Packaging Technologies to Meet Sustainability Goals

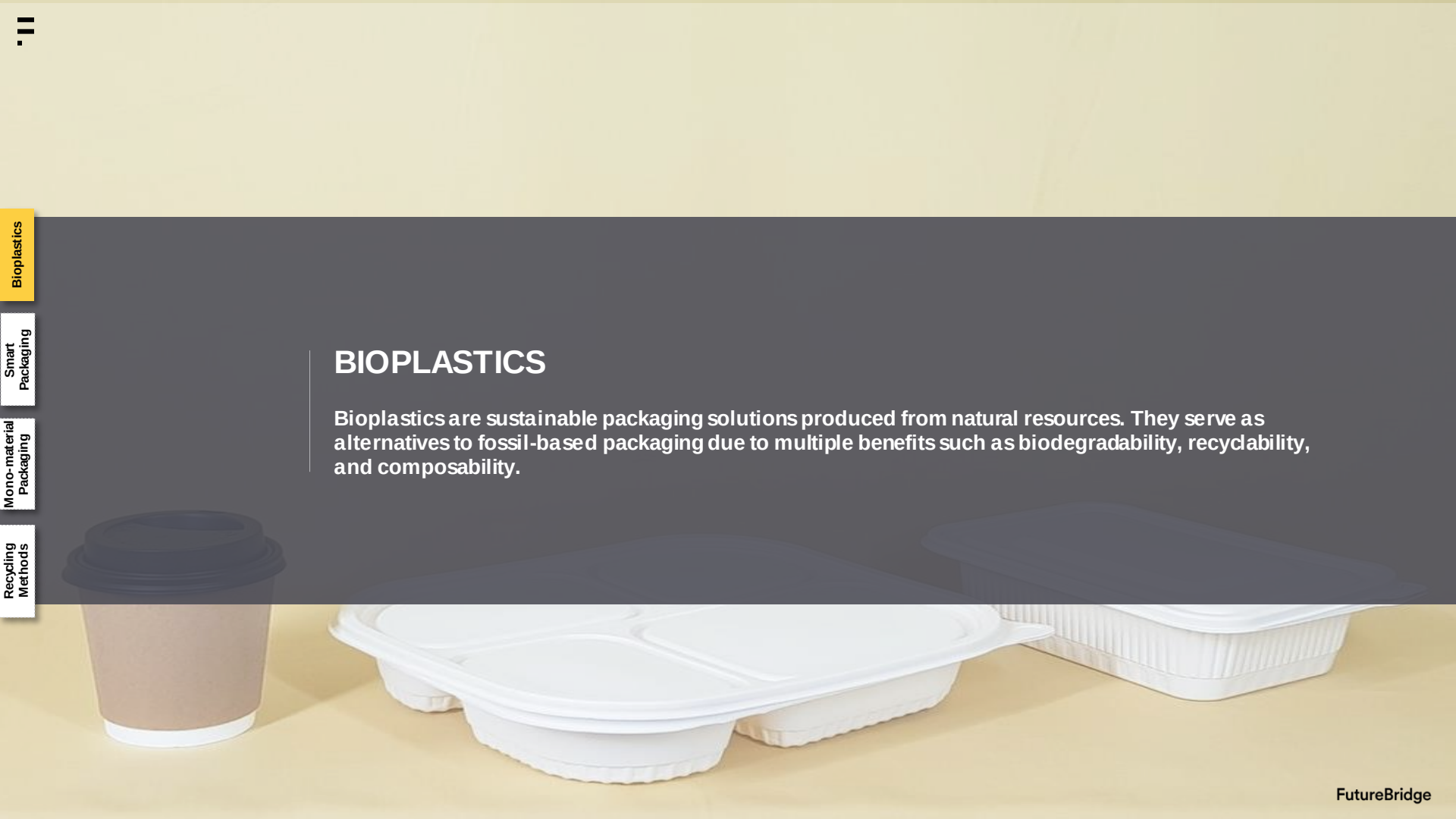
The packaging segment has different categories such as bioplastics, smart packaging, recycling methods that provide a better way to achieve sustainability goals for packaging manufacturers. These categories are enhancing the packaging market size and also fulfilling consumer demands with nature-based products.

Report Summary

FutureBridge

BIOPLASTICS

Bioplastics are sustainable packaging solutions produced from natural resources. They serve as alternatives to fossil-based packaging due to multiple benefits such as biodegradability, recyclability, and composability.



