

PLASTICS INDIA

A journal for the growth and development of plastics trade & industry

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Dear Friends,

Wish you a happy and productive new Government. If all goes smoothly, then a new central government will be sworn in the immediate future. Two long months of speculation, religiously following the news and heated debates with friends all came down to one fruitful day. What an anticlimax!



And now that the general elections and IPL are both out of the way, we can finally get down to business. The business of polymers and making money while we make the world a better place. Polymer prices have been quite volatile of late. While some polymers have been flat or seeing a decreasing trend, PVC is the sole polymer that seems to be seeing a continuous increasing trend that beats the sizzle outside your windows. This instability has brought joy to some and pain to others. For those currently suffering, do remember that every business has its cycles and your day will come too.

If polymer prices and the heat outside are getting to you then now is the best time to head for the hills or perhaps even overseas, where the slings and arrows of outrageous summer cannot get to you. If you cannot step out of Kolkata then indulge in the one grace of summer that manifests itself in the form of succulent mangoes. If only polymers were this widely popular, we would all be perpetually making money!

Do write to us at IPF and Plastics India expressing your suggestions for improving the experience and positive feedback if you liked what you saw. If we incorporate your essay in our next publication, you will receive a small token of appreciation. Mails must be addressed to me and mailed to office@ipfindia.org



Harsh V. Agarwala
Co-Editor

Presidential Address

Dear Friends & Colleagues,

By the time this volume of Plastics India is in your hand the election results will be declared and a new government may take over the reins of running the country for another five years. This will be followed by the World Environment Day on 5th June 2019 when people will once again hear a hue and cry on how plastics is damaging the environment. The competitors of the plastics industry will also pressurize the new government to raise additional taxes on plastic raw materials to make the sector less competitive, besides the misplaced environmental hazards. In this volume I would like to share some views on plastic bottles, that have replaced glass and metal bottles, as the material of choice and its disposal.



Due to the favorable properties, plastic bottles have now become the norm in the packaging of a wide variety of substances. However, most plastics are not biodegradable, which leads to the generation of significant volumes of plastic waste, which can be neither buried nor incinerated without causing severe environmental problems. As a result of this situation, the global plastic bottle recycling market is likely to post a steady growth rate in the coming years. Bottle Recycling could be resolved by their rising use in clothing amid recycling cost constraints. Plastic bottle recycling has emerged as a key topic in recent years due to the steady acknowledgment of the adverse effect of the increasing volume of plastic waste generated by humans.

The global plastic bottle recycling market is divided into polyethylene terephthalate (PET), polypropylene and high-density polyethylene (HDPE). Of these, PET bottles are the leading segment of the plastic bottle recycling market, as it has become the material of choice in the food and beverages industry, which is making the most of the rise in the demand for packaged food and beverages. HDPE bottles are also likely to hold a key share in the global plastic bottle recycling market in the coming years.

Geographically, North America is likely to dominate the global plastic bottle recycling market in the coming years thanks to the steady prospects for the market in the U.S. The U.S. has a comprehensive recycling system for plastic bottles due to the rising awareness among the citizens about the ill-effects of plastic waste, and the presence of several leading consumers of plastic bottles, such as Coca Cola. Government support to the adoption of plastic bottle recycling has also been forthcoming in the U.S. Apart from the environmental benefits of recycling plastic bottles, there are significant economic benefits of plastic bottle recycling, which are being stressed upon. The campaign is intended to illustrate the nature of plastic bottle recycling and its benefits to the community. A popular apparel brand recently started selling clothes made from recycled plastic bottles. The use of recycled plastic bottles in clothing is likely to receive increased demand in the coming years.

Plastic bottle recycling is a complicated and expensive process, which could restrain this recycling market's growth in some regions. The key difficulty in plastic bottle recycling is that different plastic polymers cannot be mixed and have to be separated before being used again. Despite steady research into developing compatible plastic polymers, this is likely to remain an influential restraint on the global plastic bottle recycling market in the coming years.

With warm regards,

A handwritten signature in black ink, appearing to read 'Alok Tibrewala'. The signature is written in a cursive, slightly slanted style.

Alok Tibrewala
President

Secretary Message

Dear PLASTIZENS,



1. The Federation is in the process of completing ROC formalities of elected and co-opted members as Directors and Additional Directors of the Federation. Past Presidents by default are Additional Directors of the Federation, if they so desire.
2. Founder member's annual membership subscription has been sent to Plastindia Foundation, Mumbai. The annual membership subscription of Bharat Chamber of Commerce, Kolkata, Bengal National Chamber of Commerce and Industry and Confederation of Indian Industry, Eastern Region, Kolkata has also been paid.
3. Emails have been sent to all members requesting them for updating their membership particulars for inclusion in our database.
4. SPE India in cooperation with SPE USA is organising an International Conference on "Plastic Pipes 2019" at Hotel Leela, Mumbai from November 21 – 22, 2019. In this connection the organizers have requested the Federation to extend logo support in all their promotions stating as "Supported by". On their request the Federation has extended its logo support without any financial obligations.
5. Govt. of Jharkhand are in the process for making a Polypark at Deoghar on 100 Acres of Land. For this reason Mr. Jayanta Bandyopadhyay, Executive Secretary, IPF alongwith Janab Neyaz Ahmed representative of Department of Industries, Govt. of Jharkhand visited IPF Knowledge Centre at Polypark, Sankrail, Howrah and visited 3-4 Industries over there to understand the procedures and other modalities followed for allotment of plots and their terms and conditions.
6. The Federation has received information from reliable sources that Indian Chemical Council has made a proposal/suggestion/representation to the Union Government requesting them to impose higher custom duties on import of plastic raw materials that would put plastic units, most of which are in the MSME category, into a very disadvantageous position. In this connection, the Federation has sent a Memo to the Ministry of Commerce & Industry, Government of India, expressing its reservation at any such move by the Union government. The Federation in its memo further stated that on the contrary duties on raw materials viz. Naptha, EDC, VCM and Styrene monomer need to be reduced since their serve as growth engines to drive the national economy.
7. A letter has also been sent to the Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilisers, Government of India requesting them to incorporation the name of Indian Plastics Federation on the list of Expert Committee for framing of BIS standards for plastic industry.

