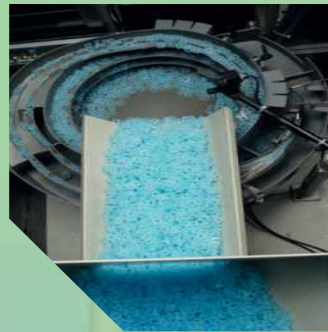


Knowledge and Strategic Partner



*2<sup>nd</sup> National Conference*

# PLASTIC PACKAGING-THE SUSTAINABLE CHOICE



*A report on*  
**Plastic Industry**  
January 2016

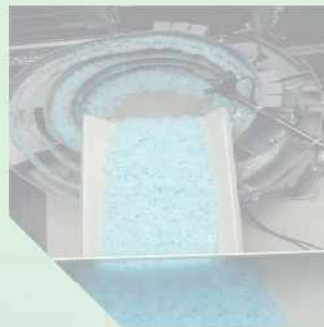


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# **PLASTIC PACKAGING-THE SUSTAINABLE CHOICE**



*A report on*  
**Plastic Industry**  
January 2016





**Mr. Vinay Mathur**  
Deputy Secretary General

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Indian Chambers  
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## Message

The growing use of plastics in different segments of economy has been very useful. Its use in various key sectors, viz: packaging, construction, healthcare etc. The growing usage in packaging has special relevance to post harvest management which is very important for the national food security mission.

While the usage and benefits of plastics are manifold, it invariably gets branded as a polluting material. The facts or myth regarding the polluting characteristic of plastic needs to be addressed in a scientific manner. Plastics are chemically inert substances and they do not cause either environmental or health hazards. If plastics can be collected and disposed off or recycled as per laid down guidelines/rules then the issue of plastic waste can be suitably addressed. In fact there is wide scope for industries based on re-cycling of plastics waste. I am sure, the deliberations of this conference will bring out good results.

I wish all the success to this conference.

*Vinay Mathur*  
(Vinay Mathur)





**Mr. Prabh Das**  
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## Message

The Indian Plastics industry is making significant contribution to the growth of various key sectors in the national economy. Packaging is emerging as the most important and fast growing segment of Indian Plastic Industry . This segment is likely to witness high growth in the coming times with life style changes in society. The growth will primarily be driven by end-user segments such as personal care, pharmaceuticals, food products including post harvest management etc. An increasing shift towards flexible packaging is expected and in terms of material used for packaging, polymers are expected to account for majority of the share in packaging.

While this offers large opportunities for the industry to grow, there is a need for that to happen in a very harmonious and sustainable manner with due regard to environmental concerns. The same can be facilitated by greater focus to R&D and innovations. I am sure all these issues will be well debated in the conference. I wish it all the best.

  
(Prabh Das)







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# 1. Foreword



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Federation of Indian Chambers of Commerce & Industry (FICCI) & TATA Strategic Management Group (TSMG) have been regularly tracking plastics & packaging industry. This report on plastic packaging is our attempt to provide the reader an overview of the Indian plastic packaging industry, its growth prospects, challenges and emerging trends in this segment of the market with a focus on relevant sustainable practices.

The Indian packaging industry is likely to witness high growth over the next three years. The growth will primarily be driven by end-user segments such as personal care, pharmaceuticals, food products etc. In the upcoming years of packaging industry, there will be an increasing shift towards flexible packaging and in terms of material used for packaging, polymers would account for majority of the share in packaging.

In order to ensure sustainable and successful business models, there is a need of diversification in client portfolio and product suite that is to be undertaken by packaging companies. Focus on product innovation, quality standards, timely delivery and proximity to end-users is also crucial.

We sincerely thank industry leaders, experts and all other participants whose valuable inputs have helped in developing this report. As always, it was an insightful experience for the team to materialize this report.





## 2. | Executive Summary

Today plastics are THE material of choice in packaging for the sectors such as FMCG, food and beverages, pharmaceuticals etc. . In India, a large chunk of products that households buy for daily use are packaged in plastics. Plastics are used heavily for packaging due to innovative visual appeal for customer attraction and convenience. Additionally, they improve the hygiene quotient and shelf-life of the products especially in food and beverages segment.

Overall, the Indian packaging industry is valued at over USD 32 Bn and offers employment to more than 10 lakh people across the country through ~ 10,000 firms.

The industry is driven by key factors like rising population, increase in income levels and changing lifestyles. Growth prospects of end-user segments are leading to rise in the demand of the plastic packaging industry. Demand from rural sector for packaged products is being fuelled by the increasing media penetration through the means of internet and television. Further, India is emerging as the most favoured destination for organized retail destination in the world. And also the presence of E-commerce is expanding rapidly and is bringing around a revolution in the retail industry. Retailers are now leveraging digital retail channels thereby enabling wider reach out to customers with less amount of money spent on real estate .Therefore, organized retail and boom in e-commerce offers huge potential for future growth of retailing in India which in turn is pushing the growth of packaging sector.

However, there are quite a few challenges and risks. High inflation rate and rising prices, lack of skilled workforce, difficulty in procuring raw material due to weak infrastructure, growing environmental concern, effective recycling of mixed plastic waste and plastic recovery are some of the issues plaguing the industry.

Going ahead recycling & reuse of plastics will be an important step towards fostering innovation and sustainability. Also increased awareness through help of industry groups and Government could help address some of these challenges.

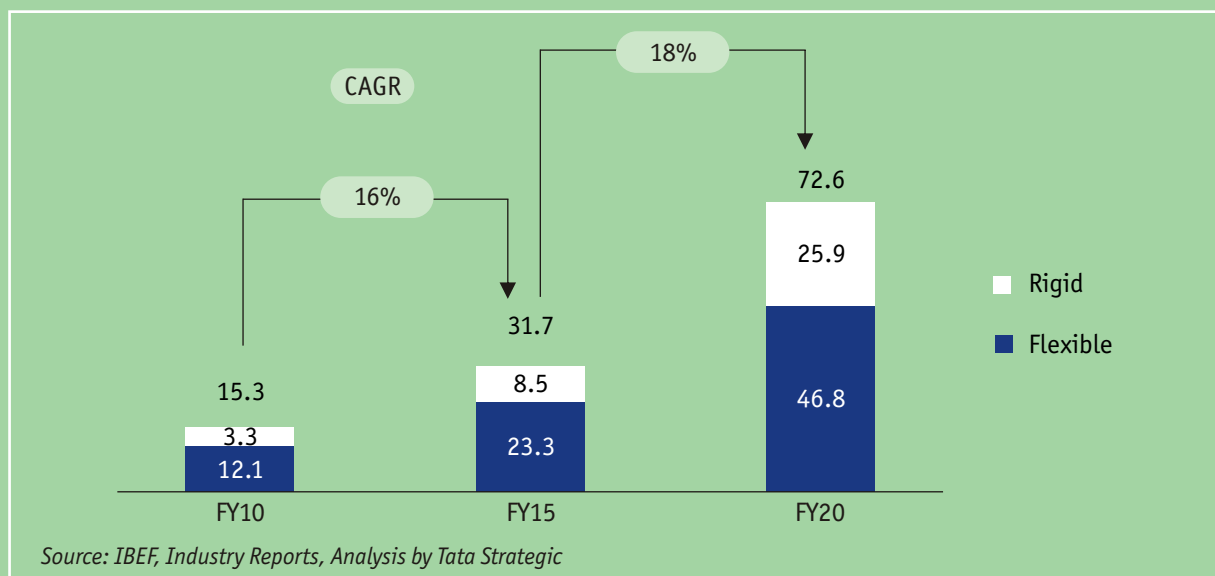




### 3. | Introduction

Packaging is one of the fastest growing industries and stands at USD 700 billion globally. It has grown higher than GDP in most of the countries. In developing country like India, it grew at a CAGR of 16% in the last five years and touched ~USD 32 Bn in FY 15. The Indian packaging industry constitutes ~4% of the global packaging industry. The per capita packaging consumption in India is low at 4.3 kgs, compared to developed countries like Germany and Taiwan where it is 42 kgs and 19 kgs respectively. However in the coming years Indian packaging industry is expected to grow at 18% p.a. wherein, the flexible packaging is expected to grow at 25 % p.a. and rigid packaging to grow at 15 % p.a. (Refer fig. 1).

