



INDIAN RESINS MANUFACTURERS' ASSOCIATION

eNewsLetter

Edition: May 2024

INDIAN RESINS MANUFACTURER'S ASSOCIATION (IRMA)

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INDIAN RESINS MANUFACTURERS' ASSOCIATION

Quote of the Month

**“THE QUALITY OF A PRODUCT
IS A REFLECTION OF
THE QUALITY OF
THE TEAM THAT BUILT IT”**

-Unknown

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INDIAN RESINS MANUFACTURERS' ASSOCIATION

From The Editor's Desk

Dear Members,

I hope this message finds you well. As the editor of the Indian Resins' Manufacturers Association (IRMA), I wanted to take a moment to highlight some key updates and initiatives within our community:



1. **Industry Trends:** Our industry continues to witness dynamic shifts, driven by technological advancements, environmental regulations, trade policy changes both domestically and globally and changing customer preferences. With the Paint industry poised for a robust growth due to strong focus on infrastructure projects, rapid increase in production capacities and new projects, across the industries and hyper growth in the housing segment, Resin industry is looking forward to witnessing exciting times ahead.
2. **Sustainability Initiatives:** Sustainability remains a central focus for the paint and resin sector. We as a Resin industry collectively would appeal and urge all our valued members to put in efforts in adopting eco-friendly practices, using more and more 'Green' raw materials and developing sustainable end products. Let's continue to work together towards a greener future. I would request all members to come forth with their proposals and suggestions towards implementing sustainability and highlight their achievements, so that we can show case the same in IRMA as well as other fellow organization bodies. Let's together make this world a cleaner and greener place for us as well as generations to come by contributing in whatever little ways we can.
3. **Past Events:** Your association has launched an IRMA Impact series of lectures by eminent speakers from various walks of life. We had conducted an event in the month of April which was focussed on two topics, namely changing Geo-political scenario and its impact on business and the second topic was on Disruption in the global Supply Chain and strategies to steer through. The event was very well attended and appreciated by all the members. We thank you for making it a stupendous success and request your continued participation in future events too.
4. **Upcoming Events:** Don't miss out on our upcoming events in our IRMA IMPACT series, including seminars, workshops, and networking sessions. These gatherings provide valuable opportunities to update and upgrade business practices, connect with industry stakeholders, exchange ideas, and explore potential collaborations. The details of upcoming events will be provided from time to time.
5. **Call for member's participation:** I welcome participations and contributions from our members on a wide range of topics, including technical advancements, case studies, market analyses, and sustainability initiatives. Share your expertise and contribute to the collective knowledge of our community and betterment of the industry as a whole.

As always, I encourage your active participation and feedback. Together, we can drive the growth and prosperity of the paint and resin industry in India.

Best regards,

Ashay Mehta,
Chief Editor, IRMA

From The President's Desk

Dear Members.

Greetings!!!

At the outset let me take this opportunity to thank each one of you for being so strong in this tough times for the resin industry, surging of RM prices, low demands followed by shortage of labours etc, keeping apart this layman issues lets focus on the big jargons like Macroeconomics and Geopolitics combined with supply chain disruptions.



As assured we at IRMA are fully committed to advancing our mission and ensuring that this association remains a valuable resource for our members. We plan to work collaboratively to identify new opportunities for growth, develop innovative programs (Eg. The recently started IRMA Impact series), and build stronger relationships with our members in the coating Industry, along with activities like Workshop, Bi-Anneal Seminar, Member engagement, government representations for helping members at large.

IRMA IMPACT:

As mentioned earlier, currently we had a wonderful session of lectures under the name IRMA Impact. The name itself signifies that under this series we will get in lectures which are impacting the IRMA fraternity as a whole. Last month we had 2 lectures under the same banner.

- 1) Friends we all are well versed with Macroeconomics & Geo-politics. (Heavy terms Right *pun intended) Let's get it simplified enough for a practitioner in Business to act upon it.

Who better can help us understand the concept through story telling narrative then an Engineer a MBA and then a specialist course at Harvard, Mr. Nimesh brings to the table as core proposition for Business leaders at large, he provided an insight on the current macroeconomic situation and its impact on Business in times to come...

Followed by that we had, The hottest topic worldover right now, hotter than the current weather,

- 2) Supply chain disruptions which are no-longer exceptions, they have become new normal. It's not enough to just respond to these disruptions. It is imperative for today's businesses to identify the leading indicators which sense these disruptions proactively and be ready to handle them in much prepared manner.

The speaker Mr Jeevan Pawar shared his views on ways to manage these disruptions better. “

Friends this two topics are Impacting our Businesses at large, hence the name IRMA IMPACT

There will be many more lectures coming under this topics so stay tuned and get the most out of it by attending the Lectures.

Thanks and Regards

Hiren Shah
President: IRMA

Update on the Global Chemical Market

Dr. Venkataraman

Hon. Secretary, IRMA

President, Global Sales and Marketing - Advanced Materials Business

Grasim Industries Ltd. of Aditya Birla Group

Dear Members,

We hope this message finds you well. The global chemical market is currently navigating through significant disruptions, which are impacting our industry in multifaceted ways. As your association, it is imperative that we keep you informed of these developments to better equip you to adapt and thrive in these challenging times.

