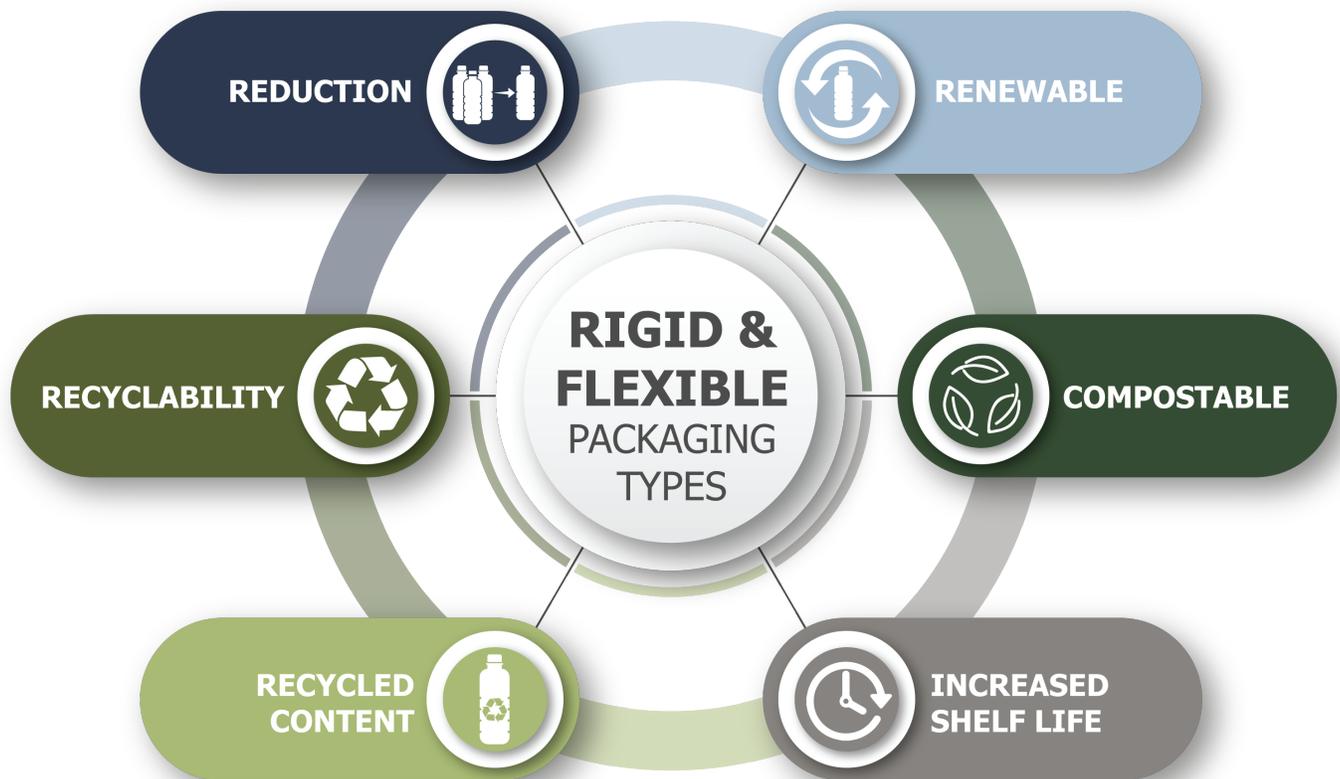


# SUSTAINABLE PACKAGING



## One-Stop Shop for Rigid & Flexible Packaging

Our commitment to sustainability and the global shift towards utilizing eco-friendly materials drives the Mitsui Plastics packaging division. We offer an extensive line of rigid and flexible packaging solutions suitable for all industries that meet or exceed product specifications of traditional materials.



## Rigid Packaging

Rigid packaging is versatile, affordable, highly protective and easy to recycle. We offer a full line of sustainable high-quality resins and film roll stocks to produce rigid packaging materials used for food packaging, cosmetics, chemicals, pharmaceuticals and much more!

### Reduction



#### Impact Modifiers

- Improve impact strength of polyolefins and polyamides especially at low temperatures.
- Resin modifiers for polyolefins can improve the toughness, impact and heat resistance of the polymer, and transparency of the final compound. With lower density, lower modulus and lower melting point vs. traditional polyolefins, these modifiers can be used to modify impact and softness in finished compounds.
- Acid-modified elastomers, with grades based in POE or EPDM, are well dispersed throughout nylon resin to prevent cracking and improve the durability of the polymer. Suitable for both filled and neat polyamide resins.

### Recycled Content



#### PET Melt Viscosity Improver

- For those looking to increase the rPET content in their products, our PET melt viscosity improver is a clever solution.
- Using this additive to increase the melt viscosity of polyester, customers have the flexibility to increase impact strength and improve processing, all while adding more recycled material into their system.
- Potential to improve yellowness index of rPET when using this Melt Viscosity Improver.