**Figure 1: Plastic Packaging Industry Outlook (USD Bn)**



Packaging in general is classified into two significant types i.e. Rigid Packaging and Flexible Packaging. As compared to rigid packaging, flexible packaging is one of the most dynamic and fastest growing markets in India. Flexible packaging anticipates a strong growth in the future. There has been increasing shift from traditional rigid packaging to flexible packaging due to numerous advantages offered by flexible packaging such as convenience in handling and disposal, savings in transportation costs etc.

The packaging segment in India is an amalgamation of both organized and unorganized players ranging from very small players with limited presence to big players with large market share. Demand for this segment is anticipated to grow rapidly across all the players. Also there is an increasing focus on innovative and cost effective packaging materials. Thus, the industry players are keeping in track with the changing trends in packaging and making efforts to capture the market with higher technology orientation. Further with a viewpoint of health and environment friendliness, the growth in packaging industry has been leading to greater specialization and sophistication amongst the market players.

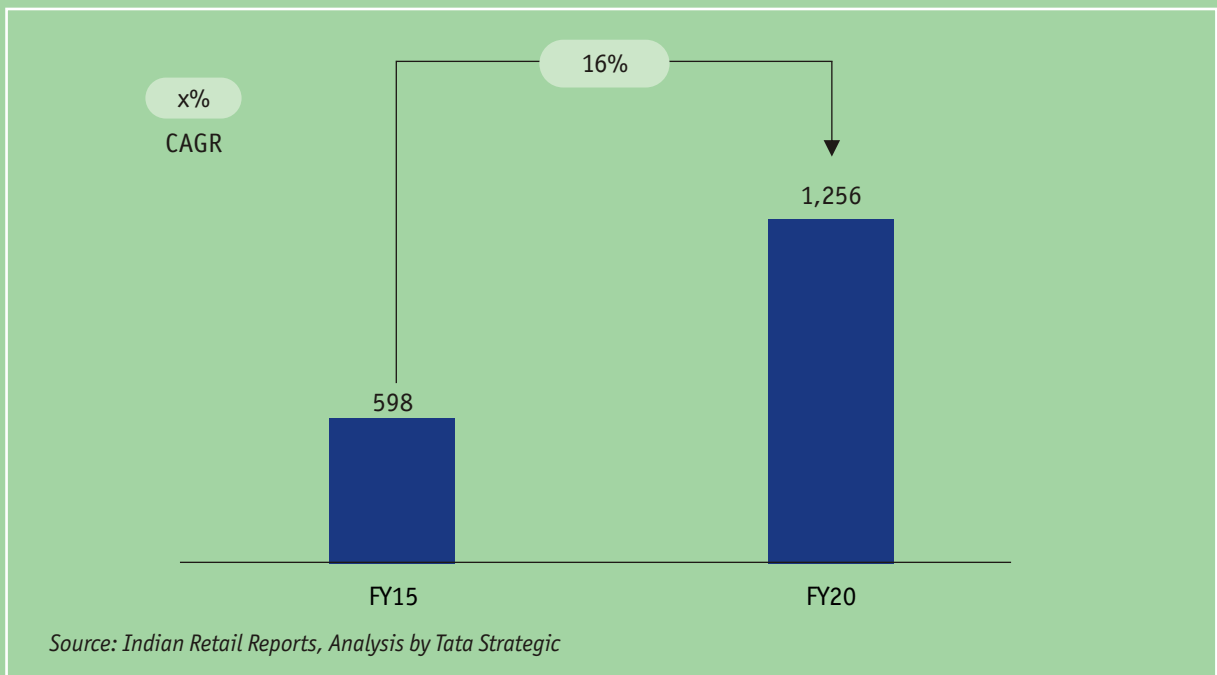




## 4. | Key Drivers of the Packaging Industry

Retail Industry is one of the most dynamic industries in India. It has experienced high growth over the past years, with a gradual shift towards modern retailing formats. Indian retail market has attracted and increased the presence of multinational companies and therefore boosted demand in spaces such as F&B, consumers' products, cosmetics etc. Rising income levels is also stimulating the growth of organised retail which therefore increases the demand for innovative and attracting packaging concepts.

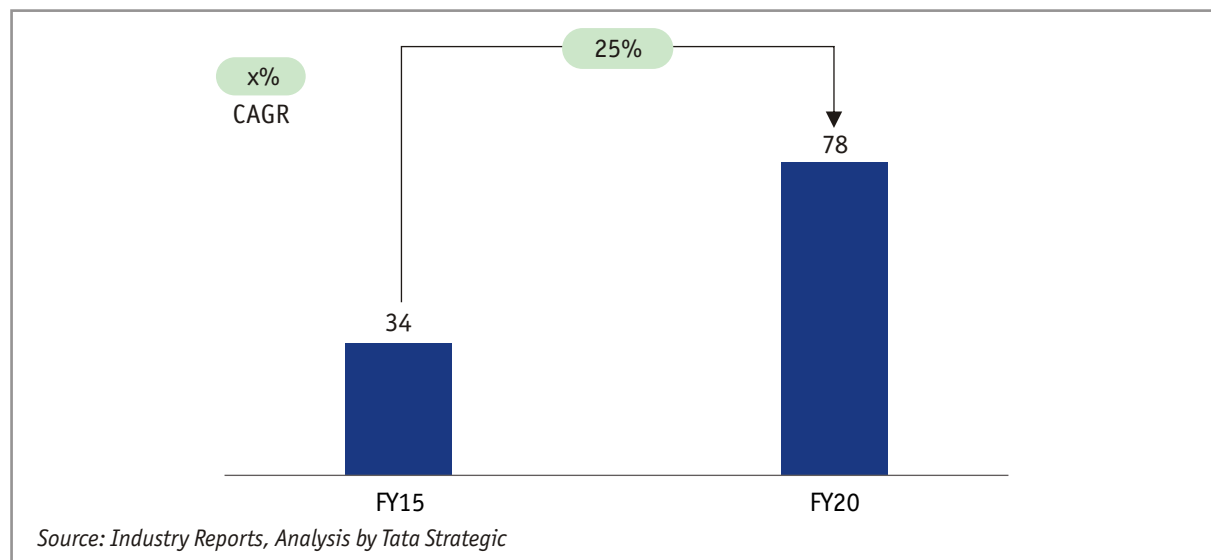
**Figure 2: Indian Retail Industry Outlook (USD Bn)**





