HRC, giving it excellent wear resistance. Another quality is its ability to retain sharp edges.
- **Stainless steel:** When molding extremely corrosive materials, stainless steel ejector pins are a viable option. Through-hardened, their values can reach between 50 and 60 HRC, depending on the grade. To achieve high hardness and wear resistance, martensitic grades are typically used, and it should be noted that they are not ranked the highest within the stainless steel family for their corrosion resistance. However, they are better suited for use as ejector pins due to their combined qualities of strength, toughness and hardness.
- **Copper alloys:** Copper alloys are primarily used for making core pins. Under some extreme conditions, when fast heat transfer becomes a priority, they are used for making ejector pins, too. Both beryllium-copper and beryllium-free grades (for medical use) may be available. Copper alloy material has its limitations due to its softness and lower strength.

Mold designers have an array of options for ejecting parts, including (shown left to right) through-hardened H13 nitrided pins, through - hardened H13 step pins, H13 nitrided ejector sleeves, A2 through - hardened, thin-wall ejector sleeves with an

electroless nickel coating, through-hardened ejector blades, M2 steel through - hardened ejector pins, through-hardened H13 ejector pin with a chrome surface treatment and through-hardened H13 ejector pins with black nitriding.

Ejector Pin Choices

Understanding ejector pin characteristics and material types provides a good foundation for what to use in a mold. Still, there is more to know or to be confused by, given the many options suppliers offer today. Here is a collection of commonly available ejector pin products with noted composition and advantages.

- **H13 through - hardened and nitrided pins:** These pins are typically available with core hardness in the range of 48-55 HRC and surface hardness of 65-74 HRC. Ion nitriding is one of the commonly known surface treatments. This pin type is universal and used for both high- and low-temperature applications. It has a high operating temperature, close to 1112° F [600°C], making it suitable for use in metal injection molding (MIM) and die - casting dies as well. It should be noted that when machining pins that are nitrided, be careful to avoid microchipping. Grinding and EDM are the preferred processes.
- **Through-hardened, cold-work steel pins:** Offering good wear resistance, this steel pin type is available mostly in metric sizes. They are ideal for applications with low - to - medium mold temperatures. The pins with no additional coating or treatment are an economical option,

offering good performance and life. Remember that pins made from these steels start to anneal or soften with exposure to high temperatures.

- **High-hard M2 steel pins:** These versatile pins are typically offered with no additional coating or treatment, yet they are a high - performing and durable option for molding resins of all types. The high hot hardness of steel enables use in cold as well as hot applications. Their ability to retain sharp edges ensures prolonged, flash-free molding in high-precision molds such as those for connectors. Due to the pins' high strength, smaller diameters or sizes are possible, making them suitable for molding miniature parts. Equally hard from the core to the surface, these pins do double duty as core pins in combination with sleeve ejectors.
- **Armor- or chrome-plated H13 pins:** The application of chrome boosts the surface hardness of H13 pins to around 70 HRC. Applied very thinly yet dense in its composition, the coating/plating offers excellent wear resistance along with some improvement in corrosion resistance. The coefficient of friction is very low, at around 0.20 to 0.25, which makes the pin highly durable. All of these qualities make the plated H13 pins a good option for high-production molds and cleanroom environments. Note that the coating may have a lower operating temperature than the core H13 material. For example, one such pin type has an approximate operating temperature of 842°F [450°C]. Also, the coating may not be

appropriate for molding PVC. As plating processes may vary among suppliers, it is best to check these factors for suitability.

- DLC-coated pins:** Diamond-like carbon (DLC)-coated pins are ideal candidates for cleanroom and medical applications as they can be run without lubrication. Usually made from cold - work steel, they are through - hardened to around 60 HRC. The coating offers excellent wear resistance and is anti-adhesive, with a very low coefficient of friction of 0.1 to 0.15. Operating temperatures can be as high as 662°F [350°C]. Also, DLC pins have a surface hardness of around 3,000 HV, which far exceeds any other pin type discussed in this article. All of these qualities make this pin a high performer, offering excellent durability.
- Stainless steel pins:** These are an optimum choice for molding highly corrosive materials such as PVC. They are also well suited to medical and other cleanroom applications. Grade selection varies among suppliers, so evaluate other properties to help choose the right one for the application at hand. If used in high - temperature applications, check with the manufacturer regarding suitability because both corrosion resistance and hardness can be reduced at elevated temperatures.

Proper design of the mold's ejection system is crucial to its production, life and performance, including its molding speed and smooth, interruption-free operation. This

information serves as a trustworthy guide for making the right ejector pin choices.