BIOPLASTICS
Trend Deep Dive | Executive Summary

SEGMENT OVERVIEW

The bioplastic industry is rapidly expanding with the utilization of various innovative technical and material solutions. Different types of bioplastics materials are available such as **plant-based** like **cellulose** and **starch-based**, **chitin-based**, **protein-based**, and **organic PE**

PATENT ANALYSIS

- Since starch can be utilized to decrease the carbon footprint and it can be a great alternative to **petroleum-based plastics**, various companies are using starch for developing bioplastic
- The company **Guangzhou Greenf Materials Technology** Co ltd filed a **patent** regarding the preparation of starch foaming materials for packaging
- The foaming agent utilized was **citric acid** and **sodium carbonate**, which helps in improving the **buffer performance** of starch foaming material

RESEARCH ANALYSIS

- **Chitin** is a biopolymer that is found in shrimp and crab shells as the main component. This chitin component is utilized by many packaging manufacturers for making bioplastic packaging
- It offers **biodegradable** and **recyclable packaging**, therefore various entities are adopting chitin, such as **Gorgan University of Agricultural Sciences** and Natural Resources Iran has developed **chitin nanofiber-based biodegradable** food packaging material
- Addition of thermoplastic **starch**, **gelatin**, and **poly(vinyl alcohol)** to **film** showed an increase in **physical** and **mechanical properties**

BIG STORIES

- Xampla a **UK-based** startup, which has developed a **bioplastic** using a **plant-based protein** that is **edible** as well as cookable

BIG STORIES

Genecis

Bioplastic development in the packaging field:
- Genecis a **biotech company** obtained **USD 6 million** in **funding** from **Next Generation (NGen)**.
- The funding will allow the company to **develop**, **scale**, and **integrate** a **novel biotech platform** to **upcycle organic waste** into sustainable bioplastics.

FutureBridge RECOMMENDS

01 Bioplastics can serve as excellent alternatives for waste management options via reuse, recycling and energy saving.

02 Bioplastics derived from biomaterials like starch and chitin reduce carbon footprints on the environment. Hence, they are useful for meeting sustainability targets.

03 Despite the above benefits, bioplastics struggle with functional features like barrier properties and mechanical strength. Therefore, further research is needed to enhance such properties through incorporation of natural fillers and edible reinforcing agents

SMART PACKAGING

Smart packaging is gaining traction due to the rapid expansion of the e-commerce and supply chain field as these areas require tracking, tracing, and safety of products (especially shelf life).

SMART PACKAGING

Trend Deep Dive | Executive Summary

SEGMENT OVERVIEW

Consumers are looking for waste reduction and shelf life enhancing solutions. Smart packaging can address such needs through active and intelligent packaging solutions.

PATENT ANALYSIS

- The main aim of an **active packaging** system is to **extend** the shelf-life of the food and improve its quality. It has different technologies that consist of **scavengers**, **emitters** or **releasers**, and **antimicrobial**
- Various packaging manufacturers and universities are producing active packaging by using various raw materials. Recently, **Zhejiang University ZJU** has **filed** a **patent** that focuses on active packaging preparation by using raw materials such as **bamboo leaf antioxidant**, **nano zinc oxide**, and **chitosan**
- It helps in **improving** the **antibacterial** as well as **antioxidant activity of active films**

RESEARCH ANALYSIS

- The **intelligent-based smart packaging** is still a growing field, which has extensive potential to improve the **safety**, **quality**, and **traceability** of food products
- Due to which various entities are coming up with new ideas and technology to develop intelligent packaging that preserves food life. University such as **Wuhan Polytechnic** has created **colorimetric-based indicators** made using inserting **purple tomato anthocyanin** (PTA) into **chitosan** (CS) matrix
- The films are used for **monitoring milk** and **fish spoilage**

BIG STORIES

Intelligent packaging development:

- **Greatview's smart packaging** helping **Oman's** most popular **juice brand TopFruit** through **partnership** by **offering smart packaging** in the form of **QR codes** onto **cartons**

GREATVIEW

BIG STORIES

Aptar

Active packaging development:

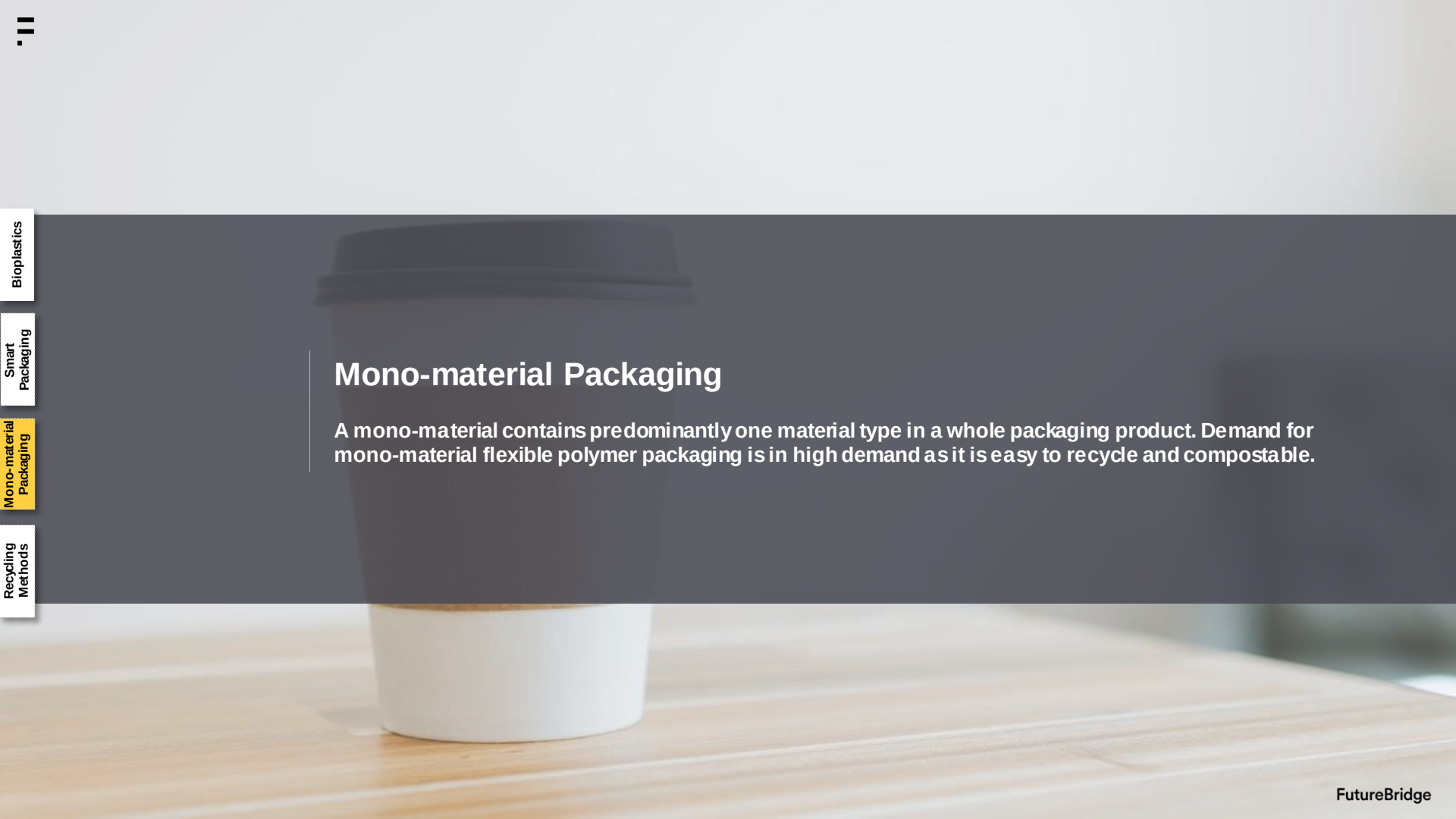
- **Aptar Food + Beverage** launches **InvisiShield platform technology**, which is an **anti-pathogenic packaging** solution that increases the **shelf-life** of **fresh-cut produce** from harmful pathogens like **bacteria**, **fungi**, and **viruses**

FutureBridge RECOMMENDS

01 Smart packaging is an emerging trend in the packaging category and helpful in reducing food wastage by preventing food spoilage and enhancing shelf life. Therefore, manufacturers should invest in this sector to expand their portfolio.

02 Research institutes and universities are actively engaging in innovating new products or solutions like chip-based packaging, antimicrobial films, that further enhance shelf life. Collaborating with these institutes could be great area for business enhancement in packaging field.