Key Factors Driving Market Disruption

Ongoing geopolitical tensions and conflicts across the globe have created instability and uncertainty in supply chains and market dynamics. This geopolitical situation has been a significant disruptor, affecting trade flows and causing volatility in raw material availability and pricing.

China has significantly expanded its chemical production capacities, leading to an oversupply situation. China now accounts for over 60% of global chemical production capacity across various value chains. However, with the end markets experiencing a slowdown, many of these capacities are operating at below 50% utilization, exacerbating the supply-demand imbalance.

A slowdown in end markets has further compounded the issue of oversupply, leading to decreased demand for chemicals globally. This reduced demand has put additional pressure on prices and market stability, making it a challenging environment for manufacturers worldwide.

Regulatory Changes and Sustainability

Major regulatory shifts in the European Union and the United States are steering the chemical market towards greener and more sustainable practices. The implementation of stricter regulations and bans on hazardous chemicals are significant trends that manufacturers must adapt to. The EU's Carbon Border Adjustment Mechanism (CBAM) and the global trade of carbon credits are set to become key components of the market. Furthermore, REACH regulations, initially specific to the EU, are now being adopted in the UK, South Korea, and China, demanding compliance from manufacturers globally.

Impact on Indian Market

Despite the global challenges, the Indian chemical market remains robust with strong demand across various segments. According to a recent McKinsey report, India's chemical market is poised to grow at a Compound Annual Growth Rate (CAGR) of 9-10% in the coming years, potentially reaching \$850-1000 billion by 2040 and capturing a 10-12% share of the global market.

However, India faces challenges in creating a complete value chain, particularly due to dependence on imported feedstocks. While India is self-sufficient in C4, C6, and C8 feedstocks, there is a significant deficit

in ethylene and propylene, crucial for downstream manufacturing. This reliance on imports for intermediates and end-products derived from these feedstocks remains a bottleneck.

Strategic Implications

Indian manufacturers must continue to innovate to align with the stringent global regulatory frameworks, focusing on green and sustainable products. This innovative adaptation is crucial for maintaining competitiveness in the evolving market landscape.

To become a global chemical manufacturing hub, India must invest in infrastructure and enhance its feedstock availability. Addressing these infrastructural challenges will be key to supporting the anticipated market growth and reducing dependence on imports.

With de-globalization trends and regional protectionism rising, Indian manufacturers should strategize to mitigate the impact of anti-dumping measures and trade barriers. Navigating these trade dynamics effectively will be essential for sustaining export growth.

The strong domestic demand presents an opportunity to fortify the market against global uncertainties. Manufacturers should focus on fulfilling local demand efficiently while exploring export opportunities strategically.

In conclusion, while the global chemical market faces disruptions from geopolitical tensions, oversupply, and regulatory changes, the Indian market shows promising growth potential. By addressing the infrastructural challenges and aligning with global sustainability trends, Indian resin manufacturers can navigate these turbulent times and emerge stronger.

We remain committed to supporting you through these changes and will continue to provide updates and insights to help you make informed decisions.

Emerging trends in resins and their applications

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Introduction

RESINS, a diverse class of organic materials, have played a pivotal role in shaping numerous industries. Their inherent versatility stems from their ability to transform from viscous liquids to robust solids with various properties. From imparting exceptional adhesion to offering superior strength and chemical resistance, resins have become crucial components in construction, transportation, electronics, and countless other sectors^[1].

Traditionally, resins have been categorized based on their curing behaviour: thermosetting and thermoplastic. Thermosetting resins undergo irreversible chemical reactions during curing, forming a permanent network structure. This renders them strong and dimensionally stable, making them ideal for composites, coatings, and adhesives^[2]. Epoxy resins exemplify this class, offering excellent mechanical strength and chemical resistance, finding applications in diverse areas like high-performance composites and electronic encapsulation materials^[2]. Conversely, thermoplastic resins soften upon heating and harden upon cooling, allowing for re-processing. This characteristic makes them valuable for applications requiring flexibility, such as in packaging films and pipes, with polyethylene (PE) being a prime example^[1].

Despite their established functionalities, the realm of resins is experiencing a period of significant transformation. Sustainability concerns are driving the development of bio-based resins derived from renewable resources like plant oils. These bio-resins not only offer an environmentally friendly alternative but also demonstrate comparable performance to their petroleum-based counterparts^[3]. Furthermore, advancements in resin chemistry are leading to the creation of high-performance variants. These novel resins boast superior properties like exceptional heat resistance, flame retardancy, and enhanced mechanical strength, catering to demanding applications in aerospace and extreme environments^[4].

Beyond traditional functionalities, the frontiers of resin science are pushing towards the development of "smart" resins. These intelligent materials exhibit stimuli-responsive properties, meaning their characteristics can change in response to external cues such as light, heat, or pressure. This opens doors for innovative applications, including self-healing composites and environmentally responsive coatings^[5].

The burgeoning field of 3D printing has further ignited the need for novel and versatile resins. Specific resins are being tailored for compatibility with various 3D printing technologies, enabling the creation of complex and intricate objects with high dimensional accuracy^[6]. This confluence of resin advancements and 3D printing holds immense potential for rapid prototyping, customized manufacturing, and even bioprinting for medical applications^[6].