With warm wishes

A handwritten signature in black ink, appearing to read 'Manish G. Bhaia'.

Manish G. Bhaia
Hony. Secretary

SEMINAR CUM TECHNICAL LECTURE ON “HOW TO READ AND UNDERSTAND RAW MATERIAL TEST CERTIFICATES”

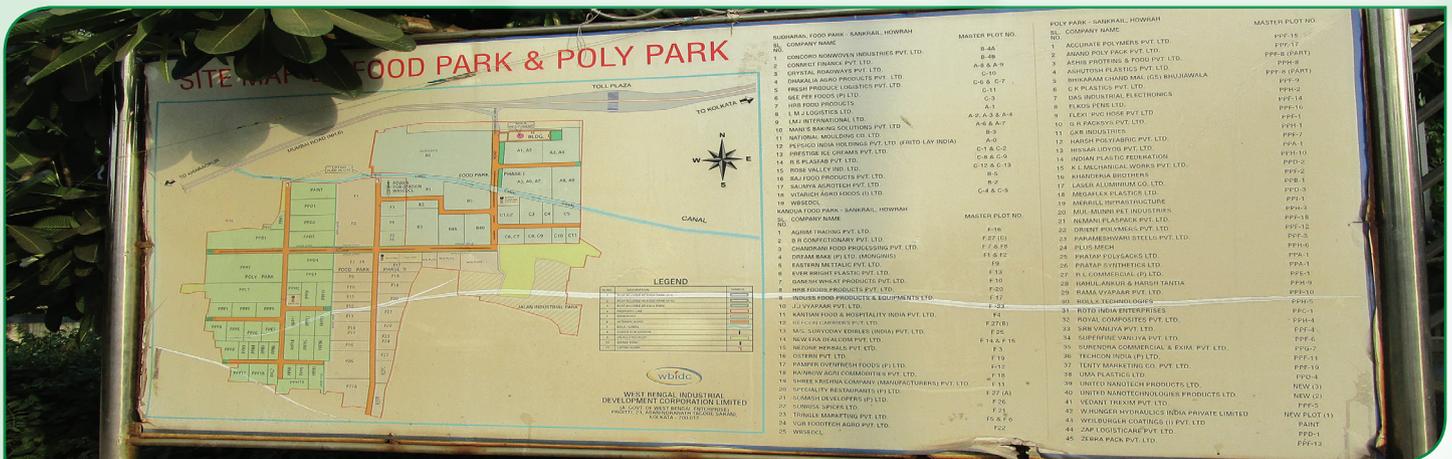
A Seminar cum Technical lecture on “How to read and understand raw material test certificates” jointly organised by Indian Plastics Institute (Kolkata Chapter) and Indian Plastics Federation was held on Friday the 26th April 2019 from 3:30 p.m. to 6:00 p.m. at IPF Conference Hall, 8B, Royd Street, 1st Floor, Kolkata - 700016.

The Speaker was Mr. Raj Dutta of Haldia Petrochemicals Ltd. The seminar was well attended by the members of IPI and IPF.



VISIT OF POLYPARK, HOWRAH WITH GOVT. OF JHARKHAND PEOPLE

Govt. of Jharkhand are in the process of making a Polypark at Deoghar on 100 Acres of Land. For this reason Mr. Jayanta Bandyopadhyay, Executive Secretary, IPF alongwith Janab Neyaz Ahmed representative of Department of Industries, Govt. of Jharkhand visited IPF Knowledge Centre at Polypark, Sankrail, Howrah and visited 3-4 Industries over there to understand the procedures and other modalities followed for allotment of plots and their terms and condition and subsidies etc.



PRESSURE TO REDUCE CONSUMPTION OF SINGLE-USE PLASTIC PACKAGING WILL CONTINUE INTO 2019

It's not hard to pinpoint the trends and issues that will impact the plastics industry in 2019—in many cases, they will be the same challenges that the industry has faced for the past two decades. While plastics usage in durable goods isn't so much a focus of those wanting to rid the world of plastic waste, packaging and water bottles will be under increased pressure thanks to a harsher light being thrown on plastics in the marine environment.

There's also more noise about how recycling isn't working, evidenced by low recycling rates and a lack of infrastructure, particularly in developing countries in the Asia-Pacific region, where most of the plastic waste is entering the Pacific Ocean.

According to figures from various sources, 40% of all plastic ends up as packaging for thousands of consumer goods, which is typically used once and discarded. The many benefits of plastic makes it ideal for safety, freshness, a longer shelf-life, light weighting for transportation and fuel savings, and even creating better health for populations around the world.

Last spring, the Washington-based American Chemistry Council's (ACC) Plastics Division announced three goals it says "crystallize U.S. plastics producers' commitment to recycle or recover all plastic packaging used in the United States by 2040." These goals for capturing, recycling and recovering plastics before they enter the environment are:

100% of plastic packaging to be re-used, recycled or recovered by 2040;

100% of plastic packaging used should be

recyclable or recoverable by 2030; and 100% of the U.S. manufacturing sites operated by ACC's Plastics Division members will participate in Operation Clean Sweep-Blue (designed to minimize pellet, flake and powder loss) by 2020, with all of those manufacturing sites in North America involved by 2022.