Nordson Measurement & Contact Solutions Introduces a New Compact Coat - Weight System for Converting Applications



Nordson (Westlake, Ohio) has developed a new compact coat weight system for adhesive measurement of flexible packaging manufactured on coating and laminating lines -- the CW 9000.

"The new CW 9000 makes possible what flexible packaging manufacturers have been asking for – accurate and fast adhesive coat weight and mix ratio measurements," said Mark Rainville, Product Manager for Nordson's film extrusion and converting businesses. "Nordson worked with several OEM line manufacturers and flexible packaging customers to make sure that this new system would be a game changer. At a glance – operators and other personnel can immediately see key quality indicators.

Coat weight and mix ratio profiles are available after a single scan – providing the operator with immediate information needed to confirm quality and make any

necessary process adjustments. A trend display shows if the coating goes outside of tolerance to enable corrective actions before a problem appears. The results are shortened startup time, reduced scrap, and minimised adhesive usage. All while maintaining product quality!" The system is built upon Nordson's proven Pro. Net Total Distributed Intelligence system. It includes the new compact CW 9000 sensor combined with the new LPS 1000 Scanner.

Infrared Sensor Engine

At the heart of the CW 9000 gauge is Nordson's infrared sensor engine adapted through extensive R&D and proven with on-line testing. Fast bi-directional scanning updates at the end of each scan with maximum coverage of the production run. Unique infrared optics are coupled with advanced algorithms to achieve measurement resolution and performance meeting the quality demands of the flexible packaging industry. Applications include clear films, printed films, aluminium foils, as well as metalized film or paper. The sensor is highly flexible and capable of measuring other coatings besides polyurethane.

The LPS 1000 is a self-contained Low-Profile Scanner that fits inside the frame of compact coating machines. It can perform fast scans and operate in a single point to analyse machine direction variations. The enclosed scanning frame prevents dirt from the scanner from falling onto the coating; it is easy to maintain and easy to remove from the coating frame. The precise motor / drive system delivers optimal positioning.



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New Jersey's Plastic Consumption Triples after Plastic Bag Ban Enacted, Study Shows

Plastic consumption in New Jersey tripled despite the state's 2022 plastic ban meant to address the "problem of plastic pollution," according to a study from a business - research firm.

The study found that the state's law banning single - use plastic bags led to a 60% decrease in the total bag volume, according to analysis from the Freedonia Report, MarketResearch.com's business research division.

However, as consumers started searching for alternatives and purchasing plastic reusable bags, the state saw plastic consumption triple, largely because of the material used in the alternative bags, the report shows.

"Most of these alternative bags are made with non - woven polypropylene, which is not widely recycled in the United States and does not typically contain any post - consumer recycled materials," the report states.

The ban, which took effect in May 2022, prevented large retailers, groceries and food

service stores from distributing the plastic bags, reports Fox29.

Democratic Gov. Phil Murphy, upon signing the bill, said the measure would address New Jersey's "most problematic forms of garbage" and "help mitigate climate change and strengthen our environment for future generations,"

Faye Franklin of Matawan bags her groceries with a reusable bag, which she purchased during her self - checkout, on the first day of the plastic bag ban at Stop & Shop in Aberdeen Township, NJ Wednesday, May 4, 2022. Stores eliminate plastics bags: Aldi eliminates plastic shopping bags in all 2,300 US grocery stores

The ban also affected retailers, with some stores reporting an increase in sales because of the need for alternative bags.

"An in - depth cost analysis evaluating New Jersey grocery retailers reveals a typical store can profit \$200,000 per store location from alternative bag sales," states the study. "For one major retailer, this amounts to an estimated \$42 million in profit across all its bag sales in NJ."

Do plastic bans help?

Single - use plastic bans are a way to curb the pollution and emissions created by the production of the material, according to the National Conference of State Legislatures.

But, the search for alternatives to carry groceries and other products from the store leads to the purchase of products that increase the pollution caused by manufacturing the bags.

A study published by Environmental and Resource Economics also suggests that plastic bag bans can lead to an increase in purchases of garbage bags.

"We estimate that (carryout grocery bag) regulations lead to an average increase in purchased plastics of 127 pounds per store per month," states the study.

Fimic Ras: a Solution for Plastics Recycling

Fimic's various types of automatic melt filters target contaminated plastics, especially post - industrial and post - consumer plastics, and have been designed to allow the

customer to choose the filter according to the final application, the filtration, the material to be processed and the hourly production.



Fimic is a family - owned company based in the north - east Italy. We started operations 58 years ago (1963) manufacturing customized guillotines for cutting industrial waste bales and rolls, but it was in 1996, when we improved the melt filtration technologies available at the time, with the first FIMIC backflush filter entering into service, followed the year after by the “scraping” system, that we started to make history in the plastics recycling industry and we've been known for more than 25 years as the specialists in automatic self - cleaning melt filters.