This article delves into these emerging trends in resin technology, exploring the advancements in bio-based, high-performance, and smart resins. We will investigate their potential applications across various sectors,

analysing their impact on sustainability, manufacturing processes, and the development of novel functionalities.

Epoxy resins

Epoxy resins remain dominant in the thermosetting resin category due to their exceptional mechanical strength, chemical resistance, and versatility. However, recent research efforts are delving deeper into epoxy chemistry, achieving novel functionalities for a broader range of applications.

A key area of focus lies in developing high-performance epoxy resins tailored for demanding environments. This often involves strategically modifying the epoxy backbone through chemical manipulation. For instance, research by Chen et al.^[7] explored the incorporation of fluorinated moieties (fluorine-containing groups) into the epoxy backbone. This chemical modification successfully introduces flame-retardant properties by disrupting the combustion cycle of the polymer. Similarly, studies by Li et al.^[8] investigated the use of graphene oxide (GO) nanofillers within epoxy matrices. By introducing these nanofillers through a dispersion process, the researchers significantly improved the resin's mechanical strength and electrical conductivity. This is attributed to the solid interfacial interactions and load transfer between the GO and the epoxy matrix at the nanoscale.

Sustainability is another driving force for innovation in epoxy resin chemistry. The development of bio-based epoxy formulations hinges on the utilization of renewable resources like vegetable oils. Studies by Liu et al.^[9] explored the synthesis of epoxy resins from epoxidized soybean oil. This approach involves the chemical modification of the vegetable oil through a process called epoxidation, introducing epoxy groups that can then undergo crosslinking reactions similar to conventional petroleum-based epoxies. Importantly, Liu et al. achieved comparable mechanical properties with their bio-based epoxies, demonstrating a viable eco-friendly alternative.

Furthermore, research by Demir et al. investigated the use of bio-based curing agents for epoxy resins^[10]. Traditionally derived from petroleum sources, these curing agents can be synthesized from renewable feedstocks like plant-derived amines. This research paves the way for creating entirely sustainable epoxy systems by replacing resin and curing agent components with bio-based alternatives.

Polyester resins

Polyester resins are prominent in the thermosetting resin category due to their cost-effectiveness, good mechanical properties, and ease of processing.

There's a growing interest in creating high-performance polyesters with improved properties. This is often achieved by strategically changing the building blocks (monomers) used to form the polyester chain. Traditional unsaturated polyesters (UPEs) are usually made from maleic anhydride, ethylene glycol, and styrene as reactive diluents. Li et al.^[11] investigated incorporating flame-retardant elements into the polyester backbone by replacing styrene with a flame-retardant monomer. This switch in chemicals successfully introduces flame-retardant properties by promoting char formation during burning. Likewise, Xu et al.^[12] explored using cyclic anhydrides with better heat resistance within the polyester backbone. By incorporating these cyclic anhydrides during polymerization, the researchers significantly improved the resin's thermal stability, making it suitable for high-temperature applications.

The push for sustainability is also influencing advancements in polyester resin chemistry. Bio-based polyesters derived from renewable resources offer an eco-friendly alternative to traditional variants sourced from petroleum.

Lazaroz et al.^[13] explored creating polyesters using bio-derived succinic acid obtained through fermentation. Their approach involves polycondensation reactions, where bio-based succinic acid reacts with other diacids and diols to form a fully bio-based polyester resin. Importantly, Lazaroz demonstrated that these bio-based polyesters exhibited mechanical properties comparable to their conventional counterparts. Additionally, research by Xu et al.^[14] investigated incorporating vegetable oils within the polyester backbone. Through a grafting process involving chemically modified vegetable oils, the researchers balanced biodegradability and desired mechanical properties.

Vinyl ester resins

Vinyl ester resins (VERs) occupy a unique space within the thermosetting resin family. They combine the superior performance of epoxy resins with the processing advantages of polyesters.

There's a strong emphasis on developing high-performance vinyl ester resins (VERs) with specific functionalities. This is often achieved by strategically altering the chemical makeup of both the epoxy and vinyl ester components. Traditionally, VERs are synthesized through a reaction between an epoxy resin and methacrylic or acrylic acid. Research by Zhu et al.^[15] investigated incorporating flame-retardant elements into the VER structure by using a halogenated epoxy resin as the starting material. This chemical modification successfully introduces flame-retardant properties by promoting char formation during burning. By incorporating monomers containing silane groups, the researchers improved adhesion between the VER matrix and reinforcing fibers in composite applications.

The drive for sustainability is also influencing advancements in vinyl ester resin chemistry. Researchers are creating bio-based VER formulations using renewable resources for epoxy and vinyl ester components. Wai et al.^[16] explored synthesizing VERs using bio-based epoxides derived from vegetable oils. Their approach involves converting vegetable oils into epoxides, which react with bio-derived methacrylic acid to create a wholly bio-based VER. Importantly, Wei et al. demonstrated that these bio-based VERs maintained mechanical properties comparable to conventional formulations. Additionally, research by Dintcheva et al.^[17] investigated incorporating bio-based methacrylates derived from lactic acid, a renewable resource, within the vinyl ester structure. This research paves the way for development of entirely bio-based VER systems, promoting a more sustainable future for the vinyl ester resin industry.