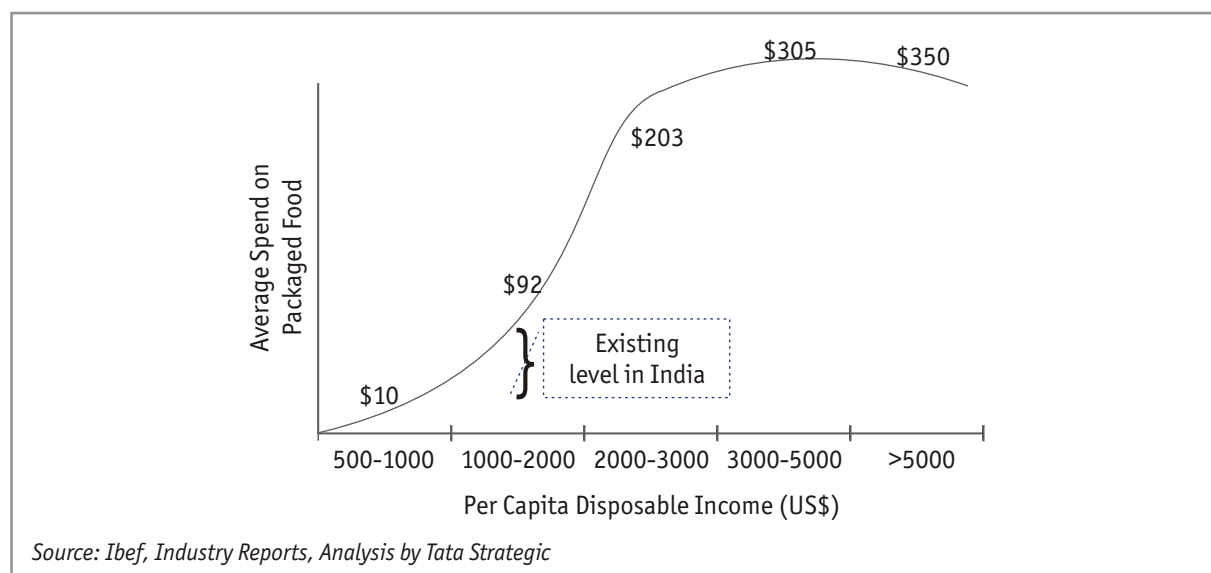
In the retail segment, Food & Beverages are one of the key growing segments (Refer fig. 3). It falls amongst the biggest end users of packaging. Growth in F&B sector will drive the packaging demand and also demand for plastic packaging, as it ensures food safety, quality and long shelf life.

**Figure 3: Indian Food & Beverage Industry Outlook (USD Bn)**



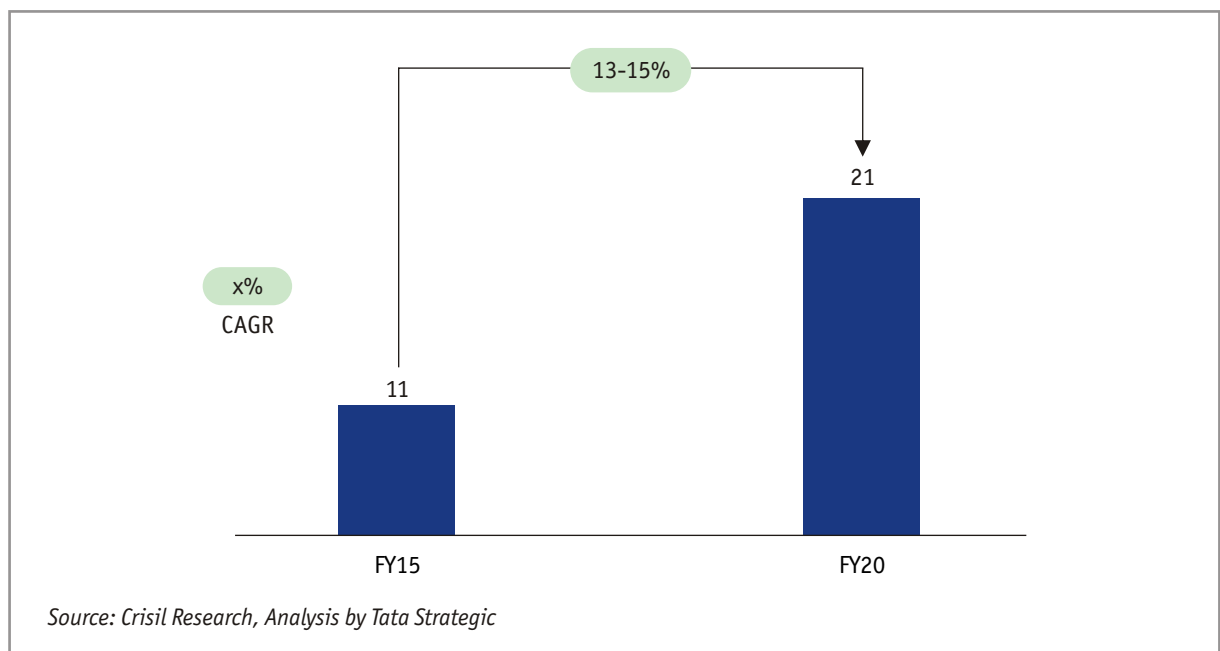
Since packaged food is the fastest growing segment, it is expected to fuel the demand of plastic packaging in India. Spend on packaged foods is increasing (at inflexion point) due to Increase in per capita income, Urbanization and Increase in working woman population. The graph below indicates the per capita expense on the packaged food in India.

**Figure 4: Packaged Food Spend (Per capita)**



Besides Food & Beverage, pharmaceuticals' are another major user of packaging. India's domestic pharmaceutical market is witnessing double digit growth. Pharmaceutical Packaging is now becoming the major part of the drug delivery system. Pharmaceutical companies rely more on packaging and labelling as media to protect and promote their products, increase patient compliance, and meet new regulations. Besides this, plastics have been gaining increasing importance in packaging of pharmaceutical goods due to properties such as barrier against moisture, high dimensional stability, high impact strength, resistance to strain, low water absorption, transparency, resistance to heat and flame etc.

**Figure 5: Indian Pharmaceutical Market (USD Bn)**



Therefore, due to increasing expertise in the packaging of F&B, medicinal, home & personal care and other heavy industrial products, plastic packaging segment is expected to capture the packaging demand. The overall packaging industry in India has a huge growth potential and is expected to reach ~USD 73 Bn in FY 20. Additionally, India is growing as a manufacturing hub and the exports are also growing. To cater to the international market, the packaging standards are being uplifted which calls for adopting better packaging methods, materials and machineries to make sure that the quality of end product and visual appeal is top notch.

Moreover highly favourable demographic patters in India such as increasing working age population, growing disposable income, growth in middle class, ongoing urbanisation and changing lifestyles etc. will further drive the growth of packaging industry in India.





## 5. | Plastic Packaging: The Material of Choice

Packaging encompasses a wide range of material types across paper board, metals, plastic, wood, glass and other materials. However amongst all the substitutes available, 'Plastic Packaging' is the fastest emerging trend in the packaging industry. Plastics today form the foundation of our “convenience consumer culture”. The traditional materials like paper boards, metals, wood, glass etc. have been replaced by plastics in many applications due to their cost to performance ratio (Refer fig. 6).