Fimic acts in the plastics recycling market; with our different types of automatic melt filters, we target highly contaminated plastic materials, especially post - industrial and post - consumer plastics. We not only manufacture melt filters, but we also design and develop new technologies which allow us

to deliver cutting edge solutions and provide those who choose our technology an ever more efficient line of work and productivity. Also, at FIMIC, we constantly run tests in our internal laboratory to guarantee high results and a supreme quality for end products.

We are specialized specifically in two product lines, designing, and manufacturing automatic and continuous melt filters and guillotines for the plastic recycling industry. Our different types of automatic melt filters target contaminated plastics, especially post - industrial and post - consumer plastics, and have been designed to allow the customer to choose the filter according to the final application, the filtration, the material to be processed and the hourly production.

Based on these parameters, FIMIC is currently able to supply 5 different types of filtrations with 5 filter models and it is the only company on the market specialized in filtration with this diverse range of models.

The RAS system is a scraping filter known for its flexibility and strength. Through the use of two blades, is able to scrape very high contaminations and reprocess both, post - industrial and post - consumer materials thanks to the adjustable discharge valve system. Following the success of the RAS filter, the introduction of the ERA filter has responded to the need for double filtration in certain applications, saving on investments and consumption by performing the double filtration step in a single machine with two consecutive filtration chambers.

RAS + REF, the melt filter that made FIMIC technology renowned in the recycling field, enhanced with the possibility to work in backflush mode, can in fact operate in two different ways: in scraping mode or in backflush mode, providing more options to anyone wishing to process materials with mesh filters, representing an ideal option for woven mesh processing with exceptional final results.

The TEN melt filter is the innovation of the first automatic screen changer, and allows continuous filtration on woven mesh, eliminating material build-ups and reduction of output with the additional option of adjusting the mesh output to guarantee regularity and quality of post-industrial waste alongside the chance to avoid constant supervision of the operator, making daily work much simpler.

These days there's no end to the amount of material to be recycled, and yet is necessary to keep really high - quality standards for the end product. That's why FIMIC designed a really unique melt filter, representing the culmination of its technology and the expertise that made them the filtration specialists, the largest melt filter on the market: GEM, the twin melt filter that works twice as much with its unmatched filtering surface and using just two parallel filtering screens guaranteeing better results than anything else on the market, an ideal application for high - throughput recycling lines.

The plastics recycling market is booming since some years already. This is because of a

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variety of factors acting altogether. Consumers are getting more and more sensitive to environmental protection as well as the need of a circular economy for plastics, hence the use of more recycled plastics in new plastic products. The major quantity of waste plastics is post - consumer, i.e., highly contaminated. To reach high quality recycled plastics from contaminated waste needs automatic technologies to filter out impurities and contaminations from the plastic flow. That's where FIMIC's technology can help more and that's one of the reasons of our success.

TOMRA Launches World's First Open Managed System for Reusable Takeaway Packaging



The system now being trialed in Aarhus enables a shift from single - use takeaway packaging to reusable takeaway packaging, by offering an infrastructure that entire cities can use.

The TOMRA system provides a unique convenience for businesses delivering takeaway food and drinks (like cafés and quick serve restaurants), as well as for consumers. The system is designed as an open system, meaning packaging from different packaging providers can be returned 24/7 to a shared

infrastructure of automated collection points throughout a city.

High packaging return rates are ensured by having monetary return incentives, which in the Aarhus pilot takes the form of a deposit that is paid when purchasing the takeaway food /drink, and afterwards reimbursed in full to the consumer when the packaging is returned to a collection point.

“Aarhus wants to be a greener and more sustainable city, and one which has the courage to test new solutions. That is why I am really happy that today Aarhus is launching its own deposit system for to - go cups, and that there are so many food establishments in the city that have already shown an interest in providing the cups. We have worked hard in recent years to make this happen, and now it's time to really test its application in reality. I hope that the residents of Aarhus will embrace this new to-go cup system and that during this pilot project we will hopefully be able to take the next steps needed to expand the system to include several types of takeaway packaging,” says Nicolaj Bang, Alderman for Technical Services and Environment, Aarhus Municipality.

Says TOMRA President and CEO Tove Andersen: “This is a very important project for TOMRA and a key part of the ambitious plans to use our systemic know-how and technological expertise to create new innovative solutions that will provide expanded benefits for businesses, consumers and society. We are thrilled to be able to partner with such a forward-thinking city as Aarhus, and look

forward to the positive impact we can make together in shaping a more sustainable future.”