Polyurethane resins

Due to their versatility, polyurethane (PU) resins have become a cornerstone in various industries. Their properties can be tailored extensively, offering a range of benefits like flexibility, toughness, and excellent adhesion.

Researchers focus on creating next-generation polyurethanes (PUs) with improved functionalities. This is often achieved by strategically altering the building blocks (monomers) used to form the PU backbone. Traditionally, PUs are created by reacting isocyanates with polyols. Research by Zhao et al.^[18] explored incorporating flame-retardant elements into the PU structure by using halogenated diisocyanates as starting materials. This chemical modification successfully introduces flame-retardant properties by promoting char formation during burning. Additionally, studies by investigated the use of specialized chain extenders with specific functionalities within the PU backbone. The researchers significantly improved the PU's thermal stability and mechanical strength by incorporating chain extenders containing aromatic groups.

Bio-based PUs derived from renewable resources are emerging as an eco-friendly alternative to traditional petroleum-based variants. Patel et al. ^[19] explored synthesizing PUs using bio-based polyols obtained from vegetable oils. Their approach involves chemically modifying vegetable oils into polyols, which can then react with isocyanates to create bio-based PUs. Importantly, Patel et al. demonstrated that these bio-based PUs maintained mechanical properties comparable to their conventional counterparts. Furthermore, research by Hai et al. ^[20] investigated incorporating bio-based isocyanates derived from renewable sources like castor oil. This research opens doors for creating entirely bio-based PU systems, paving the way for a more sustainable future in the PU resin industry.

Acrylic resins

Acrylic resins, renowned for their transparency, aesthetics, and durability, are vital in various sectors.

Creating high-performance acrylic resins with specific functionalities is a significant area of research. This often involves strategically modifying the building blocks (monomers) that form the acrylic backbone. Traditionally, acrylic resins are created through the polymerization of methacrylates and acrylates. Research by Pelras et al. ^[21] explored incorporating flame-retardant elements into the acrylic backbone by using halogenated acrylates as starting materials. This chemical modification successfully introduces flame-retardant properties by promoting char formation during burning. Likewise, studies investigated incorporating functional monomers containing siloxane groups within the acrylic polymer chains. By integrating these siloxane groups, the researchers significantly improved the resin's weatherability and scratch resistance, making it suitable for harsh outdoor applications.

Bio-based acrylic resins derived from renewable resources are emerging as an eco-friendly alternative to traditional petroleum-based variants. Liu et al. ^[22] explored synthesizing acrylic resins using biomass-derived methacrylates. Their approach involves converting biomass into methacrylate monomers, which can then be polymerized to create bio-based acrylic resins. Importantly, Liu et al. demonstrated that these bio-based acrylics maintained mechanical properties and transparency comparable to their conventional counterparts. Additionally, research by Y su et al. ^[23] investigated incorporating natural oils like linseed oil within the acrylic matrix. They integrated the natural oil into the acrylic polymer network through chemical modification, achieving a unique combination of self-healing properties and good mechanical strength.

Construction

1. High-Performance Adhesives for Advanced Construction Techniques:

Epoxy resins, known for their exceptional adhesion and chemical resistance, are finding new applications in advanced construction methods. Research by Liu et al. ^[24] explored toughened epoxy adhesives for bonding prefabricated concrete elements. These toughened adhesives exhibit improved flexibility and impact resistance, crucial for withstanding the stresses and strains experienced during construction and throughout the building's lifespan. Similarly, studies by Li et al. ^[25] investigated the use of bio-based epoxy adhesives derived from plant oils. This research promotes sustainability in construction by utilizing renewable resources while maintaining the strong adhesive properties essential for prefabricated building components.

2. Self-Healing and Self-Cleaning Coatings for Building Maintenance:

Polyurethane (PU) resins are being tailored to create smart coatings for building exteriors. These coatings offer superior protection against environmental degradation while incorporating self-healing and self-cleaning

functionalities. Research by He et al.^[26] explored the use of microcapsule-based self-healing PU coatings for building facades. These microcapsules contain healing agents released upon surface damage, promoting self-repair and extending the lifespan of the coating. Similarly, studies by Luo et al.^[27] investigated using photocatalytic PU coatings for building exteriors. These coatings utilize sunlight to break down dirt and pollutants on the building surface, promoting self-cleaning properties and reducing maintenance requirements.

3. Fiber-reinforced polymer (FRP) Composites for Seismic Retrofitting and Strengthening:

Epoxy resins are crucial components in FRP composites, which are increasingly used for strengthening existing buildings and improving their seismic resilience. Research by Zhang et al.^[28] explored using FRP composites for strengthening concrete columns in earthquake-prone regions. These FRP composites provide additional strength and confinement to the concrete columns, enhancing their ability to withstand seismic loads. Similarly, studies by Zhou et al.^[29] investigated using bio-based epoxy resins for FRP composites in building retrofitting projects. This research promotes sustainability in construction while maintaining the structural integrity and seismic resistance FRP composites offer.

Transportations

The transportation sector constantly seeks advancements in material science to achieve lighter, more robust, and more fuel-efficient vehicles. Resins, with their diverse properties and ongoing innovations, play a pivotal role in this transformation.