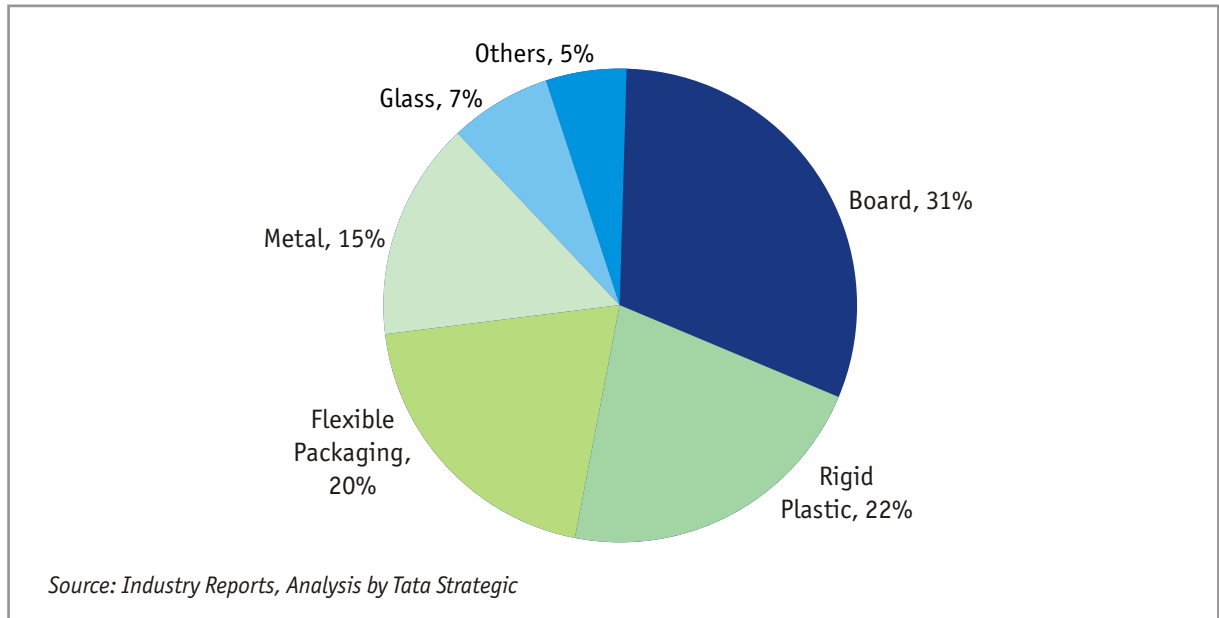
**Figure 6: Plastics replacing the traditionally used materials**

Product	Traditional Material	Current Trend
Milk/ Edible Oil	Glass/ Metal	3/ 5 Layer Film Pouches
Toiletries (Soap / Shampoos)	Paper/ Glass	Plastic Pouches / Films
MPCG (Cement / Fertiliser)	Jute	PP / HDPE Woven Sack
Toothpaste	Metal	Plastic Lamitube

The features of plastics make them an ideal packaging material for all industrial or commercial users. Globally, Plastics comprise of 42% of packaging with the combination of rigid and flexible plastics in packaging (Refer fig. 7).



**Figure 7: Global segment breakup of packaging materials (%)**



Plastics have been the preferred choice in packaging globally and in India due to the following key benefits;

**a. Increased Food Safety, Quality & Shelf Life:**

Plastics act as an excellent barrier to oxygen, water and carbon dioxide. They are inert towards acids, alkalis and most solvents and therefore they ensure freshness & hygiene of the contents and high durability of the items packed. As per industry estimates, 35-40% of the food products produced in India are wasted due to deficient infrastructure and lack of food processing capabilities. Plastics find applications in packaging which protects the longevity and quality of food and can reduce the post-harvest losses. For Example;

1. Plastic Sacks: Used for packaging rice, grains and other materials. It can be generally recycled for packing fresh produce. The key advantages are ready availability and cost effectiveness.
2. Plastic Bags: These are made from polyethylene films and are commonly used for transporting highland vegetables to wholesale markets in urban centres. They are relatively inexpensive, readily available and have a low weight to volume ratio.
3. Plastic Films: Used as a cushioning material in packaging. It helps in reduction of moisture loss from the product, which is a principal requirement of limited permeability packaging materials.



Their versatility allows them to be used in wide variety of applications such as food and beverages, FMCG items, pharmaceutical industry to name a few. The following table depicts the applications of different plastics used across the industry segments and the attainable benefits of the same;

**Figure 8: Applications and Benefits of different plastic products**

Plastic	Applications	Benefits
<b>PET</b>	Food jars for jelly, jam and pickles Plastic bottles for soft drinks, water, juice Ovenable film and microwavable food trays	Excellent resistance to most solvents High impact capability and shatter resistance Clear and optically smooth surfaces
<b>HDPE</b>	Cereal box liners Reusable shipping containers Bottles for non-food items, such as shampoo, liquid laundry detergent, household cleaners, motor oil etc.	Relatively stiff material with useful temperature capabilities Higher tensile strength
<b>PVC</b>	Rigid packaging applications include blister packs and clamshells. Packaging, film and sheet, and loose-leaf binders. Flexible packaging uses include bags for bedding and medical	High impact strength Brilliant clarity Excellent processing performance
<b>LDPE</b>	Container lids Shrink wrap and stretch film. Squeezable bottles (e.g., honey and mustard).	Excellent resistance to acids, bases and vegetable oils Toughness, flexibility and relative transparency
<b>PP</b>	Medicine bottles Bottle caps and closures Bottles for catsup and syrup.	Low moisture vapor transmission Inertness toward acids, alkalis and most solvents
<b>PS</b>	Protective foam packaging for furniture, electronics and other delicate items. Packing compact disc cases and aspirin bottles	Low thermal conductivity and excellent insulation properties Excellent moisture barrier for short shelf life products

Source: Industry reports, Analysis by Tata Strategic

## b. Reduced Environmental Impact:

As plastics possess versatile properties it can help us do more with less. One such property is light weight. As plastics are light in weight, they have a high product to package ratio which results in lighter weighed end product. For eg: Only 1.5 pounds of flexible plastics can deliver ~60 pounds of beverage; compared to three pounds of aluminium or 50 pounds of glass. Thus, plastic packaging enables in shipping more products with less packaging material. And also brings down the fuel consumption and the overall transportation cost.

Besides this, plastics can be reused and recycled. They have low energy requirements during production, hence considered to be energy efficient. They consume ~25% less energy in production compared to other alternatives. They result in lower emission of CO2 gas. Thus when compared to glass or aluminium plastics results in lighter environmental footprint.



### c. Innovations in Packaging:

The unique properties of plastics provide an advantage of using plastics in flexible manners. Plastics can be made re-sealable, reusable, they can be moulded into desirable shapes, rigid packs, innovative designs etc. thus resulting in consumer friendly packaging; that provides ease in handling, disposal, storage etc. New products in flexible packaging such as vacuum pouch, high temperature retort pouch, stand-up pouch etc. can lead to changing packaging trends.

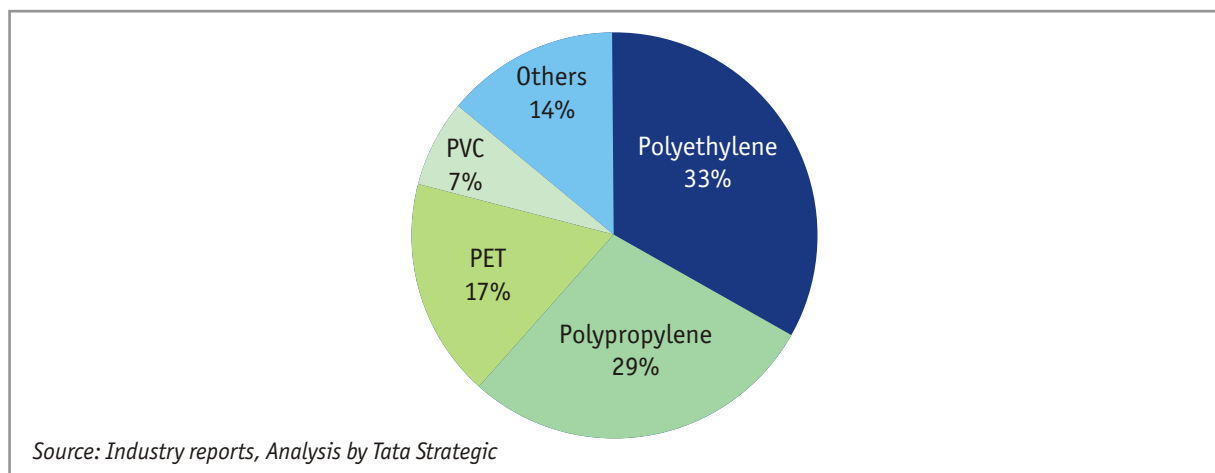
IML (In-mould Labelling) technology that uses plastic labels is also one of the cost effective technology. For eg: It can be beneficial as it increases packaging line speeds, improves sidewall strength and appearance of the packaging and reduce container weight. Further, innovations such as MAP (modified atmospheric packaging), nano-structure multi-layered films, etc. will also enhance the performance of plastics in packaging, thereby resulting in higher efficiency.