In the first stage the new system focuses on hot and cold drink containers, such as takeaway coffee cups. When returning the reusable cups to one of the automated TOMRA collection points specifically used for takeaway packaging, the customer receives the deposit reimbursement directly on their card/account. This is possible by tapping a contactless payment credential (card, phone, smart watch, etc.) to activate the dedicated TOMRA collection point.

The payment system is enabled through a collaboration with Visa, MasterCard and Shift4, a leading provider of integrated payment and technology solutions.

In addition to providing bespoke automated collection machines for the reusable takeaway packaging, TOMRA is also responsible for emptying the machines and transporting the packaging to its own industrial sanitization facility that it has set up in Aarhus. The sanitized cups are quality inspected and then ready to go back into the system when retailers order new supplies via a convenient online web shop.

TOMRA therefore ensures businesses don't need to take back and sanitize packaging themselves, which has been a struggle for most alternative reuse-based takeaway packaging systems. The combination of automated collection and industrialized sanitization means that the system can be scaled to a future where reusable packaging is the norm, and not the exception like today.

After the initial phase which is focused on hot and cold drink beverage cups, the plan is to increase the scope of materials to also cover more types of takeaway packaging – providing a holistic, convenient, and transparent system that can be utilized by all within a city. This will contribute to both better use of resources and help prevent litter in the urban environment. The use of reusable takeaway also has significant potential to reduce greenhouse gas emissions compared to the continued use of single - use takeaway packaging. According to a recent study¹, by moving away from single - use cups (for both warm and cold drinks) the potential reduction in GHG emissions is at least 70 percent. Further, besides the environmental benefits and helping to achieve sustainability goals, the system for reusable takeaway packaging also generates local jobs in the community.

“TOMRA believes reusable takeaway packaging will be an increasingly important and necessary part of a circular approach to waste management, and we are determined to provide novel, attractive and efficient solutions to enable this. We believe that a shared infrastructure with automated collection points is a prerequisite for successful implementation. In addition to the technical setup, another key success factor for broader adoption is that the system is accompanied by policy frameworks that will ensure that these systems are utilized. We are confident that with this pilot project we will demonstrate that reusable takeaway packaging is a viable alternative going forward,” says Geir Sæther, TOMRA Senior Vice President and Head of TOMRA Reuse

Revolution Acquires PolyAg Recycling.



Transition expected to strengthen existing position in agricultural film production and recycling. In Alberta, the EPR system went into effect in 2022, and both governments and non-governmental agencies have turned to recyclers such as PolyAg to help implement various innovative waste management programs to divert waste away from landfills and increase circularity in the agricultural market. Revolution a recycler and producer of agricultural bags and film, announced the successful acquisition of PolyAg Recycling, a Canadian mechanical recycler of agricultural films. The acquisition of PolyAg is expected to benefit both businesses and the markets they serve by combining PolyAg's existing operations with Revolution's resources and expertise in the film recycling space. PolyAg, based in Bashaw, Alberta, began operations in 2019, offering a local recycling solution for used agriculture film — a market where extended producer responsibility (EPR) and product stewardship programs designed to drive toward the goal of increased recycling have been expanding in recent years. The partnership aligns with Revolution's strategic growth goals, including the company's recent expansion in Little Rock, Arkansas, where they invested in new blown film lines to produce

specialty agriculture films. As Revolution expands further into the agriculture market, adding PolyAg's recycling capacity offers opportunities to better serve customers across the U.S. and Canadian markets with the company's holistic approach to collection, recycling and production of sustainable product solutions. "We are excited about the possibilities that this acquisition brings to Revolution and our valued stakeholders," says Sean Whiteley, CEO of Revolution. "PolyAg has built an impressive business in a relatively short period of time, and by combining our strengths and expertise, we are well positioned to deliver even more impactful sustainable solutions to our customers in the U.S and Canada." Revolution says it is committed to ensuring a seamless transition for PolyAg and its employees. According to the company, current customers of PolyAg can expect uninterrupted service and support during this transition.

Turkish Plastic Recycler Tanrikulu Enters the Bottle - to - Bottle Market with the Support of Starlinger



The PET bottle - to - bottle line is the second plastics recycling system from Starlinger that Tanrikulu has installed. It is in operation at Tanrikulu's post-consumer PET processing plant in Akyazi, Sakarya Province, in Türkiye's Marmara Region. The

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recycling system processes post-consumer PET bottle flakes and has a production output of 2.4 tons per hour. Tanrikulu supplies the bottle- grade rPET pellets to customers in Turkey and abroad.