While all of that sounds promising for creating the circular economy that everyone wants as a solution to plastic waste, how do we get these discarded, single-use items—particularly water bottles—into a value stream that captures the benefits and value of plastic waste and creates greater usefulness?

Bottled water is big business

While bottled water is in for consumers, plastic water bottles are out, according to numerous news reports that say consumers are becoming more concerned about the plethora of water bottles floating around in the ocean. Bottled water companies, which are enjoying a boom as consumers turn away from sugary drinks and avoid drinking tap water, are trying to come up with a better bottle. But that doesn't look promising, according to a recent article in the Wall Street Journal, "Bottled Water Confronts Its Plastic," by Saabira Chaudhuri.

U.S. bottled water consumption rose by 284% between 1994 and 2017. Most of that growth was driven by single-serve bottles, which make up 67% of U.S. sales, but recycling rates of those bottles are down, said the WSJ article. Some people are turning to reusable bottles—either metal or glass—but they have their downsides, as well.

A recent study published by Fact.MR, "Reusable Water Bottles Market," projected that this market will see a 3.1% year-on-year increase over 2017, exceeding US \$8.3 billion by the end of this year. "The study remains bullish on the continual rise in demand for reusable

water bottles, as growing environmental concerns are driving consumers as well as end-use industrial sectors to switch to eco-friendly alternatives for single-use water bottles," said Fact.MR.

With recycling rates for PET water bottles at around one-third of all bottles made, that leaves a lot of PET out there needing to be recycled into something—carpets and other textiles, but rarely back into food-grade PET for more water bottles. In fact, a joint report from the Association of Plastic Recyclers (APR) and the American Chemistry Council shows that plastic bottle recycling declined slightly in 2017, slipping 3.6% to 2.8 billion pounds. The overall recycling rate for plastic bottles for the year was 29.3%, down from 29.7% in 2016.

Factors contributing to industry challenges included changing export markets and a 3.6% drop in material collected for recycling. Ongoing increases in single-stream collection also led to increased contamination of recyclables in the near term, said the report. In addition, growth in the use of plastic bottles was offset by continuing progress in light weighting and increased use of concentrates with smaller, lighter bottles.

In 2017, PET bottles collected for recycling decreased by 27 million pounds. The collection of high-density polyethylene (HDPE) bottles, which includes bottles for milk, household cleaners and detergents, fell by 70.3 million pounds (6.3%) to just over one billion pounds for the year. The recycling rate for HDPE bottles slipped from 33.4% to 31.1%.

"Plastic bottle recycling is proving to be resilient in the face of short-term challenges," said Steve Alexander, president of APR. "The recycling industry is responding in kind, with some investing in increased U.S. infrastructure, a clear sign of a positive long-term outlook. These investments underscore the need

for continued consumer participation and convenient access to recycling programs.” The low rates of recycling could put a damper on the use of recycled materials that are needed to help bottle makers reduce the amount of virgin resin and contribute to consumers’ desire for “green” bottles made with recycled material.

Europe does a bit better than the United States when it comes to collecting and recycling PET. A 2017 survey of the European PET recycling industry, released on Dec. 19, 2018, shows that 58.2% of PET bottles were collected out of 3,308,300 tons of PET bottles placed on the European market in 2018. “PET collection and recycling rates are exceptional in the plastics packaging industry, which shows the important role of the material in the circular economy,” summarized Christian Crépet, Executive Director of Petcore Europe.

Recycling fail

The WSJ article noted that while many bottlers of water are using a percentage of recycled PET in their bottles, consumers want 100% recycled bottles. That isn’t possible for several reasons, including the fact that plastic loses its structural integrity and clarity after being recycled numerous times. That is why virgin resin is combined with a percentage of recycled material to add eco-friendliness while maintaining structural properties.

Growing concern over waste plastic and a heightened ongoing war against plastic is resulting in many consumers shifting away from single-use water bottles toward reusable ones, primarily metal and plastic, since glass is too fragile. Additionally, as Fact.MR pointed out, “Metal and glass are costlier than plastic, which is why a majority of manufacturers in the reusable water bottles market are choosing plastic as a primary raw material,” said the report. “This also enables reusable water bottle manufacturers to reduce the production

cost and maintain competitive prices.”

Talk of collecting more PET water bottles to increase recycling rates by implementing deposit schemes arises from time to time. Paying consumers to return their plastic water bottles to the store might work as an incentive to consumers. It worked with glass soda bottles back in the 1950s and 1960s. It works today with glass milk bottles from local dairies; however, you pay a \$2 deposit when you buy the milk, which is refunded when you return the bottle. Two dollars is a large enough amount to serve as an incentive. Five cents was a nice amount in the 1950s, and finding a glass soda bottle or two in the ditches along roadways meant trading a bottle for a Snickers bar . . . or another bottle of soda! What is the deposit value of a PET water bottle? Would it be enough to encourage people to take their water bottles back to the store?

Stories about recycling in the news media all seem to point to one thing: Recycling isn’t working as planned, so we have to get rid of plastics. Plastic pollution is targeted as the biggest environmental problem we face. We’re constantly being told of its “devastating” effects, as in a half-hour 60 Minutes piece on Dec. 16. The segment showed video after video of “rivers” of plastic waste in the Philippines and on the beaches of Midway Island, which is hundreds of miles from any heavily inhabited country. The solution offered in this segment? Get rid of single-use plastics.