Therefore the unique combination of energy efficiency, lighter packaging, reduced use of natural resources, fewer greenhouse gas emissions, less waste, improved shelf life & appeal and cost effectiveness makes plastics the preferred choice in the packaging industry.

In India, the majority of the FMCG products consumed by the households are packaged in plastics. In 2014, >95% of the total number of biscuits, dried processed food items and hair care products; and >85% of dairy products, baked goods, laundry and skin care sold in India were packaged in plastic.

In context to the Indian markets, industry at present is dominated by flexible plastics packaging. There has been a gradual shift from rigid to flexible packaging due to flexible packages being visually appealing, cheaper and durable. Both flexible and rigid packaging is used in processed foods. Flexible packaging consists of either monolayer or multilayer films of plastics. Multi-layered laminated sheets of plastics mainly include PE, PP, PET, and PVC. Polyethylene and polypropylene account for ~ 62 % of polymer usage in the flexible packaging industry (Refer fig. 9). Flexible packaging is dominated by small & medium sized companies. Uttarakhand (Haridwar, Rudrapur & Pant nagar) is one of the key packaging clusters in India contributing to 13% of the total organized flexible packaging production.

**Figure 9: End-usage share of plastic products (%)**





## 6. | Challenges of plastics packaging

With more than 40% of packaging needs catered by plastics in India, the domestic market is third largest consumer of polymers and a growth in plastic demand is expected to boost the consumption further. Besides FMCG sector, growth is also driven by growing construction industry and adoption of advanced coating, ceiling and polymer-based reinforcing material in construction as well as plastics, paints and coatings for the automotive segment. Availability of raw material is a major challenge. For e.g. Crude is the feedstock required for these products and India is relying on heavy imports of crude to meet its requirements. Also, Volatility in the Prices of crude oil and exchange rate has led to increase in price pressure and lower profits in spite of high volume realizations. The plastic packaging industry primarily driven by the consumer goods sector often faces the issue of low margins, as most of the end products are coming from the imported raw materials and hence profit margins are highly dependent on import prices.

**Lack of Domestic Technology:** Indian manufacturing industry has seen a shift from low output/low technology machines to high output/high technology machines, and the domestic plastic processing industry is no exception. With more focus on increasing the capacity utilization, focus to develop a state-of-the-art R&D is dying down. Domestic machinery is manufactured as per the present-day technologies for improving productivity and energy efficiency, in order to enable processors to compete on the global front. Most technical components are imported from Europe, the U.S. and Japan. These imports invite 7.5 per cent customs duty resulting in huge losses.

However, India's technology needs are acute in areas like high production and automatic blow moulding machines, multilayer blow moulding, Stretch/Blow Moulding Machines, specific projects involving high capital expenditure like PVC calendaring, multilayer film plants for barrier films, multilayer cast lines, BOPP and Nonwoven depend exclusively on imported technology/machinery. Other technological needs are:

- Multilayer blown film line up to 9/11 layers



- Automatic Block bottom bags production line
- Higher tonnage Injection Moulding machine >2000 Tons
- Higher tonnage >500 Tons all electric Injection Moulding machines

**High input costs:** The plastic industry in India is a labor intensive industry as compared to its western counterparts. This has impacted the productivity in an unfavorable way. With the ever expanding population, growing needs for electricity has led to unreliable power and high energy costs in India. When comparing with other countries, these constraints hamper the capacity utilization. There is a growing need to shift to the renewable energy sources such as solar, wind, etc. which is now emerging, despite the high investment required.

**Environmental concerns:** Apart from playing an increasing role in packaging and consumer products plastics also take up a growing percentage of municipal solid waste streams and pose environmental challenges. They are considered to be a major threat to environment and public health. Improper disposal of plastics clog the water bodies, it leads to ground water pollution, disturbance of soil microbe activity, release of poisonous chemicals thereby harming the human health and the entire ecosystem. These adverse impacts therefore alarm the society to ensure proper disposal of plastic. Going ahead recycling & reuse of plastics could be a foremost step towards fostering innovation and sustainability. If plastics can be collected and disposed of or recycled as per laid down guidelines/rules then the issue of plastic waste can be suitably addressed Also increased awareness through help of industry groups and Government could help address some of these challenges.



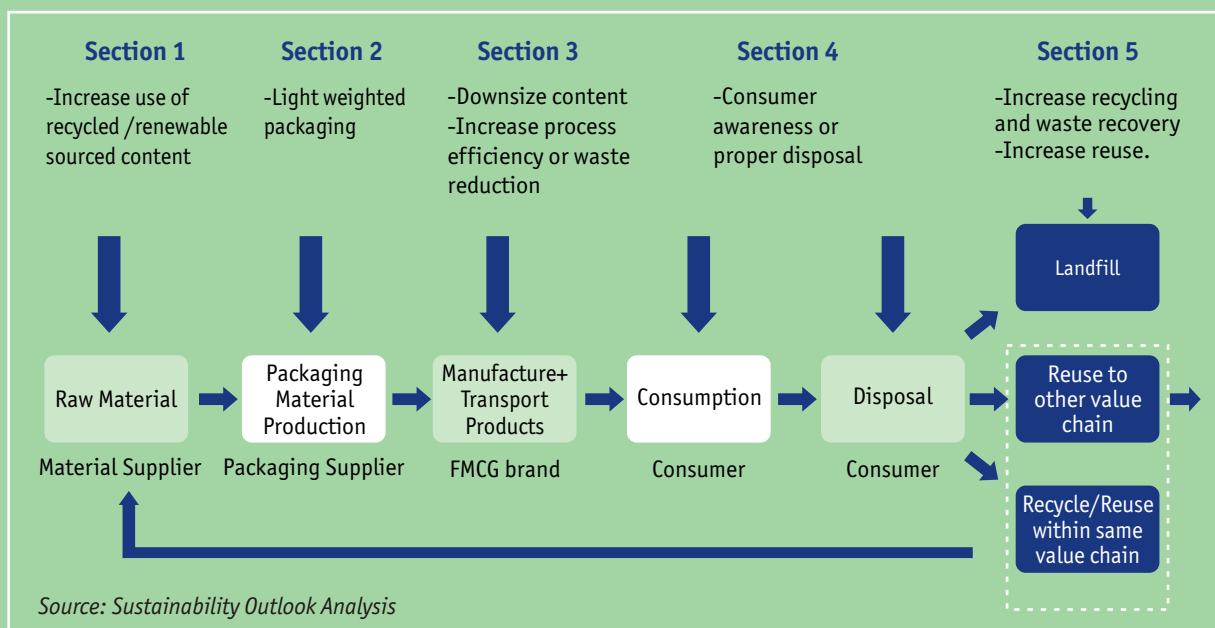




## 7. | Sustainability

Sustainability in packaging would mean ensuring that the waste resulting out of the packaged products never leave the value chain and also using materials that may cause little to zero environmental harm. Plastics are now emerging as a sustainable and a smarter choice on the basis of their versatile properties and the benefits resulting out of its usage. Using alternatives of plastic packaging can result an increase in packaging weight, energy consumption and global warming. Therefore, plastics in packaging is a sustainable choice; as they ensure reduced environmental impact with lower GHG emissions and can be made re-sealable and/or re-usable.