The recoSTAR PET 215 iV+ recycling line is equipped with a special cartridge filter that reduces production waste, increases the production output and ensures highly purified melt. The backflush melt filter system called DPC 4000 operates continuously with two screen-bearing pistons and four screen cavities. With a total of approx. 4000 cm², the filtration area is 2.4 times larger than when using standard screens, filtering the melt with a fineness of 56 µm. Another big advantage is the high process stabilization as 75% of the filtration area is available in the filtration process during screen change and backflushing. The DPC 4000 cartridge filter significantly reduces melt loss during backflushing and generally improves system performance.

“With our ongoing investments in PET recycling we aim to protect our social, cultural and natural environment for future generations by closing the packaging loop. Every discarded PET bottle should become a new PET bottle again,” said İzzet Tanrikulu, General Manager of Tanrikulu Group of Companies. “Starlinger is one of the leading technology suppliers in the field of PET bottle-to-bottle recycling. The Starlinger PET recycling process has been approved by international brand owners in

the food and beverage sector as well as by important legal authorities such as FDA and EFSA. We strive to improve the environmental impact of plastic packaging by combining the latest technology with our vast experience in the field of recycling, thereby reducing both plastic waste and resource consumption.”

About Tanrikulu Group

With currently seven plastics recycling and manufacturing plants in various locations of Kocaeli and Sakarya Provinces and a total staff of more than 500 people, Tanrikulu Group of Companies is one of the leading plastics recyclers in Turkey. Founded in 1989, Tanrikulu started as a paper, glass and metal recycling enterprise in Istanbul. After expansions in 2006 and 2014 the company focuses on plastics recycling and PET sheet production.

Tanrikulu already operates a Starlinger recoSTAR dynamic recycling system for HDPE and PP in Başiskele, Kocaeli Province, and has recently entered the market for PET bottle - to - bottle recycling with another Starlinger recycling line. Besides producing regranulate from plastic scrap the group also owns a facility for PET sheet production in Cayirova, Kocaeli Province. Tanrikulu recycles a total of 40,000 tons of post-consumer PET and 45,000 tons of other plastics such as PP, HDPE and LDPE per year and also exports its products to customers in neighbouring countries, Europe and overseas.

Masterbatches Reduce Gloss in PLA and PETG FDM 3D Printed Systems



Insight Polymers & Compounding's two low - gloss additive masterbatches shown to boost appearance of 3D printed objects. Two new low - gloss additive masterbatches for PLA and PETG FDM (fused deposition modeling) 3D printed systems are newly being offered by Insight Polymers & Compounding. Insight LAA112 Low Gloss PLA and Insight TCA112 Low Gloss PETG masterbatches have been shown to reduce gloss and improve the aesthetic profiles of 3D printed objects with minimal to no impact on mechanical properties. (Image: Cat depicted on the right incorporates the low - gloss masterbatch.)

Explains director of operations A.J. Pasquale, “Conventional 3D printed parts with high - gloss accentuate layer - lines and other defects suggesting lack of durability, or prototype and single - use only applications.” Typical use level is 10% to 30%. “Additive manufacturing is now used for producing finished goods rather than prototypes for injection molds. So we facilitate that trend by producing masterbatches that make end-products more aesthetically acceptable to the customer.” With FDM filament being used as the

final article and 3D printing now a manufacturing technique, Dr. Pasquale said the resulting piece must be aesthetically 100% good, not 90%. Moreover, FDM and other techniques are accepted now for low volume manufacturing. The 3D-printed part, therefore, must present a high-quality appearance that earns customer acceptance.

While the current low gloss masterbatches are designed specifically for FDM, Insight Polymers can develop materials for SLS (selective laser sintering) and BAAM (Big Area Additive Manufacturing), according to customer interest.

Creating Machine - Wrap Film Incorporating up to 30% Post - Consumer Recycled Content



Challenge: Incorporate Recycled Content While Maintaining Stretch Film Performance

ExxonMobil wanted to ensure that stretch film performance was maintained when incorporating recycled content. Traditional LLDPE-based solutions provide only moderate pallet stability, with little to no downgauging possibility without a booster such as performance polyethylene. These films were often unable to incorporate recycled content

while maintaining mechanical performance. "Our customers struggle to incorporate PCR into their stretch wrap solutions," said Marie-Paule Van Den Eede, PE Technology, Customer and Application Developer, ExxonMobil. "PCR feedstock typically contains a certain degree of LDPE, which can be detrimental to stretch film by reducing stretchability, which can compromise film end - use properties. In addition, PCR feedstock typically exhibits a certain degree of gels, which can be detrimental for stretch film by creating holes and reducing stretchability, which can compromise film end - use properties. Unless high quality recycled content is used, a C4-LLDPE - based formulation incorporating PCR may not deliver the film and end-use level of performance required for machine wrap stretch films. We were eager to propose a solution that could overcome these challenges."