Reducing the amount of virgin resin in manufacturing bottles is seen as one answer to the perceived lack of recycling success. Don’t make as much single-use plastic stuff like water bottles that end up as waste in the environment, they say. According to Pat Snap’s latest report, “Sustainable Packaging Innovation and R&D Trends: the scramble to scrap single-use plastic,” regulation is forcing companies to reduce their usage of virgin plastics. Pat Snap is a firm specializing in

patent search, innovation intelligence and intellectual property analytics. “Regulation from China saw the ban on importing waste plastics begin in December 2017,” the report noted. “In January 2018, the European Union (EU) announced it aims to make all plastic packaging in the EU recyclable by 2030.”

While it might be possible to make all plastic packaging recyclable in the EU and, indeed, worldwide, that does not mean that all plastic packaging will be recycled. That’s because you still have the human element involved. Even if all plastic packaging is recyclable, humans must take the responsibility to get the recyclable plastic packaging into the proper waste stream to ensure that it is recycled. And that’s the real problem!

Pat Snap’s report said that its analysis of current intellectual property filings of modern innovators in sustainable packaging and PET recovery found that these areas “are crying out for innovation. Companies filing in this space could go on to control the growing market for recyclable and re-usable plastics used in packaging.”

Providing examples, Pat Snap noted that “Mondelez International announced that it will make all of its packaging recyclable by 2025, as the company aims to reduce waste levels and create a circular economy for packaging.” PepsiCo signed a multi-year supply agreement with Loop Industries to incorporate Loop’s plastic into its product packaging by early 2020. Nestlé announced its “ambition” to make all packaging recyclable or reusable by 2025.

“While PET recovery has seen an uptick in patent filings in 2016, it is clear there is no real trend in search queries, which may indicate an industry that is innovating at pace,” said PatSnap. “This is perhaps not so surprising when considering that this is an issue which companies are facing due to

regulatory change.”

The most number of patents filed for the recovery or working-up of waste plastic materials were filed in 2017 and 2018. “For the area of recovery or working-up of waste materials there have been only a small number of filings over the past 10 years, and many of these areas have seen no patenting activity. The top companies patenting innovations in this area include Toray Industries, Eastman, Teijin, DuPont and Arkema. “Loop Industries Inc., appears to be the most prolific new entrant in this PET recovery and up-working area,” said PatSnap. Loop Industries holds a patent that uses a chemical recycling process to break down waste PET and polyester into their monomer building blocks, resulting in resin that is the “same quality as virgin feedstock, and one that meets FDA requirements for use in food-grade packaging.”

While these are admirable goals, making all plastic recyclable in order to reduce the need for more virgin resin will not guarantee that all single-use items will be recycled. Will those goals to make all packaging recyclable result in higher recycling rates, from the current one-third to maybe 50%? And will the other 50% continue to end up in landfills, or worse, in the marine environment? I can almost guarantee that “recyclable” plastic packaging will continue to be found floating in the world’s marine environment. The European PET Recycling Survey 2017 noted that other problems also interfere with the recyclability of PET, including the quality of the material. The survey outlines an increase in PET trays and opaque materials in clear and transparent PET bales. Even though the products are recyclable they have a negative effect on the quality of the reprocessed flakes. The share of PET trays in clear bales is different from country to country, ranging from 1% to 18%. The same goes for trays and opaque bottles in mixed color bales,

where the share ranges from 1% to 25%. “It has to be mentioned that this opaque and difficult-to-recycle PET material should be collected in separate streams,” noted the executive summary of the Pet core Europe survey.

With an actual processed PET amount of 1,741,700 tons and an installed maximum capacity of 2,038,100 tons in 2017, there was an unused capacity of 296,400 tons caused by several reasons, one of them being the quality of the collected PET. Additionally, insufficient quantity of collection was observed—a lack of 115,000 tons in 2017. In its Dec. 12 newsletter, Pet core acknowledged that the success of “ambitious sustainability targets” will require not only the industry but the “support of national authorities, European legislators and consumers alike. More collection and better sorting are needed to increase recycling and incorporate recyclate into new products.” (Detailed survey results will be presented during the annual Petcore Europe Conference 2019 in Brussels on Feb. 6 and 7.)

It’s one thing to say that “more collection and better sorting” will provide a solution to ridding the environment of plastic waste and putting more recyclate into the resin stream (rPET in particular), but getting the PET bottles and other single-use packaging waste into the recycling stream remains the most difficult part of achieving these goals. Collection, sorting and cleaning the waste to make it fit for recycling is labor and energy intensive. At the end of the day, how much have we actually accomplished in terms of reducing the carbon footprint, the ultimate goal of this whole effort?

Sustainability as a market driver

A study by IHS Markit Chemical and Energy sector in that research company’s 2018 Issue 3 newsletter noted that sustainability is a “critical plastics market driver.” According to Nick Vafiadis, Vice President, Plastics, IHS Markit, “A clear

shift is developing the approach toward sustainability, as the movement transitions from reactive to proactive mode.” Extended Producer Responsibility (EPR) was cited in the study as one of the proactive approaches to increase the circularity of plastics. EPR “levies fees on packaging . . . that are paid by manufacturers,” explained Vafiadis. “These fees are used to develop recycling infrastructure and encourage the recycling of content. EPR policies are currently either in effect or targeted for near-term implementation in Europe, North America, China and India. Presently there are no packaging EPR programs in effect in the U.S., although we expect to see programs adopted by 2025.”