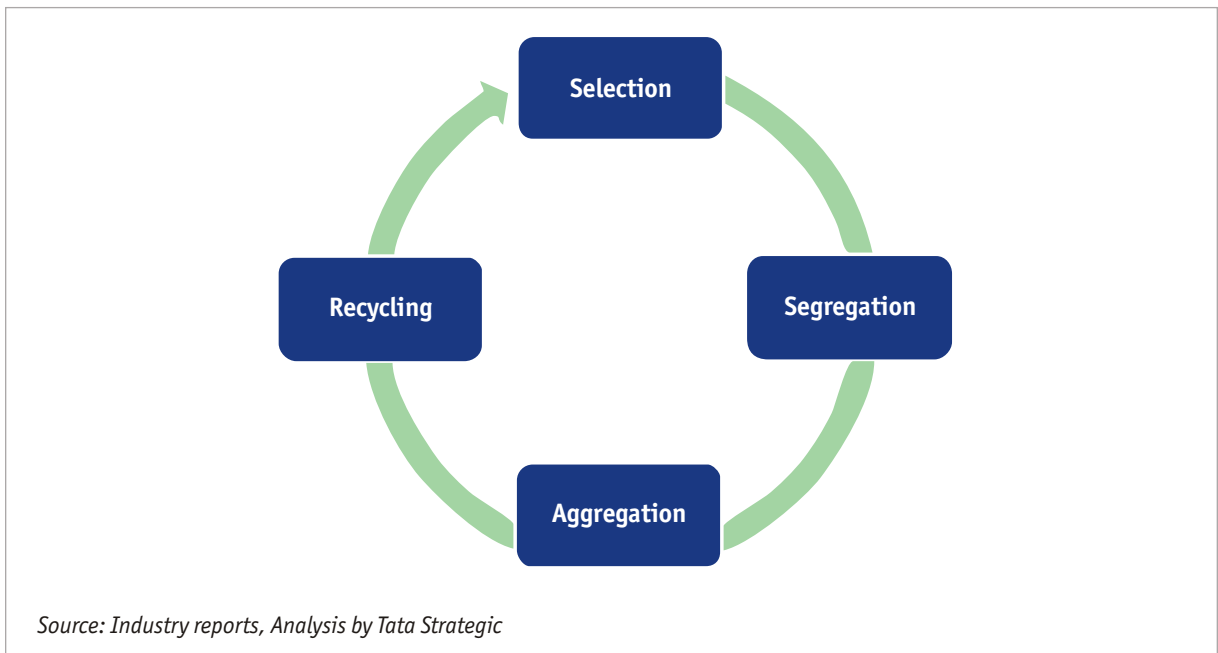
**Figure 10: Sustainability Interventions in Packaging Value Chain**



### Reduce-Reuse-Recycle:

Recycling of plastics is one of the foremost steps towards innovation and sustainability in this industry. In India, there are ~3500 organized and ~4000 unorganized plastic recycling units. Most of the plastics (PE, PP, PVC, PET and PS) could be recycled via mechanical route, whereas, engineering plastics, such as PBT, SAN and Nylon, are recycled by selected recyclers. In India, recycling of plastics is currently 3.6 MnTPA and it provides employment to almost 1.6 million people (0.6 million directly, 1 million indirectly).

**Figure 11: Sustainability Best Practices**



The collection & segregation of decomposable waste is one of the key stages in taking this further. Mostly consumers throw the waste on the street out in the open without segregating the waste which diminishes the quality and at times could make it unsafe. It is crucial to save the recyclable waste material from going to the waste processing and disposal sites and using up landfill space. Effective recovering at source for recycling could make profitable use of such material. This will protect national resource and also save the cost and efforts to dispose of such waste. In order to do so, innovations such as optical sensors and floatation devices could be adopted on large scale which will result in improved sorting process. Brand owners should come forward and share the responsibility of managing plastic waste and make efforts to address the issues. Besides this, best practices of other developed nations could be adopted for packaging waste to ensure reduction, reuse and recycling of packaging materials. Thus by addressing the challenge of segregation of waste at source and promoting formation of waste



management infrastructure coupled with investment in developing recycling centres can help in achieving a favourable outcome and make plastic materials as a topmost and sustainable choice in packaging,

The real solution lies in addressing the challenges faced by the recycling system prevalent in India. The industry has been facing issues like lack of critical infrastructure and support from small players involved in recycling. Small recyclers are involved in cleaning process which results in the release of effluent, dust and debris. But due to poor financials, these recyclers are unable to set up and operate large effluent treatment plants or even use dust filters. This has pushed the government to consider creating polymer clusters in various parts of country which would include small and medium sized entrepreneurs (SMEs) and recyclers. Furthermore, there is a growing need for public awareness and discipline towards plastic waste recycling. Responsibility for enhancing this awareness lies both on government as well as on industry. Maximum participation of all stakeholders is critical to tackle the issue of Plastics Waste Management.

In near future, the awareness of consumers and support from government is likely to increase the recycling of plastics and increase the magnitude of plastic waste management.

### **Bio-based plastics:**

Bio-based plastic products are material which undergoes decomposition in a specified period of time under composting conditions in industrial facilities. This type of plastic is made from biomass and can degrade naturally in a matter of years. The traditional, petroleum based variety accounts for about 99% of world's plastic and much of that will still be decomposing for centuries.

One of the feedstock to produce bio-plastics is avocado seeds. Though the product is currently priced marginally higher than its petroleum based counterpart; with high volume of production and a stress on green chemistry by community, the cost of production are expected to come down and be more attractive and sustainable option vis-à-vis the traditionally produced plastics.

With the market for this product still in its infancy, continuous R&D efforts are being taken to promote the segment. Many polymers like PLA (Poly Lactic Acid), PHA (Poly Hydroxyalkanoates), Bio PTT (Poly Trimethyl Terephthalate), Bio PDO (Propanediol) etc. form the upcoming trends. These plastics are significantly made of renewable materials like bio mass and save up to 40% energy in production as compared to their petrochemical counterparts.



## 8. | Future Opportunities

In the way ahead, the growth in the plastic packaging industry in India will be majorly impacted by the end use industries, growing consumerism and government initiatives such as Make in India.

**End-Use Industries:** The Indian Food & Beverage industry has nearly 25% yearly growth and major application of plastics in food products is in packaging. Thus growth in food and beverage sector highlights the growth potential for plastics in packaging. Similarly, personal care sector, which is growing at nearly 15%, will also drive demand for rigid plastics, as it is the most used material for packaging of personal care products. Other industrial sectors such as, pharmaceutical that is proposed to grow at 13-15% over next five years, retail industry, that is currently witnessing the shift from unorganized to organized retail; will also stimulate the demand of plastic in packaging material.

**Consumerism:** Growing consumerism will also contribute to growing demand. Consumer's preference for the use of convenient packaging and affordable packaging is driving the market towards flexible packaging in India. Consumers today are increasingly looking to buy products which are suitable for handling, long lasting and easy to store and as plastics can be used with great versatility, they have been the preferred choice in packaging. This growth will also be pushed by the increasing size of middle class population in tier II/III cities in the country.