Solution: ExxonMobil performance polymers for improved mechanical performance and improved wrapping consistency

ExxonMobil combined its performance polymers to propose a solution that would meet the requirement to incorporate up to 30% recycled content in machine wrap. Exceed™ 3812CB performance polymer as an excellent PCR blend partner

- Higher melt index and lower density (vs reference performance PE (0.916 g/cm³; 3.5 g/10 min)), exhibiting improved mechanical performance and processing capability

- Especially suited as blend partner with PCR
- Act as gel grinder > reducing the impact of gels > improving the wrapping consistency Vistamaxx™ 6000 performance polymer functional layer as a consistency booster
- Metallocene catalyzed copolymer that can provide ultimate stretch, exceptional tear propagation resistance and wrapper consistency
- To be used pure in a functional layer of 10-15% (of the overall structure)

Results: Incorporating up to 30% PCR into a high - end machine wrap film requires performance polyethylene to maintain mechanical properties

In ExxonMobil testing, C4-LLDPE is not an option when incorporating PCR. Unless high quality recycled content is used, a C4-LLDPE based formulation may not deliver the film and end-use level of performance required. When testing ultimate stretch force, C4-LLDPE with 20% PCR broke early in comparison to the reference without PCR. The solution also performed poorly in comparison to performance PE-based solutions in maximum strain for wrapper consistency tests. "The results help to emphasize the important role that ExxonMobil performance polyethylene can play when incorporating PCR," said Van Den Eede. "In this example, replacing C4 - LLDPE with Exceed™ 3812 as blend partner with PCR helps to maintain mechanical performance and wrapping consistency for machine wrap stretch films."

Challenges with Mechanical Recycling of Multilayer Packaging Plastics

The widespread use of multi-material multilayer plastic (MLP) packaging in fast-moving consumer goods has become a common phenomenon, placing emphasis on leveraging the unique functionalities of various materials. These packaging structures offer advantages such as improved resource-use efficiency and enhanced barrier performance, contributing to extended shelf-life and other consequential benefits. However, despite their utility, MLPs pose a formidable challenge to existing recycling systems, presenting significant hurdles to the principles of a circular economy. The intricate composition and complex nature of MLPs raise concerns regarding effective recycling, necessitating a closer examination of the associated challenges and potential solutions to enable their alignment with sustainable practices.

Multi-layer plastic recycling presents a series of formidable challenges due to the intricate nature of its composition. These plastics often incorporate a blend of diverse polymers like PE and PP along with the tie (adhesive) layers, resulting in a complex structure that hinders effective separation and recycling. The distinct melting points and chemical compositions of the various layers pose compatibility issues during the recycling process, making it difficult to achieve uniform reprocessing. Additionally, the presence of barrier coatings designed for specific properties, such as

protection against moisture and oxygen, proves challenging to remove, impacting the quality of the recycled material.

The absence of standardization in MLP, combined with the use of different layering techniques by manufacturers, further complicates the establishment of a universal recycling process. Collection and sorting difficulties arise from the prevalent use of these plastics in flexible packaging, like pouches and sachets, which are both lightweight and small, hindering efficient recycling facility operations. The recycling of MLPs can be costlier than producing new materials, and thus economic viability becomes a significant concern. Moreover, limited market demand and potential contamination with food residues or adhesives create additional obstacles. Technological advancements are crucial to developing effective methods for separation, cleaning, and recycling, while environmental considerations regarding energy consumption and emissions during the recycling process add another layer of complexity.

The Design for Recycling concept is one such aid to address some of these issues. The plastic packaging recycling system involves various standards for individual plastics and specific applications, such as flexible packaging. Let us look at the popular example of "PET Products Recyclability Design Guidance," where the focus is on achieving bottle-to-bottle recycling of PET. Key design elements impacting recyclability include base resin, barrier layer / coating / additives, labels / inks / adhesive, closures, color and dimensions, and attachments.

Preferred designs include PET copolymer resins, bio-based PET resins, and recycled PET, while additives like PVDC may hinder recycling. Labels and inks play a crucial role, requiring thorough removal of adhesives for accurate PET bottle sorting. Density considerations guide the choice of materials for closures, and color choices influence cost-effectiveness and contamination risks. Attachments made of PET or easily separated materials are preferred, with caution against problematic materials like PVC and PLA. The overall goal is to optimize design for efficient and high-value PET recycling.

Designing recyclable plastic packaging involves addressing the core functions of packaging—protecting products, ensuring convenience, and promoting sales. This design process primarily encompasses material design, structural design, and decoration design. In material design, the challenge of recycling multilayer packaging is addressed through innovations such as Colgate's recyclable toothpaste tube, which replaced traditional LDPE-aluminum combinations with easily recyclable HDPE.