The ACC noted that it intends “to further enhance plastic pellet stewardship by 2022,” which is also good. Resin producers and processors are doing a much better job of controlling resin pellets and keeping them out of the environment.

Levying fees on producers, as I see it, is only the beginning. We still need people to accept responsibility for getting their plastic bottles and other single-use packaging into the recycling stream. However, that must be easy and convenient, which might mean moving toward alternatives to sorting and cleaning the collected plastic waste which is not very energy efficient or “green.”

Recycling alternatives

According to IHS Markit, “only about 4% of the plastic packaging used globally is ultimately delivered to recycling plants, while a third is left in various ecosystems, and 40% ends up in landfill.”

The challenge, as noted above, involves humans and their handling of the single-use plastic bottles and other containers once the product has been consumed. There is also issue of the quality/cleanliness of the recyclate. Even U.S. cities that have good recycling infrastructure, including

curbside pick-up, sorting and baling, send a large percentage of the materials that are recyclable to the landfill.

If recycling systems are not a viable option for many cities or even developing countries, what about waste-to-energy (WTE) or plastic-to-fuel? The value of plastic does not lie just in its ability to be recycled into other plastic products, but also in its inherent energy content. Many developing countries could use greater energy production and I can foresee the mountains of discarded plastic being an excellent source of energy. It also simplifies the process by allowing co-mingling of all types of plastics (the greatest value) along with other waste materials. That is something that consumers also want—simplification in the identification and sorting process—which WTE addresses.

Plastics that are considered “trash” (#3 to #7 bales) can also be taken to companies that provide plastic-to-fuel processing, according to Mike Dungan, Director of Sales and Marketing for RES Polyflow LLC. Its patented plastics-to-fuel process complements current recycling efforts by converting low-value, co-mingled plastic waste, such as film and flexible packaging, into marketable petroleum blend stocks like fuels and wax. Dungan noted that RES Polyflow is getting a “high degree of cooperation and interest” in its process, “since plastic-to-fuel creates a new market for the residual plastics generated by a typical material recycling facility (non 1s and 2s),” he told *PlasticsToday*. “They generally consider a #3 to #7 bale to be trash,” he commented. “We see it as a bar of gold, chock full of hydrocarbons that can be repurposed efficiently. We don’t combust or incinerate, and we accept a broad range of somewhat contaminated material, and we produce feedstocks for other processes.”

Sustainability in 2019

Aggressive policies to regulate the use of single-use plastic packaging and bottles—even outright bans—are likely to be in the industry’s future. IHS Markit’s Vafiadis notes that these moves will create “significant investment risk and market uncertainty. This is especially significant for plastics producers, processors and consumer packaging companies that must invest now for the future.”

Resolving the issue of plastic waste in the environment isn’t easy and there’s no silver bullet. Blaming the material and banning it from use only results in alternatives that do not provide high levels of food safety, shelf life and convenience, not to mention that plastics are more economical and eco-friendly to produce and maintain their high value after their useful life through recycling, waste-to-energy and plastics-to-fuel technologies. You can’t say that about many of the alternatives such as paper, coated paperboard or even bio-plastics that claim compostability or degradability.

Plastics will never disappear—these materials were intended to be durable and lightweight and they provide cost-effective benefits to consumers. A number of years ago I heard a presentation at an SPE meeting. The processor who was talking encouraged attendees to “define the customer’s needs and required performance for their packaging. Compare options. Some customers say they want “fluff” (good PR or even green-washing), so they can say they’re ‘green.’ Others want to see true sustainability,” said the speaker. “Focus on direct, quantifiable benefits, i.e. cost, properties and performance. Evaluate end-of-life considerations. There are too many assumptions about what happens at the end of life to make any broad claims. Not all solutions are viable.”

Source :Clare Goldsberry

RESEARCHERS DEVELOP FIRE-RETARDANT COATING FEATURING RENEWABLE MATERIALS

Texas A&M University researchers are developing a new kind of flame-retardant coating using renewable, nontoxic materials readily found in nature, which could provide even more effective fire protection for several widely used materials.

Dr. Jaime Grunlan, the Linda & Ralph Schmidt ‘68 Professor in the J. Mike Walker ‘66 Department of Mechanical Engineering at Texas A&M, led the recently published research that is featured on the cover of a recent issue of the journal *Advanced Materials Interfaces*.

Successful development and implementation of the coating could provide better fire protection to materials including upholstered furniture, textiles and insulation.

“These coatings offer the opportunity to reduce the flammability of the polyurethane foam used in a variety of furniture throughout most people’s homes,” Grunlan noted.

The project is a result of an ongoing collaboration between Grunlan and a group of researchers at KTH Royal Institute of Technology in Stockholm, Sweden, led by Lars Wagberg. The group, which specializes in utilizing nanocellulose, provided Grunlan with the ingredients he needed to complement his water-based coating procedure.

In nature, both the cellulose -- a component of wood and various sea creatures -- and clay -- a component in soil and rock formations -- act as mechanical

reinforcements for the structures in which they are found.

“The uniqueness in this current study lies in the use of two naturally occurring nanomaterials, clay nanoplatelets and cellulose nanofibrils,” Grunlan said. “To the best of our knowledge, these ingredients have never been used to make a heat shielding or flame-retardant coating as a multilayer thin film deposited from water.”

Among the benefits gained from using this method include the coating’s ability to create an excellent oxygen barrier to plastic films -- commonly used for food packaging -- and better fire protection at a lower cost than other, more toxic ingredients traditionally used flame-retardant treatments.