**Make in India:** The Government's current campaign on 'Make in India' which aims to turn the country into a global manufacturing hub will have positive impact on the growth of both plastic and packaging industry. The proposed policies of government for technology up-gradation fund scheme, setting up of plastic parks, setting up Special Economic Zones (SEZs) to overcome bottlenecks of infrastructure and creating business friendly policies will help in exploring the underlying potential. Also the extended support from Ministry of Chemicals & Fertilizers and the Central Institute of Plastics Engineering &



Technology (CIPET) will drive the growth of plastic industry in India. For example an export-oriented plastic cluster has been proposed to be set up at an investment of over INR 100 crore in Lucknow. India Industries Association (IIA) in collaboration with CIPET will set up this cluster. Cluster has already generated interest amongst 200 industrialists and entrepreneurs and is expected to generate direct employment opportunity for ~2,500 youth.



## 9. | Conclusions

Plastics packaging segment is poised to grow at a good rate with the major applications being in food, beverage and consumer goods. Several factors are enhancing the demand and supply of plastics used in packaging across India such as high growth of end-user industry, dynamically changing lifestyles, availability of feedstock, focus on manufacturing, etc.

However, gaining market share is difficult due to high competition, fragmented market and cheap imports from the other nations. Thus to support the industry players to retain their margins following initiative has been taken. For e.g. To restrict plastic machinery imports from China, the Plastics Machinery Manufacturers Association of India (PMMAI) has suggested the government to extend the imposing of antidumping duty on Chinese machinery for another four years. This is expected to help the Indian industry grow to be more competitive and increase exports. It will be beneficial for industry as well as the government as it would expand the country's ForEx reserve, improved balance of payment and employment generation with industrial growth.

Besides this, plastics are considered detrimental towards environment and hence, several states have imposed a ban on these products but the implementation of these ban are questionable. Thus, the need of the hour is to arrive at a sustainable solution by adoption of technologies, upcoming innovations and eco-friendly solutions. An organized development addressing cost effective plastic processing, along with streamlining operations of recycling of plastics could pave a path for growth of this industry.



## 10. | Indian Plastics Industry : An Overview

India is a growing market for plastics and consumes about 12.8 Million Metric Tonnes (MMT) of plastics annually against global consumption of 285 MMT per year. The plastics and polymer consumption is growing at an average rate of 10%. About 30,000 processing units with 113,000 processing machines have created manufacturing capacity of 30 MMT per annum in India. This has been achieved with a 13% CAGR of processing capacity during last 5 years. The industry has invested \$5 billion in the machinery and it is expected to make further investment of \$10 billion for further increase in capacities during the next 5 years.

The expected consumption of major polymers by the Indian Plastic Processors in the current year is as given below:-

Polyethylene	4683 KT
Polypropylene	4521 KT
PVC	2960 KT

The per capita consumption of polymers in India during 2014-15 was just 10.5 kg as compared to 109 kg in USA, 45 kg in China and 32 kg in Brazil. India is expected to be among the top ten packaging consumers in the world by 2016. The low level of per capita plastics consumption in India is indicative of the massive growth potential of the plastic industry. It is expected that per capita consumption will be doubled in the next five years, given the rising consumerism and modern lifestyles which have increased the usage of plastics across industries like automobiles and consumer products.

The downstream plastic processing industry is highly fragmented and consists of micro, small and medium units. Out of 30,000 processing units, about 75% are in the small-scale sector. The small-scale sector, however, accounts for only about 25% of polymer consumption. The industry also consumes recycled plastic, which constitutes about 30% of total consumption.

The Key Plastic Sectors are as mentioned below:

- PP Non Woven
- Raffia
- Automotive
- Agriculture
- Flexible Packaging
- Textile Fibers

### Exports From India

Products from the Indian Plastic Industry are exported to over 150 countries round the globe with the major trading partners being the European Union, USA, China, UAE, Saudi Arabia, Turkey, Nigeria, Indonesia, Egypt etc.



The exports of Plastic Products aggregated to US \$ 4860 millions during the year 2013-14. During this year the exports of Plastic Polymers were US \$ 3057 millions. Thus, the exports of Plastic Polymers and Plastic Products from India totaled 7917 millions.

The exports from the Indian Plastic Industry are expected to reach US Dollars 10 billion by 2015-16.

#### The major exports are:

- Plastic Raw materials
- Plastic sheets, films, plates etc
- Other Moulded and Extruded items
- Packaging items
- Woven sacks / FIBCs
- All types of optical items (incl. optical frames, lenses, sunglasses etc.)
- Medical Disposables
- Writing Instruments
- Floor coverings
- Houseware

#### Recent Innovations:

- **Water Purifier.** Millions of Indians have access to safe drinking water because of low cost of plastic components (PP), simple design, ease of operation and handling and Low operating cost.
- **Oriented Polyolefin Composites (OPOC)** is made by selective fusion of different layers (fabrics/films) resulting in oriented and layered structure both in micro and macro scales, making it light weight but strong. It has huge applications in plastic luggage Industry, Furniture, Protective shield, Building & Construction, Automotive and Marine products.
- **CPVC** offers thermal stability and extended life for plumbing solutions.
- **Oxygen Scavenging technology** is extremely critical for variety of packaging applications like use of PET bottles for Beer Packaging.
- **DWC Pipe manufactured from HDPE** material is designed as a technically superior and cost effective solution for replacement of GI, RCC pipes for laying fiber optic and electric cable networks and sewer applications.
- **Polyethylene gas pipes** are the preferred natural gas distribution piping product of choice.
- **Buried HDPE conduit** is resistant to chemicals and corrosive soils providing protection and long life.





## BIS Standards For Plastic Products

Standardization in the field of plastics for use in packaging, Building & Construction, Transportation, Medical & Health, Electrical & Electronics, Agriculture, Textiles, FMCG and Sports & Leisure items has been carried out by Bureau of Indian Standards (BIS). Till date about 1100 Indian Standards on various plastic products and their test methods have been developed and about 150 are at various stages of development.

## Human Resources /Skilled Manpower Requirement of Plastic Industry

The Report prepared jointly by Plastic Associations and CIPET states---

- Currently the capacity utilization of Indian Plastic Processing Industry is 48% which is expected to improve to 52% by 2020-21 and 55% by 2023-24.
- Current direct technical manpower in the plastic processing industry is estimated at 1.17 million. Additional manpower required by 2020-21 is estimated at 0.73 million and by 2023-24 at 1.17 million.
- Technical Manpower currently is 3.6 per 100 MT of Installed Capacity. It would be slightly lower at 3.4 per 100 MT of Capacity addition by 2020-21 and 3.3 per 100 MT by 2023-24 due to improvement in capacity utilization.
- In addition the manpower available in the Mould making industry during the year 2013-14 is 64,200 and addition of manpower required during the years (2013-14 to 2020-21) would be 21,489 and during the years (2021-24) would be 10,753. Thus in the next 10 years 32,242 addition of manpower is required.

## Growth of Indian Plastic Industry:

- Huge growth opportunities in India for Plastics due to lower per capita consumption as compared to world average.
- Flexible packaging industry poised for strong growth due to huge and diversified consumer base.
- New applications / innovations in Packaging development is driving growth in India.