03 Use of plant-based material is promising in smart packaging segment. They tackle environmental issues by enhancing antimicrobial properties of the packaging material sustainably.



Mono-material Packaging

A mono-material contains predominantly one material type in a whole packaging product. Demand for mono-material flexible polymer packaging is in high demand as it is easy to recycle and compostable.

MONOMATERIAL PACKAGING

Trend Deep Dive | Executive Summary

SEGMENT OVERVIEW

In the food & beverages segment, mono-material based packaging is attracting great interest due to its **recycling polymer formats which make it completely recyclable.** Hence, companies are using mono-material for as a sustainable packaging solution

PATENT ANALYSIS

- As mono-material packaging consist of a **single layer** therefore they are easier to recycle compared to the products produced using different materials
- Recently the adoption of mono-material by the companies has increased for offering a package having high recyclability properties
- Various entities are focusing their topic on mono-material for example **The Dai Nippon Printing Co., Ltd**. researchers have **filed** a **patent** regarding the production of the mono-material container by using **polyethylene film**
- This film **enhances** the **recyclability** of the packaging

RESEARCH ANALYSIS

- As mono-material packaging also helps in preserving the food quality, so many researchers had focused on developing a mono-material by utilizing various raw materials that help in keeping the food fresh for long period. For example, **Kapadokya University** had developed a **tannic-acid functionalized polypropylene copolymers**, which was used as a packaging material
- **This copolymer showed a good antioxidant effect**

BIG STORIES

Mono-material packaging development:

- **Waddington Europe** has launched **100% mono-material soft-fruit** protective **punnet** by using **MONOAIR cushion technology**
- It's a **100% recycled PET punnet**

WADDINGTON EUROPE A NOVOLEX BRAND

BIG STORIES

AR PACKAGING

Mono-material packaging development:

- **AR packaging** has launched an **Ecoflex mono-material packaging** for **thermoformed applications**
- It is **100% recyclable** made using **mono polyethylene film**

FutureBridge RECOMMENDS

01 Mono-material packaging is fully recyclable. Therefore, they can be advantageously used for meeting sustainable goals by companies.

02 Mono-material packaging is energy efficient as it requires less energy inputs. So, these solutions offer energy saving and cost-effective means of production.

03 Research institutes are focusing on improving film properties through innovative technologies like using vapor-deposited substrates. Collaborating with such relevant academia will address issues related to managing barrier and lamination properties.

Mono-Material Packaging– Overview

Today, retailers, consumers, and food manufacturers are looking for both sustainable and food-preserving packaging products. Therefore packaging suppliers are using various materials together to fulfill the need. But the heterogeneous compositions are unrecyclable. This creates the need for easy recycling materials, which can be achieved by using mono materials.

Global Mono-Material Plastic Packaging Film Market

It is expected to reach by **USD 71 billion** by 2025

Why the market is expected to grow more;

- composed of a single type of material or a product
- ease the maintenance and re-use
- Easy recyclability
- High-barrier properties
- Enhances value chain to customers

Players in mono-material packaging

SK, ZOTEFOAMS, Mitsui Chemicals Group, Graphic Packaging International, COEXPAN, POLYSACK flexible packaging, NISSHA METALLIZING SOLUTIONS, mondi

Common Mono-Material types

List of mono materials;

- PE (LDPE, LLDPE, HDPE)
- PP
- PET

- The mono-materials are gaining interest in the market as the major benefit is recyclability.
- Along with this, It needs less energy during the recycling process, their process becomes more efficient and cost-effective.

Application Areas

Source: DKSH Management Ltd.

RECYCLING METHODS

Plastic waste is a perennial issue for the packaging industry, which needs to be focused on and solved with innovative technologies. At present, Chemical recycling is overtaking conventional recycling and attracting the majority of manufacturers.