Additionally, bio-based and biodegradable materials like PLA and PHAs can be explored as substitutes for conventional plastics. Structural design innovations, crucial for recyclability, include the development of all-plastic pumps by Tianzhou Packaging and Coca-Cola's introduction of plastic bottles with attached caps which are recyclable. These advancements simplify disassembly and promote recycling enthusiasm. Decoration design focuses on balancing aesthetics

with recyclability, urging brands to minimize excess inks, pigments, and oversized labels. Some brands opt for label reduction or removal, while others employ techniques like embossing, laser printing, and electronic tagging to convey essential information without hindering recyclability. The trend towards transparent and light-coloured bottles further supports recyclable packaging efforts.

Another perspective on the issue of single-use plastics could be framed around the concept of "behavioral design for sustainability." This school of thought emphasizes the importance of understanding and influencing human behavior in order to address the environmental impact of single-use plastics. In this view, the argument is that, simply banning or restricting the use of single-use plastics may not be sufficient, as it fails to account for the complex and varied behaviours of individuals once the packaging leaves the point of purchase. Instead, proponents of this perspective advocate for a proactive approach that incorporates principles from behavioural psychology into the design of packaging. By understanding how people interact with and dispose of packaging, designers can create solutions that align with human behavior, making it more likely that individuals will choose sustainable options. For example, packaging could be designed to be easily recyclable, with clear and simple instructions on how to do so. Alternatively, it could incorporate incentives, such as deposit systems, to encourage proper disposal and recycling. This approach recognizes the inherent unpredictability of human behavior and seeks to

leverage that understanding to foster environmentally conscious choices. Ultimately, the idea is that by aligning design with human behavior, we can create more effective and sustainable solutions to reduce the impact of single-use plastics on the environment.

The widespread use of MLPs in fast-moving consumer goods offers valuable benefits but presents formidable challenges to recycling systems. The intricate composition of MLPs, incorporating diverse polymers with distinct melting points and barrier coatings, hinders effective separation and recycling. Lack of standardization, collection difficulties, economic concerns, and technological limitations compound these challenges.

The Design for Recycling concept, emphasizing material, structural, and decoration design, emerges as a crucial aid. Innovations such as Colgate's recyclable toothpaste tube demonstrates the potential of sustainable design. To address the multifaceted issues surrounding MLP recycling, a comprehensive approach, which incorporates the integration of technological advancements, sustainable design practices, and an understanding of human behavior, is imperative for fostering a more sustainable and circular approach to plastic packaging.

Bioplastic from Nordic Kelp

Interesting Times Gang is a design and innovation studio specialising in circularity and biomaterials. Together with Nordic Seafarm, one of Scandinavia's leading kelp

producers, the two companies have committed to exploring the development of biodegradable plastic made from Nordic Kelp.

The project has resulted in two bio-plastic compounds, a PHA which is biodegradable in natural biotopes, like soil and water, and a PLA which is bio-based, but requires industrial composting at end-of-life.

The process involved incrementally increasing the volume of kelp in the compounds as a filler and stabiliser, starting at 3% and finally achieving a 40% volume of kelp in the latest iteration.

These biomaterials were converted to pellets and filament, and used with injection-moulding and 3D-printing, to better assess the functional and mechanical properties, and the aesthetic results.

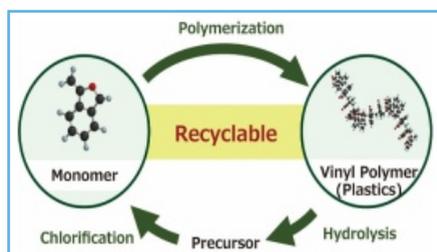
Ultimately the studio prototyped two beautiful lampshades, one in each material, to demonstrate the future potential of kelp-based bioplastic in the transition to ocean-based biomaterials, for circular design and production.

"Biomaterials are the next great frontier of product design and sustainable production. Natural resources such as ocean-based biomass from the Nordic Region will be at the forefront of this exciting revolution.

Specifically, industrial kelp cultivation, and scaling up the emerging aquacultural infrastructure and production capabilities, will not only provide an important source of renewable biomaterials, it will also serve a crucial role in increased sequestration of CO₂ from our environment"

- Sean Barrett, Head of Innovation at Interesting Times Gang.