*The article is authored by:*

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Secretary General

Organization of Plastics Processors of India



## 11 | Polyolefins and Sustainability: New Biobased Barrier Material for Flexible Packaging and Other Applications

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### ABSTRACT

SABIC is one of the largest global polyolefin producers. In order to contribute to sustainable development of all the applications our customers are producing we are exploring different aspects of material and application development. The combination of functionality, light weight, recycling, material reduction and renewable material is looked at in order to define solutions to several market segments. One of the topics we are investigating is the usage of renewable materials in combination with polyolefins. An example deals with partially biobased packaging material for improved gas barrier and therefore increased shelf life. Here special attention is given to morphology development during processing of such materials and the role of blend morphology for the steering of oxygen permeability and water vapour transmission rate. Other examples of sustainable solutions are the material reduction by using advanced multilayer packaging films. Another example is on the use of natural fibers as reinforcing agent for polyolefins. This enables light weight construction material for several markets as the life cycle assessment shows the clear advantages especially in the use phase.

**KEYWORDS:** Polyolefins, Sustainability, Packaging

### 1. INTRODUCTION

Our mission includes improving our environmental footprint, innovating products, services and processes that brings sustainability to our customers and growing our business by delivering better solutions for the planet and humanity. In order to contribute to this mission SABIC is working on a broad variety of topics to improve our environmental footprint including the reduction of greenhouse gases, energy and water and improving our material efficiency. As discussions intensify around carbon footprints and the life cycle of materials used in various industries, polyolefins compounds present significant opportunities to help address key sustainability concerns.

One of the topics we are investigating is the usage of renewable materials in combination with polyolefins for packaging and other applications.

### 2. HIGHLIGHTS OF OUR PROJECTS

Polyethylene films are the mostly widely used in blown film applications (packaging) [1]. Very costly solutions like multi-layer films of PE and ethylene vinyl alcohol (EVOH) are needed to get required oxygen and carbon dioxide barrier properties of these PE films. Our recent research work has shown that

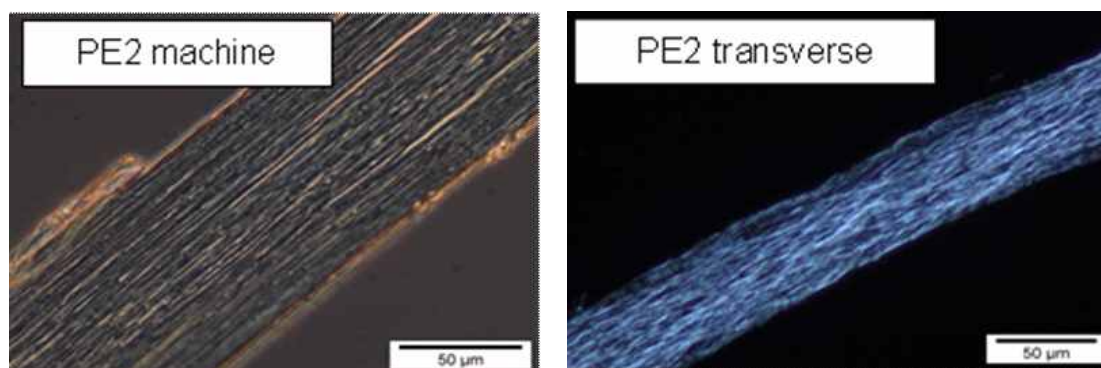


a polyethylene-starch based biaxially oriented film has a co-continuous morphology structure based on sandwiched thermoplastic starch (TPS) and PE layers is a potential solution to improve barrier properties and printability. Process optimization has been carried out to achieve highly elongated TPS phase in both machine and transverse directions as shown in Figure 1.

Multi-layer systems are being used in the packaging industry to add various functionalities to the application. Standard in the market is a 5-layer film set up, but the trend is to go to 7 (and more) layer systems. Most commonly used nowadays and benchmark for packaging applications is a 5-layer system. PE/tie/EVOH/tie/PE combinations are commonly used to improve the shelf life of a large variety of food items. The excellent oxygen barrier performance of this 5-layer EVOH concept can be attributed to the fact that the oxygen molecules are trapped in the free volume by the hydrogen bonds in the EVOH structure. The use of carbohydrates (natural materials consisting of crystalline amylose and branched amylopectin) like starch do have the potential to have similar functionality as EVOH to have excellent oxygen barrier performance.

Polyolefin based natural fiber compounds have market potential in the automotive and the building and construction industry. The choice of fibers gives slight differences in the mechanical property profile that is achievable in the compound [2-5]. In general properties of natural fiber filled (no further chemical treatment) compounds have properties comparable to talc filled compounds. Moduli and strength are high and notched and especially unnotched impact resistance is low. The latter is related to the crack initiation process, where the broad particle size distribution of standard natural fibers (d50 of ~250 μm) plays a big role in brittle fracture behaviour of all these compounds. There is a lot of literature [6] claiming properties of glass fiber reinforced composites by the usage of natural fibers, but this has never been proven on industrial scale due to the complex internal structure of fibers leading to a low lateral strength of each fiber and therefore even adhesion promoters will not lead to the desired high strength and impact values. Therefore the costs of these compounds have to be comparable to talc filled products, since they will be used in the same type of applications.

**Fig.1. Homogeneous dispersion of TPS and it is present as elongated elongated phase in both machine and transverse directions**



## REFERENCES

- 1 J. Lange, Y. Wyser, Packaging Tech. Sci., Vol. 16, 149-158 (2003).
- 2 Anil N. Netravali and Shitij Chabba, Materials today, April, 22-29 (2003).
- 3 K. Goda and Y. Cao, Journal of Solid Mechanics and Material Engineering, Vol 1, no 9, 1073-1084(2007).
- 4 S. J. Eichhorn et.al., J.Mat.Sci. V36, 2107–2131 (2001).
- 5 A K Mohanty, M Misra, G Hinrichsen, Macromolecular Materials and Engineering, Volume: 276-277, 1-24 (2000).
- 6 P. Wambua, J. Ivens, I. Verpoest, Comp. Sci. Tech. Vol. 63, 1259-1264 (2003).

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## 12. | References

1. Indian Brand Equity Foundation Reports on “Flexible packaging”, “Indian Pharmaceutical Industry” and “Indian Retail Industry”
2. Report by FICCI on “Plastic packing – The sustainable choice”.
3. SIES school of packaging's knowledge report on “New Generation Packaging of Personal and Home care products”
4. Report of the Sub-group on Petrochemicals for the 12th Five Year Plan
5. India Petrochemicals Industry Outlook to 2015
6. Handbook on Indian Chemical Industry, IndiaChem2010
7. India Chem Gujarat report on Indian chemicals and petrochemicals sector, 2015
8. Chemicals & Petrochemicals statistics at a glance : 2014
9. Report on Indian Plastic Industry 2014 - 2015, Plastindia Foundation
10. NDTV Profit News report on Reliance Industries and India Oil to Invest in Petrochemical Expansion
11. Plastindia's report on plasti-culture and Indian plastic industry
12. Expansion of refineries may boost plastic processing units
13. AIPMA Plastic News 2015
14. IRR (Indian Retail Reports)
15. Central Institute of plastic Engineering report on growth of plastic industry
16. FICCI's knowledge paper on Plastics Industry, 2015
17. Business Standard Articles
18. TATA Strategic Management Group's databases



# 13. | About Tata Strategic

Founded in 1991 as a division of Tata Industries Ltd, Tata Strategic Management Group is the largest Indian own management consulting firm. It has a 50 member strong consulting team supported by a panel of domain experts. Tata Strategic has undertaken 1000+ engagements, with over 300 clients, across countries and sectors.

It has a growing client base outside India with increasing presence outside the Tata Group. A majority of revenues now come from outside the group and more than 20% revenues from clients outside India.

Tata Strategic offers a comprehensive range of solutions covering Direction Setting, Driving Strategic Initiatives and Implementation Support.



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## 15. | About FICCI (Federation of Indian Chambers of Commerce and Industry)

Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community.

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