1. Lightweight Composites for Next-Generation Vehicles:

A key area of focus lies in utilizing resins to develop lightweight composites for car bodies, airplane fuselages, and other transportation components. Epoxy resins, known for their excellent mechanical strength and adhesion, are being reformulated. Research by Lin et al.^[30] explored the incorporation of carbon nanotubes (CNTs) within the epoxy matrix. These CNTs act as lightweight reinforcements, significantly reducing the composite's weight while maintaining or even improving its strength and stiffness.

2. Corrosion-resistant coatings for Enhanced Durability:

Resins are crucial components in developing robust and long-lasting protective coatings for vehicles. Polyurethane (PU) resins, known for their exceptional adhesion and flexibility, are precious in this regard. Research by Wang et al.^[31] explored the use of silane-modified PU coatings for car bodies. The silane modification enhances the coating's adhesion to the metal substrate and offers superior resistance to corrosion caused by salt spray and weathering. Similarly, Zhu et al.^[32] investigated self-healing PU coatings for vehicle undercarriage. These coatings incorporate microcapsules containing healing agents, allowing for self-repair of minor scratches, and extending the lifespan of the coating.

3. 3D Printing with Resins for Customized Transportation Components:

The burgeoning field of 3D printing presents exciting opportunities for the transportation industry. Specific resins are being tailored for compatibility with various 3D printing technologies, enabling the creation of complex and lightweight transportation parts. Research by Song et al.^[33] explored the use of UV-curable epoxy resins for 3D printing of customized airplane interior components. These UV-curable resins offer rapid printing speeds and high dimensional accuracy, making them suitable for the on-demand manufacturing of intricate parts.

Aerospace

The relentless pursuit of lighter, stronger, and more fire-resistant materials remains paramount in the aerospace industry. Resins, with their exceptional properties and ongoing innovations, are critical in pushing the boundaries of aerospace technology.

1. High-Performance Composites for Lighter and Stronger Aircraft Structures:

Epoxy resins are a cornerstone in developing advanced composite materials for aircraft components. Recent research focuses on enhancing their properties to meet the demanding requirements of aerospace applications. Studies by Wang et al. ^[34] explored the incorporation of high-modulus nanofibers within the epoxy matrix. These nanofibers significantly improve the composite's stiffness and strength-to-weight ratio, allowing for lighter and more fuel-efficient aircraft structures.

2. High-Temperature Resistant Resins for Engine Components:

Specific resin chemistries are being tailored for applications requiring exceptional thermal stability. Research by Wang et al. ^[35] explored the development of high-temperature epoxy resins containing thermally stable aromatic groups within the backbone. These resins can withstand the extreme temperatures experienced by jet engine components, improving engine performance and efficiency. Similarly, studies by Jing et al. ^[36] investigated using polyimide resins for high-temperature aerospace applications. Polyimides boast excellent thermal stability and are being explored for engine components like seals and gaskets.

3. Lightweight Ablative Coatings for Heat Protection:

Resins play a vital role in developing lightweight ablative coatings for spacecraft and hypersonic vehicles re-entering the atmosphere. Wu et al. ^[37] explored silicone-based ablative coatings reinforced with ceramic microspheres. These coatings offer superior thermal protection while maintaining low weight, crucial for spacecraft manoeuvrability and fuel efficiency. Similarly, studies by Cai et al. ^[38] investigated using self-healing ablative coatings for reusable spacecraft. These coatings incorporate microcapsules containing healing agents, allowing for self-repair of minor surface damage during re-entry and extending the lifespan of the spacecraft.

Consumer products

1. Durable and Stylish Coatings for Everyday Items:

Polyurethane (PU) resins are widely used for coatings due to their excellent scratch and wear resistance. Recent research focuses on enhancing their properties for even more demanding applications. Studies by Huang et al. ^[39] explored using UV-curable PU coatings for furniture surfaces. These UV-curable coatings offer rapid curing times and superior scratch resistance, which is ideal for high-traffic furniture surfaces. Similarly, research by Liu et al. ^[40] investigated the development of self-cleaning PU coatings for appliance surfaces. These coatings incorporate photocatalytic properties, utilizing sunlight to break down dirt and stains, reducing cleaning frequency and maintenance requirements.

2. Bio-Based Resins for Sustainable Consumer Products:

The drive for sustainability prompts the development of bio-based resins derived from renewable resources. Research by Krishnan et al. ^[41] explored using bio-based epoxy resins for printed circuit boards in consumer electronics. These bio-based resins offer an eco-friendly alternative to traditional petroleum-based variants while maintaining the necessary electrical properties.

3. 3D Printing with Resins for Personalized Consumer Goods:

The burgeoning field of 3D printing opens doors for customized consumer products. Specific resins are being tailored for compatibility with various 3D printing technologies, enabling the creation of complex and personalized objects. Research by Zhou et al.^[42] explored the use of high-resolution UV-curable epoxy resins for 3D printing of customized jewellery. These resins offer exceptional detail and clarity, allowing for the creation of intricate and personalized jewellery pieces.