Novel Chemical Recycling System for Vinyl Polymers of Cyclic Styrene Derivatives



Chemical recycling of widely used vinyl polymers (VPs) is one of the key technologies required for realizing a sustainable society. In this regard, a team of researchers from Shinshu University have recently reported a new chemical process that facilitates the depolymerization of cyclic styrene-based VPs, resulting in the recovery of a monomer precursor. This highly efficient chemical recycling system can help with effective resource circulation and the development of new plastic recycling technologies.

Vinyl polymers (VPs) are one of the most widely used plastic materials. They are found everywhere, from poly (vinyl chloride) pipes and surgical gloves to disposable polystyrene plates. Given the global call for a move towards sustainability, would it not be great to chemically recycle this widely used polymer for realizing a sustainable society?

Recently, a team of researchers led by Associate Professor Yasuhiro Kohsaka from the Faculty of Textile Science and Technology (FTST) and Research Initiative for Supra-Materials (RISM), both at Shinshu University, undertook a study to find a way out for achieving this.

In their recent breakthrough published online in ACS Macro Letters and co-authored by Yota

Chiba from the FTST at Shinshu University, the team presented a new strategy for effectively depolymerizing the VPs of cyclic styrene derivatives to retrieve a monomer precursor.

Traditionally, chemical recycling of VPs has always been challenging. The conventional approach to recycling any polymer is reversing the polymerization process, which entails breaking a single large molecule made up of repeating monomeric units down to its parent monomeric components.

Depolymerizing VPs is difficult because the covalent carbon-carbon bonds holding together the monomer units are very stable and, therefore, tough to break. Studies have proposed ways to break the carbon-carbon backbone of VPs, but most of them fail to ensure quantitative and selective scission (bond breaking) of its main chain, which is crucial to the effective recovery of monomers.

"Polymers that are stable have poor recyclability, and the ones that are easily recyclable are unstable in nature," says Dr. Kohsaka. "We overcame this trade-off by forgoing conventional strategies that try to reverse the polymerization reaction to recover monomers and developing a two-step recycling process. In the first step, degradation of the polymer to a monomeric precursor was achieved, which was followed by the recovery of the monomer by chemical modification."

The team chose VPs made of cyclic α -substituted styrene derivatives, such as 3-methylene phthalide, as their molecule for testing chemical recyclability and investigating the ring-opening reaction of the pendant groups

in the presence of a base like sodium hydroxide. They found that the opening of the rings due to saponification increased the steric hindrance around the pendant groups, which led to main-chain scission and depolymerization of the VP into monomer precursors.

These recovered precursors were then converted to monomers via single-step chlorination and spontaneous intramolecular esterification. The researchers further discovered that the same cyclic monomer structure that facilitated depolymerization was also responsible for promoting polymerization owing to reduced steric hindrance around the vinylidene group. These findings led the researchers to conclude that cyclic α -substituted styrene derivatives can potentially recycle chemicals.

At a broader level, this study has opened new avenues for resource circulation, one of the foundational pillars of a sustainable society, by providing a facile method of polymerization and depolymerization of ubiquitous VPs. The researchers believe that their findings can provide useful fodder for further research on not just the depolymerization of plastic materials but also the development of new recyclable plastics.

"The aim of our research was to aid the mission of developing efficient plastic recycling technology, which is a tool that humanity desperately needs against the backdrop of environmental pollution caused by plastics. While we cannot remove all the plastic that already exists on this planet, we can at least make the best use of plastic resources available to us with our new chemical recycling strategy," concludes Dr. Kohsaka.

Exporting Innovation Expanding Possibilities

To promote India's innovation and processing Capabilities and expand global distribution. The plastics Export Promotion of India will be organizing the 2nd Edition of India's only export focused exhibition for Plastics, PLEXCONNECT 2024 from June 7-9 2024, Hall Nos. 2 & 3, NESCO, Goregaon, Mumbai.

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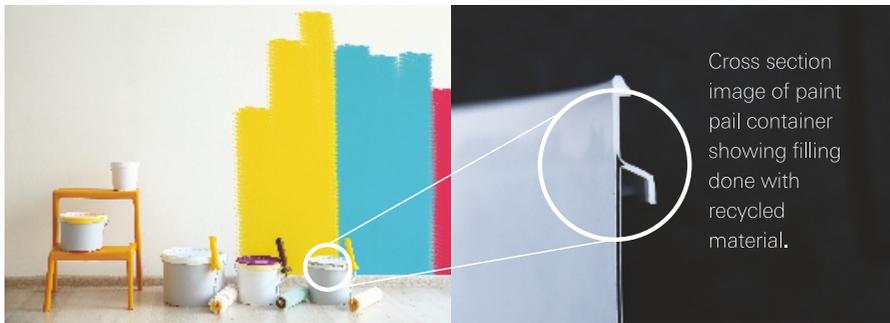
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