To test the coatings, Grunlan and his colleagues applied the flexible polyurethane foam -- often used in furniture cushions -- and exposed it to fire using a butane torch to determine the level of protection the compounds provided.

While uncoated polyurethane foam immediately melts when exposed to flame, the foam treated with the researchers’ coating prevented the fire from damaging any further than surface level, leaving the foam underneath undamaged.

“The nanobrick wall structure of the coating reduces the temperature experienced by the underlying foam, which delays combustion,” Grunlan said. “This coating also serves to promote insulating char formation and reduces the release of fumes that feed a fire.”

With the research completed, Grunlan said the next step for the overall flame-retardant project is to transition the methods into industry for implementation and further development.

Source : Science Daily

FERROELECTRIC POLYMERS MADE MORE VERSATILE

The ferroelectric polymer PVDF (polyvinylidene fluoride) has interesting properties and could be used to store information or energy. One of the main drawbacks of PVDF is that if you add extra functional groups to improve certain properties, this also interferes with its ferroelectricity. To solve this, scientists have created block copolymers from PVDF that leave its ferroelectricity intact, but allow them to tune its characteristics.

The ferroelectric polymer PVDF (polyvinylidene fluoride) has interesting properties and could be used to store information or energy. One of the main drawbacks of PVDF is that if you add extra functional groups to improve certain properties, this also interferes with its ferroelectricity. To solve this, scientists from the University of Groningen have created block copolymers from PVDF that leave its ferroelectricity intact, but allow them to tune its characteristics. They wanted not only to study how this polymer works but also to widen its use to include flexible organic electronics. The results were published in the journal *Nature Communications* on 6 February.

PVDF polymers possess polar structures with dipoles that can be aligned with the application of an electric field. The orientation of the dipoles can be reversed by changing the direction of the electric field. The material thus shows switchable behavior, which means it could be used for information storage. The presence of dipoles in PVDF and its high dielectric constant means that energy storage in capacitors could also be an option, although its ferroelectricity would reduce the efficiency of such capacitors.

Phase separation

Modification of the material might

solve this issue. ‘However, modifying the molecules by attaching side chains affects their ferroelectric properties’, explains Ivan Terzic, a Ph.D. student at the University of Groningen’s Department of Polymer Science and co-first author of the *Nature Communications* paper.

Together with his fellow Ph.D. student Niels Meereboer and their supervisor, Professor of Polymer Science Katja Loos, Terzic devised a way to produce a copolymer of vinylidene fluoride and trifluoroethylene with a functionalized end group that can be linked to an insulating polymer chain to form a block copolymer. Next, the scientists showed that the material forms small domains at nanometre scales, through phase separation between the blocks. These domains take different shapes -- lamellar, cylindrical or spherical, for instance -- depending on the ratio between the blocks.

Free-standing films

Terzic: ‘Others have tried to prepare PVDF block copolymers, but they could only produce blocks with short polymer chains. In that case, the blocks mix and show no phase separation.’ By varying the type of block and preparing block copolymers of sufficient length, the scientists were able to tune the properties of the material. An important part of this work was the ability to make free-standing films of the polymer with satisfactory mechanical properties. ‘This allowed us to investigate the properties of the material.’

Terzic used block copolymers to improve the interactions between PVDF and inorganic nano-objects and to improve their dispersion of inside the polymer. For example, magnetic nanoparticles can be added to the PVDF to produce a multiferroic material that has both ferroelectric and ferromagnetic properties, which means it can be coupled. Furthermore, changing the behavior of PVDF could make energy retrieval more efficient. ‘That would allow

us to make a highly efficient capacitor that could be used wherever stored energy needs to be released fast, like in defibrillators or to convert direct current from solar panels to alternating current.’

Toolbox

Overall, the authors have created a toolbox for the production of different PVDF-based block copolymers with tunable properties. ‘We can use this to increase our understanding of the ferroelectric and other properties of PVDF, but also for new applications’, says Terzic. ‘The organic PVDF is flexible, lightweight and non-toxic, in contrast to some inorganic ferroelectrics that often contain lead. And it is bio-compatible, so medical applications are another interesting possibility.’

Source : Science Daily

FRESH FUNDS TO HELP CLEAN UP OCEAN PLASTICS IN ASIA

It might not sound quite like a fairytale romance, but the match between millions of available investment dollars and underfunded ocean plastic waste management and recycling projects could provide solutions to one of the world’s most vexing environmental problems.

Investors are becoming increasingly aware of the enormous environmental and social problems created by the accumulated 150 million tons of plastic waste in the world’s oceans, a volume that grows by some 8 million tons every year. The proliferation of photos of dead sea animals and birds, their bellies stuffed with plastic bits, and tourist beaches populated by more plastic bags than people illustrates the issue.

With their growing awareness of the ocean plastic pollution problem, investors are also seeing the potential for returns for contributing to the massive efforts needed to deal with the issue.

In January, some 30 major global companies created the Alliance to End Plastic Waste (AEPW), committing more than USD 1 billion in investment over the coming five years to tackle this issue in one of the most comprehensive and well-funded efforts to date. AEPW members include private sector companies that make, use, sell, process, collect and recycle plastic products.

Global components of its strategy include partnering with cities on integrated waste management programs and collaborating with the UN and other agencies to host workshops on good governance.

But it has an initial focus is on South and Southeast Asian countries, where the ocean plastic waste problem is especially acute, accounting for about half of the plastic that flows into oceans annually. This focus is seen through AEPW’s investment of USD 10 million in a new initiative of impact investment management firm Circulate Capital and innovation agency Second Muse that supports waste management technologies and start-up entrepreneurs. The initiative, called the Incubator Network, is designed to help coordinate work of several existing efforts towards achieving similar plastic waste reduction goals.