Electronics

1. Advanced Encapsulation Materials for Miniaturized Electronics:

Epoxy resins remain the workhorse for encapsulating delicate electronic components. However, recent research focuses on enhancing their properties for even smaller, more powerful devices. Studies by Yang et al.^[43] explored the development of ultra-low-shrinkage epoxy resins for chip encapsulation. This minimal shrinkage minimizes stress on the encapsulated components, which is crucial for reliable performance in miniaturized devices. Similarly, research by Gaska et al.^[44] investigated the incorporation of thermally conductive fillers within the epoxy matrix. These fillers improve the resin's heat dissipation capabilities, a critical factor for managing the heat generated by high-performance electronics.

2. Flexible Substrates for Wearable Electronics:

Polyimide resins are being explored for their exceptional flexibility and thermal stability, making them ideal for wearable electronics. Research by Sahatiya et al.^[45] investigated using polyimide films as flexible substrates for printed electronics. These films offer a robust and flexible platform for mounting electronic components on wearable devices. Similarly, studies by Wang et al.^[46] explored the development of self-healing polyimide films for wearable electronics. These films incorporate microcapsules containing healing agents, allowing for self-repair of minor scratches or tears enhancing the durability of wearable devices.

3. High-Performance Dielectric Materials for Advanced Packaging:

Epoxy resins are also being tailored as dielectric materials in electronic packaging. These materials separate electrical conductors while minimizing signal loss. Research by Zhang et al.^[47] explored the development of low-dielectric constant epoxy resins for high-speed electronic devices. These resins minimize signal propagation delays, crucial for efficiently operating high-frequency electronic components. Similarly, studies by Cram et al.^[48] investigated using acrylic resins containing functional groups for improved adhesion to metal electrodes. This enhanced adhesion ensures reliable electrical connections within electronic packaging.

Conclusion

Resins are not merely industrial materials; they are silently revolutionizing consumer goods. Advancements in resin chemistry are leading to the creation of high-performance, sustainable, and personalized products. From durable coatings for everyday items to bio-based resins for electronics and 3D printable materials for customized goods, resins are transforming how we interact with the products that shape our daily lives. As research explores the potential of resins, we can expect even more innovative applications to emerge, defining the future of consumer products and their impact on our lives.

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Marketing Bulls Eye

A Series On Marketing Strategies

Stp Strategy

Implementing segmentation, targeting, and positioning (STP) in the context of industrial products requires a strategic approach tailored to the unique characteristics of the industrial market. Here's how it can be done:

1. *Segmentation*:

- *Demographic Segmentation*: Industrial markets can be segmented based on factors such as industry type, company size, and geographic location. For example, companies may target specific industries like automotive, aerospace, or pharmaceuticals.
- *Behavioural Segmentation*: Segments can also be identified based on purchasing behaviour, usage patterns, or decision-making processes. Some companies may prioritize segments that value quality, reliability, or cost-effectiveness.
- *Needs-Based Segmentation*: Identify different customer needs within the industrial market, such as those related to efficiency, customization, technical support, or sustainability.

2. *Targeting*:

- *Evaluate Segment Attractiveness*: Assess the potential profitability, growth opportunities, and competitive landscape of each segment. Consider factors like market size, growth rate, buying power, and barriers to entry.
- *Select Target Segments*: Choose one or more segments that align with the company's capabilities, resources, and strategic objectives. Focus on segments where the company can provide superior value and gain a competitive advantage.
- *Develop Target Profiles*: Create detailed profiles of target customers within chosen segments, including their needs, preferences, buying criteria, and decision-making processes.

3. *Positioning*:

- *Identify Competitive Advantages*: Determine the unique value proposition and competitive advantages that the company can offer to its target segments. This could include factors like product quality, technical expertise, reliability, innovation, or customer service.
- *Develop Positioning Strategies*: Craft messages and communication strategies that emphasize the company's strengths and differentiate its offerings from competitors. Position the industrial products as solutions that address specific customer needs and challenges.
- *Tailor Marketing Mix*: Adapt marketing tactics, pricing strategies, distribution channels, and promotional activities to resonate with the selected target segments. Provide relevant content, technical information, and support to meet the needs of industrial buyers.

Overall, successful implementation of STP in industrial marketing requires a deep understanding of customer needs, competitive dynamics, and industry trends. By effectively segmenting, targeting, and positioning industrial products, companies can enhance their market relevance, drive customer satisfaction, and achieve sustainable growth in the industrial marketplace.



Press Release

Grasim Industries boosts the total capacity of Advanced Materials to 246,000 tons' per annum

The plant expansion in Gujarat will enhance operational efficiency and meet growing demands. Grasim Industries Limited, the flagship company of Aditya Birla Group, in its Chemical business formally inaugurated the expansion project of 123,000 tonnes of Epoxy resins and formulation capacity at Vilayat, Gujarat boosting the overall capacity of Advanced Materials to 246,000 tonnes per annum. The expansion marks a crucial turning point for the Advanced Material business to establish itself as a significant player in the worldwide epoxy materials market, driven by ambitious growth strategies.

While emphasizing the pivotal role that advanced materials, particularly epoxy resins, plays in propelling India's imminent industrial growth, Mr. Jayant Dhobley, Business Head of Global Chemicals, Fashion Yarn & Insulators, Aditya Birla Group, said, "The demand for advanced materials like specialty chemicals tends to grow faster than the GDP, especially in consumption-based economies like ours. This expansion not only demonstrates the Chemical business steadfast commitment to innovation and sustainability but also reaffirms our dedication to strengthen the industrial and chemical sectors in Gujarat and throughout India."