RECYCLING METHODS

Trend Deep Dive | Executive Summary

SEGMENT OVERVIEW

The waste produced by plastic industries causes a lot of pollution and affect the environment in adverse ways. To overcome these problems, entities are developing various **recycling methods** to reduce overall environment impacts. These methods include a **chemical method** and **mechanical methods**

PATENT ANALYSIS

- Recycling the materials such as **aluminium**, **glass**, and **paper** is easier because these materials are fit for recycling as they do not degrade in by normal use and cause less contamination
- However plastic on the other side has a few issues because these materials contain different types of **chemical** in it, therefore it requires **strict forms** and **regulations** for its **reuse**
- Due to this, different countries have different **regulations** on **plastic recycling**, for example, **European Union** has imposed a regulation that it does not allow **chemical processes** if naphtha is used to produce plastic packaging for a **food product**

RESEARCH ANALYSIS

- As plastic recycling involves various **sorting** and **separating techniques**, which was done manually in past years but nowadays many industries have developed different sorting techniques and utilization of the such techniques increases the recycling rates of plastics
- For instance, **Wuppertal Institute for Climate** has utilized a **robotics sorting** method **to increase the recycling** rates of plastic and the **purity** of the recovered materials
- The technology helps in replacing the **manual sorting**

BIG STORIES

Plastic recycling development:

- **Svensk Plaståtervinning** has invested about **USD 109 billion** in building the largest **plastic recycling facility**, which will be able to recycle all types of **plastic packaging's**

Svensk Plaståtervinning

BIG STORIES

OBBOTEC

Startup in plastic recycling field:

- Obbotec is a plastic recycling startup, which utilizes its **SPEX** and **Hydrocat technologies** for recycling **high-quality plastic**. The SPEX technology uses **dissolution** to **recycle plastic** such as **PP** and **PE**., while **Hydrocat technologies** are used for producing a high-quality marketable fuel with a high calorific value

FutureBridge RECOMMENDS

01 In order to meet the regulatory aspects related to plastic recycling, it has become imperative to adopt innovative methods of recycling plastics like mechanical recycling, solvent extraction, depolymerization, and pyrolysis

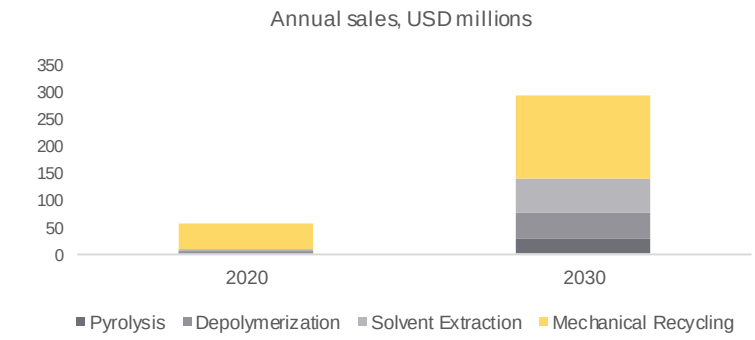
02 Chemical recycling is energy efficient, time saving and gives higher productivity compared to mechanical methods. The entities should focus on adopting chemical means for turning plastic waste into high-quality products

03 Innovation in recycling processes to reduce plastic wastage is on the rise. For instance SPEX technology is using dissolution process to recycle plastic. Research institutes and packaging suppliers must continue research on innovative recycling technology.

Plastic Recycling – Overview

The global recycled plastics market is estimated at USD 36,927.1 million in 2017 and is predicted to reach USD 50,356.1 million by 2022, at a CAGR of 6.4% between 2017 and 2022. It was observed that several consumers are aware of the plastic issues and they are participating in recycling the plastic waste into useful products

Global revenue from plastics recycling is set to grow enormously this coming decade



Major Players in Smart Packaging

MARS, TotalEnergies, Unilever, AIMPLAS, NEXTLOOPP, THE Coca-Cola COMPANY, DOW, BASF We create chemistry, amcor, PEPSICO

Consumer perception

About **83%** of people said that it's important for companies to design products that are meant to be reused or recycled

Nearly **72%** of people said that now they buy more environmental products compared to 5 years ago.

And **81%** said they will buy more eco-friendly products over the next five years.

Only **54%** of consumers are recycling and converting their plastic waste into useful products, and **38%** more showed their interest to do so in the next 12 to 18 months.

Source: Plastic Today, UN environment programme, Chemical and Engineering News

About FutureBridge

FutureBridge tracks and advises on the future of industries from a 1-to-25 year perspective.

We keep you ahead on the technology curve, propel your growth, identify new opportunities, markets, and business models, answer your unknowns, and facilitate best-fit solutions and partnerships using our platforms, programs, and access to global ecosystems and players.

At FutureBridge, our Food and Nutrition practice uses its extensive experience to solve your complex business challenges. We help you identify and thrive from transformation, develop and embrace new tech, and create and capitalize on new opportunities.

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