The Incubator Network is a targeted initiative within Circulate Capital’s broader goals to move plastic waste out of the environment and into the recycling value chain and improve the plastic industry’s circularity, beginning in five countries – India, Indonesia, the Philippines, Thailand and Vietnam – some of which have been replacing China as the world’s dumping ground for solid recyclable waste. Circulate Capital is partnered with the Ocean Conservancy and, separate from the AEPW’s infusion, expects to receive USD 90 million from initial investors including PepsiCo, Procter & Gamble, Dow, Danone, Unilever and the Coca-Cola Company.

The concentration of plastic waste in South and Southeast Asia is largely due to an extreme shortage of investment in waste management infrastructure, coupled with a lack of taxes that pay for waste collection and processing, as do garbage taxes in North America or Europe. Instead, waste collection is often handled by an informal sector composed of people who scavenge for sellable waste.

‘We know where to start,’ says Rob Kaplan, founder and chief executive officer of Circulate Capital. ‘We know the solutions that need to be put in place. We know that those solutions create economic value and environmental value and social value in these communities.’

According to the Ocean Conservancy, solving the ocean plastics problem would be helped considerably by three measures: reducing plastic in the waste stream, improving solid waste management, and increasing capture and re-use of plastics.

More than 100 businesses, large and small, in plastic waste management have already responded to Circulate Capital’s initial request for investment proposals, says Kaplan. Their pitches include new technologies for organizing plastic waste collection and sorting; innovations in chemical recycling at the waste-processing stage; and new ideas for re-incorporating plastic waste materials into manufacturing products such as packaging, furniture and other durables. The fund is now performing due diligence on several proposals and has said that funding could begin in the first quarter of 2019.

Increasing access to capital to develop waste management and recycling infrastructure could significantly encourage solutions, adds Kaplan. ‘If you’re working on the ground in South and Southeast Asia, or wherever plastic pollution is happening, and you try to talk about solutions, the biggest question that always comes up is ‘who is going to pay for it?’ ’

Circulate Capital also hopes its investments will help local entrepreneurs build solid track records, collectively generating an encouraging atmosphere for other investors to buy in along the plastic waste management chain. This can, in turn, boost local economic growth and job creation.

The Incubator Network currently includes We Work Labs in India, working on early-stage start ups; management consulting firm McKinsey & Company's non-profit McKinsey.org; and the Ocean Plastic Prevention Accelerator (OPPA), which highlights start ups tackling packaging and recycling in Indonesia.

"We're seeing a pathway toward preventing plastic pollution – or at least ocean plastic pollution – in the next five to 10 years," says Kaplan.

Source : Plastics News

GLOBAL SUPER ABSORBENT POLYMER MARKET POISED TO CROSS US\$12 BLN BY 2025

The global super absorbent polymer market size is poised to reach US\$12.13 bln by 2025, according to a new study by Grand View Research, Inc., posting a CAGR of 6.2% during the forecast period. Growing demand from various application sectors such as baby diapers, adult incontinence products, agriculture, and female hygiene products is expected to drive the market during the forecast period. Super absorbent polymer is a key component of baby diapers. SAPs are used to absorb and retain fluids under moderately high pressure.

In terms of revenue, Europe dominated the global super absorbent polymer market. It is anticipated to expand at a CAGR of 6.1% during the forecast period. Baby diapers were the largest application segment in the market in 2017 and are

projected to maintain their dominance through 2025. Agriculture is poised to be the most promising application segment, rising at a CAGR of 7.3% over the forecast period. The growth of the segment can be attributed to ongoing extensive research conducted by governments and agricultural agencies in countries such as the U.S., China, and India to pave way for novel applications of super absorbent polymers. Asia Pacific is likely to exhibit the fastest CAGR of 7.2% during the forecast period. Increasing demand from various application segments in the region, particularly in China and India, is projected to supplement the growth of the market. Emerging regions such as Asia Pacific and Central & South America are likely to witness a sharp rise in the demand for baby diapers owing to growing population, rising disposable income, and increasing awareness regarding benefits of synthetic baby diapers, which are estimated to play a key role in the development of the overall market.

Factors such as constantly developing medical infrastructure, technological advancements, and growing accessibility to medical treatments have resulted in an increase in life expectancy rates. Growing life expectancy is expected to further supplement the growth of the adult incontinence product market and, in turn, boost the growth of the SAP market. Super absorbent polymers find application in the agriculture industry owing to their water retention and water absorbing properties, which makes them perfectly suitable for agricultural applications, particularly in water-scarce regions. These super absorbent polymers increase crop yield and water use efficiency. Problems such as diversified soil characteristics, paucity of large cultivable land, and underprivileged conditions of farmers result in inability to adopt expensive and latest technologies and agricultural methods.

Source : Plastemart.com

PROCESS TO CONVERT POLYOLEFIN WASTE INTO POLYMERS

Researchers have developed a process to convert polyolefin waste into polymers and fuels at Purdue University in Indiana. According to the research, the chemical conversion process could transform the world's polyolefin waste by changing it into useful products. Linda Wang, Kai Jin and Wan-Ting Chen are the inventors of the technology which can convert more than 90 per cent of polyolefin waste into many different products, including pure polymers, naphtha, fuels, or monomers. The team is collaborating with Gozdem Kilaz, from Purdue's School of Engineering Technology, and her doctoral research assistant Petr Vozka, to optimise the conversion process to produce high-quality gasoline or diesel fuels.