Acknowledging the collective efforts of employees, customers, and vendors that have contributed to the success of the Advanced Material business, Mr. Rajesh Balakrishnan, CEO Advanced Materials, Aditya Birla Group, said, "The enhanced facility aims to establish new benchmarks in operational effectiveness, integrating industry leading safety protocols and sustainable approaches such as implementing solvent-free technology, minimizing water usage and waste production, and a commitment to utilize renewable energy sources."



Left to Right :Mr. B. Venkataraman - President, Global Head – Sales & Marketing, Advance Materials, Mr. Pavan K. Jain - CFO , Grasim Industries Limited, Mr. Rakesh Chokshi - Joint President & Unit Head, Advance Materials, Mr. Jayant Dhobley - Business Head of Global Chemicals, Fashion Yarn & Insulators, Aditya Birla Group, Mr. Rajesh Balakrishnan - Chief Executive Officer-Advance Materials, ABG, Mr. Naresh Satani, Functional Head – Technical, Advance Materials, Mr. Bipin Patel - Project Head, Advance Materials

MINISTRY OF FINANCE**(Department of Revenue)****NOTIFICATION**

New Delhi, the 16th May, 2024

No. 08/2024-Customs (ADD)

G.S.R. 278 (E).—Whereas, in the matter of “Pentaerythritol” (hereinafter referred to as the subject goods), falling under tariff item 2905 42 90 of the First Schedule of the Customs Tariff Act, 1975 (51 of 1975) (hereinafter referred to as the Customs Tariff Act), originating in, or exported from China PR, Saudi Arabia and Taiwan (hereinafter referred to as the subject countries) and imported into India, the designated authority in its final findings, *vide* notification F. No. 06/04/2023-DGTR, dated the 20th February, 2024, published in the Gazette of India, Extraordinary, Part I, Section 1, dated the 20th February, 2024, has come to the conclusion, *inter alia* that-

- (i) the product under consideration has been exported to India at a price below normal value, thus resulting in dumping;
- (ii) the domestic industry is suffering material injury;
- (iii) the material injury suffered by the domestic industry has been caused by the dumped imports from subject countries,

and has recommended imposition of anti-dumping duty on imports of the subject goods, originating in, or exported from the subject countries and imported into India, in order to remove injury to the domestic industry.

Now, therefore, in exercise of the powers conferred by sub-sections (1) and (5) of section 9A of the Customs Tariff Act read with rules 18 and 20 of the Customs Tariff (Identification, Assessment and Collection of Anti-dumping Duty on Dumped Articles and for Determination of Injury) Rules, 1995, the Central Government, after considering the aforesaid final findings of the designated authority, hereby imposes on the subject goods, the description of which is specified in column (3) of the Table below, falling under the tariff item of the First Schedule to the Customs Tariff Act as specified in the corresponding entry in column (2), originating in the countries as specified in the corresponding entry in column (4), exported from the countries as specified in the corresponding entry in column (5), produced by the producers as specified in the corresponding entry in column (6), and imported into India, an anti-dumping duty at the rate equal to the amount as specified in the corresponding entry in column (7), in the currency as specified in the corresponding entry in column (9) and as per unit of measurement as specified in the corresponding entry in column (8) of the said Table, namely :-

TABLE

S. No.	Tariff item	Description of goods	Country of origin	Country of export	Producer /exporter	Amount	Unit of measurement	Currency
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	2905 42 90	Pentaerythritol	China PR	Any country including China PR	Any	345.15	MT	USD
2.	2905 42 90	Pentaerythritol	Any country other than China PR	China PR	Any	345.15	MT	USD
3.	2905 42 90	Pentaerythritol	Saudi Arabia	Any country including Saudi Arabia	Any	300.15	MT	USD
4.	2905 42 90	Pentaerythritol	Any country other than Saudi Arabia	Saudi Arabia	Any	300.15	MT	USD
5.	2905 42 90	Pentaerythritol	Taiwan	Any country including	Any	499.01	MT	USD

				Taiwan				
6.	2905 42 90	Pentaerythritol	Any country other than Taiwan	Taiwan	Any	499.01	MT	USD

2. The anti-dumping duty imposed under this notification shall be levied for a period of five years (unless revoked, superseded or amended earlier) from the date of publication of this notification in the Official Gazette and shall be payable in Indian currency.

Explanation.- For the purposes of this notification, rate of exchange applicable for the purpose of calculation of such anti-dumping duty shall be the rate which is specified in the notification of the Government of India, in the Ministry of Finance (Department of Revenue), issued from time to time, in exercise of the powers conferred by section 14 of the Customs Act, 1962 (52 of 1962), and the relevant date for the determination of the rate of exchange shall be the date of presentation of the bill of entry under section 46 of the said Customs Act.

[F. No. CBIC-190354/56/2024-TRU Section-CBEC]

NITISH KARNATAK, Under Secy.

EVENTS

IRMA Impact lecture on changing geopolitics and supply chain management

INDIAN Resin Manufacturers Association (IRMA) recently organised its “IRMA IMPACT” series of lectures on 12th April 2024. at the Chembur Gymkhana, Mumbai. Two eminent experts were invited to share their knowledge with the Members.

Mr. Hiren Shah, president, IRMA welcoming the members and guests, gave a brief background to the IRMA IMPACT series of lectures and the topics. Mr Ashay Mehta, introduced the speakers.



Hiren Shah

Mr. Nimesh Rathod, the first speaker talked on the subject “Economise Geopolitical Impact on business”. Mr. Nimesh Rathod an B.E. (Electrical), SIBM – MBA & Harvard (HBS), is a Thinking Catalyst with expertise in Business Coaching Macroeconomics, Finance, Negotiation skills etc.



Nimesh Rathod

In his talk he unravelled the geopolitics of the global economy and the dominance of the US dollar and the forces behind it that would go to any extent to maintain this dominance. He also explained how the rising imports of gold had a huge impact on business taking risk and also inflation. He also explained the relation between dollar's strength

and gold rates.



Jeevan Pawar

Mr. Jeevan Pawar the second speaker spoke on 'Disruption in Global Supply Chain and Impact on our business'. Mr Pawar, an IIM Mumbai (NITIE) & Mechanical Engineering, MBA in Supply Chain Management from Mumbai University is the

Global Head Supply Chain – Aditya Birla Advanced Materials Business.



IRMA impact seminar

In his presentation, he shared his observations on the global supply chain. “We are living in a VUCA world, Global supply chain pressure index developed by the US Federal authorities is a composite index which one can keep a tab on regularly. Currently we are approaching a stable period. He discussed the recent disruptions or choke points in the supply



View of the audience

logistics which affected the larger way to the economy and the lessons to be learnt from them. We need to do risk mapping -identify the risk; assess these risks and keep monitoring and report. We need to track the right suppliers based on the Kraljic segmentation chart," he said. In the end he said that it is high time for end to end supply chain digitalisation by identifying the low investment, high impact areas for digitalisation; ensuring data accuracy and analytics, integrating business planning with Digital twins, TMS, WMs as the control tower.



Aditya Chandrachud

Both the lectures were highly interactive with the participants raising questions which were ably fielded by the speakers.

Mr Aditya Chandrachud, vice president IRMA gave the vote of thanks and was followed by fellowship with cocktail dinner.

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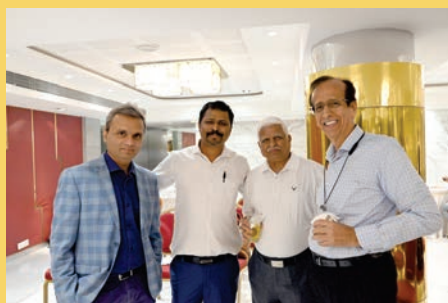
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RAW MATERIAL SCENARIO

- Compiled by Hiren Shah

Rates are per KG for bulk buying. Rates prevailing as on 12/5/2024

Phthalic	-	114₹
Pentaerythritol	-	145₹
Glycerine tanker	-	56₹
Benzoic acid	-	105₹
Maleic anhydride	-	98₹
Gum Rosin Indonesia	-	100₹
Sorbitol tanker (70%)	-	42₹
Fatty acids (130IV)	-	95₹
Mix xylene	-	89₹
Soya oil	-	94₹
Linseed oil	-	96₹
Castor oil	-	116₹
Slop oil reliance	-	75.50₹

all prices are Ex Bhiwandi basis or Freight extra basis

** Disclaimer: Every effort has been made to provide information that is current and accurate.

WELLNESS CORNER

In today's daily hectic and volatile life, maintaining a healthy body and a positive mind is the key to happiness and the overall wellbeing. Today's lifestyle, quality of the products, pace of work, exposure to media and rapidly changing scenarios are taking a toll of health of all especially the elder generation. Our elder generation have seen times of organic and unadulterated food, cleaner air, active lifestyle due to limited resources available for transportation, communication, to name a few. Such rapid changes have come as a shock and sometimes overwhelming technology changes are giving nervousness and pressures to the elderly. These changes cannot be avoided hence it is important for all to work towards a good health.

Focus on activities like low-impact exercises, stretching, and balance training to stay physically active. A balanced diet rich in nutrients is essential, and regular health check-ups can help catch any issues early. Engaging in social activities and keeping the mind active through hobbies or learning can also contribute to overall well-being.

For seniors and young alike, a balanced diet is key. Aim for plenty of fruits, vegetables, whole grains, lean proteins, and healthy fats. Consider incorporating foods rich in Calcium (like Milk, Yogurt, Cheese, Tofu, Almonds , Leafy greens like Spinach and kale , Fortified Cereals) and vitamin D (Exposure to Sunlight , Dairy products, Orange juice , cereals , fortified food , etc) for bone health, and foods high in fibre (Berries, Apples, Pears, Oranges, Broccoli, Carrots, Sprouts, Oats, Quinoa, Barley, Brown Rice, beans, chickpeas, lentils) to support digestion and maintain healthy weight. Also, watch sodium intake and stay hydrated. Consulting with a nutritionist can help tailor a diet plan to individual needs and any health conditions.

STAY HEALTHY , STAY HAPPY