The conversion process incorporates selective extraction and hydrothermal liquefaction, and once the plastic is converted into naphtha, it can be used as a feedstock for other chemicals or further separated into specialty solvents or other products. The clean fuels derived from the polyolefin waste generated each year can satisfy four per cent of the annual demand for gasoline or diesel fuels.

Wang, who is the Maxine Spencer Nichols Professor in the Davidson School of Chemical Engineering at Purdue, said: "Our strategy is to create a driving force for recycling by converting polyolefin waste into a wide range of valuable products, including polymers, naphtha, or clean fuels." "Our conversion technology has the potential to boost the profits of the recycling industry and shrink the world's plastic waste stock."

Source : Plastemart.com

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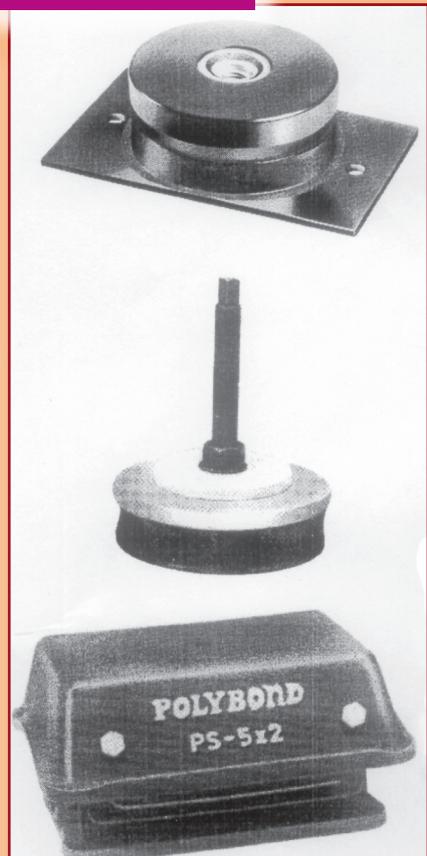
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HIGH COST OF DIVERSITY

Dr. Devdutt Pattanaik

Business is about efficiency. There is always a great push towards standardised manufacturing and business practices, and a yearning for homogenous markets. However, the reality is that the world is diverse—and so you have to continuously modify and adapt manufacturing, sales and marketing practices to meet the diverse market conditions you encounter in the world. In other words, diversity makes our lives inefficient. This is one idea that no one in the business world wants to admit.

Take a look at the US dollar bill. The United States of America is built on the shoulders of immigrants—Germans, French, British, Russians, Irish, Chinese, Arab, Indian, African, Spanish. Yet the bill has only one language, like the Declaration of American Independence. English.

Now take a look at the Indian rupee note. See the number of scripts there. It acknowledges a fraction of the many languages spoken in the country. And now you wonder what should be the language of business, of the constitution, of the judicial process, of state business, of street business. In what language should the road signs be to help ALL Indians? Hindi—that's no more than 40% of the population. English—that's no more than 20% of the population. Sanskrit—come on!

Can we say that India's diversity is the reason why it seems 'chaotic'?

In China, there are many languages. But they are referred to as dialects. But there is a standard script—the central pillar of Chinese civilisation.

The same script is read differently in different dialects. However, they all have the same meaning. This allows for a cultural unity in China, despite its vast size. It is through the single dominant script that Chinese people speaking different dialects feel united.

When the nation of France came into being over two centuries ago, the language was standardised. And this meant the destruction of local dialects and the creation of a 'standardised' French, with other dialects being seen as inferior or corrupt. This helped in the transformation of a kingdom into a nation-state. So much for liberty and equality of the 18th century revolution!

In Africa, diversity of tribes is not encouraged as it is seen as a threat to the unity of the nation-state. In Rwanda, after the 1994 genocide, the government plays down tribal identity and the consequent inter-tribal rivalry and insists that people refer to themselves as citizens of

the state rather than members of the Hutu or the Tutsi.

The doctrine of equality, like the doctrine of unity, has problems with diversity. It tends to see diversity as divisive. In fact, many western political commentators keep wondering why there has not been a Balkanisation of India as yet? Why did it stop simply with the breakup of India and Pakistan? Surely South Asia with its vast diversity will drift towards division.

European Union has been struggling to unite. But unity demanded equality between the various European nations, at least in financial terms, for the union was economic not cultural. The assumption was that Europeans are 'rational' enough to have cultural diversity with economic unity. However, economic unity demanded economic homogeneity, which demanded behavioural homogeneity, that was naturally at odds with cultural diversity. The aim of EU was

to enable capital and labour to move effortlessly between borders. But it was tougher than imagined. The Greeks did not quite have Scandinavian efficiency. And the French did not like Germans telling them what to do. People forgot the bloody Thirty Years war fought on European soil in 17th century over religious differences. And this was not a fight with Islam. This was a fight within Christianity, between Catholics and Protestants. It marked the fragmentation of the Holy Roman Empire into nation-states. What was once united by religion had divided itself on cultural grounds.



Equality is a Judeo-Christian-Islamic concepts rooted in tribalism. One God of the tribe treats all tribal members as equal. Diversity, on the other hand, is a concept rooted in polytheism, the comfort with many gods. Equality and diversity will always be at odds with each other just as monotheism and polytheism have always been at odds with each other. In the 19th century colonial powers privileged monotheism by calling it religion while qualifying polytheism as pagan and mythological.

However, in the 21st century, post the World Wars, as atheism and postmodern philosophies are on the rise, we are becoming blind to the tension between the equality of monotheism and the diversity of polytheism. Both are values that we admire, and that makes us forget that diversity has a cost, that is very different from the cost of equality.



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