#### MAH-Polymers

- Trying to get extra performance out of your PCR-containing compounds? With our Maleic Anhydride (MAH) grafted polymer masterbatches, customers can improve compatibility between PCR/Virgin resin resulting in better mechanical properties across the board – tensile strength, flexural strength, impact strength, etc.
- Mitsui's MAH-polymers are low VOC, and minimize free Maleic Acid content on the final polymer – leaving customers with less worry of polymer degradation.

#### POE (Polyolefin Elastomer)

- Provides critical durability benefits such as impact and high-heat resistance.
- Boasts high clarity and anti-whitening resistance properties.



## Renewable



### TPX™

- With high heat resistance, this plastic resin is suitable for high-temperature applications. It features a low surface tension, second lowest compared to fluorine polymers, giving it excellent release-ability against various materials.
- It has a high chemical resistance compared with traditional polymers.
- TPX™ (PMP) has excellent transparency and high UV transmittance, comparable to that of glass. Its low density makes PMP ideal for applications requiring a light weight.
- As of November 2021, TPX™ will include material derived from renewable hydrocarbons.

### Ultra High Molecular Weight Polyethylene (UHMWPE)

- A unique self-lubricating UHMW polyethylene resin, it outshines traditional UHMWPE products. With high mechanical strength and abrasion resistance, this injection-moldable material can be used to replace PA6/PA66 modifiers and improve the lifespan of lubricant-free moving parts.
- As of November 2021, this resin is produced using renewable hydrocarbons originating from biogenic materials. It is also Halogen and PFOA free.

## Recyclability



### O<sub>2</sub> Scavenger

- Designed for oxygen-sensitive food and beverage packaging, O<sub>2</sub> Scavenger provides users with an effective O<sub>2</sub> barrier solution for their product while maintaining glass-clear, attractive optics.
- Eliminate the need for a multilayer EVOH/Nylon-based barrier structure – with O<sub>2</sub> Scavenger, material is polyester based and will actively scavenge Oxygen throughout the shelf life of the product.
- By replacing passive, hard-to-recycle barrier solutions such as EVOH, O<sub>2</sub> Scavenger can be recycled in the base PET stream with limited yellowing.

### Acid Scavenger

- Offerings range from different synthetic hydrotalcites to metallic soaps, including regular type hydrotalcite as well as dehydrated hydrotalcite.
- Regular-type hydrotalcite is commonly used in polyolefin production.
- Dehydrated hydrotalcite is used in production where higher processing temperature is needed.
- Zinc-type hydrotalcite is also available.
- Metallic soaps include calcium stearate, zinc stearate and magnesium stearate.

### ZrXL Series

- Additive blend that protects polyolefins 1-5 passes through the extruder with minimal polymer degradation.
- Designed to protect color, melt flow, and

## Rigid Packaging

### Compostable



#### Bio-Based PBS

- This patented, certified-compostable resin offers high temperature resistance, good heat sealing at low seal temperatures, good printability without pretreatment.
- Compatible with natural fibers and other biodegradable materials, excellent processability and is food-contact approved.

#### Polylactic Acid (PLA)

- Your go to solution if seeking a plant-based and compostable resin, and looking to significantly reduce your carbon footprint. PLA is certified compostable and it's applications are limitless - from rigids, food serviceware and more. PLA offers the highest of optical clarity in the bioplastic offerings today. PLA is also compatible for compounding with PBS, PBAT and more recently, PHA.

#### Polybutylene Adipate-Co-Terephthalate (PBAT)

- These resins offer a lower cost alternative solution for compostable packaging. PBAT exhibits a wide melting point with good flexibility and toughness, thereby ideal for blending with TPS.

#### RTU Compostable Compounds

- Technological solutions can be found through the use of RTU (Ready-to-Use) compounds for enhanced performance and processability. Available options including a range of injection molding, ISMB, extrusion coating, and extrusion/thermoforming compounds to provide a solution for transforming to a circular economy.

### Increased Shelf Life



#### EVOH (Ethylene Vinyl Alcohol Copolymer)

- Specialty polymer to provide superior barrier against the transmission of gases and other volatile products.
- It features excellent chemical and oil resistance.
- We offer various grades of EVOH containing between 29-44% of ethylene.

#### POK (Polyketone)

- Only engineered polymer that has a carbon footprint as low as Polyolefins. (
- For every two tons Polyketone produced, one ton carbon dioxide removed from the environment.
- Oxygen barrier properties at similar levels to EVOH depending on application details.

## Application Examples

### **O<sub>2</sub> Scavenger & Melt Viscosity Improver for PET Applications**

**Looking to produce a food-safe thermoformable tray with recycled material?** Using O<sub>2</sub> Scavenger + Melt Viscosity Improver, one can eliminate hard-to-recycle traditional barrier solutions such as EVOH or Nylon with an effective Oxygen scavenger in a monolayer structure. The O<sub>2</sub> Scavenger material package is effective with many rPET/PET systems. Where recycled content is a priority, using a Melt Viscosity Improver allows a higher rPET % while improving strength and processability.

After the lifecycle of a tray using O<sub>2</sub> Scavenger + Melt Viscosity Improver is reached, the product can be recycled in the PET stream with minimal yellowing effect.



### **Bio-Based Lubricant – Everglide®**

**Looking for a processing aid with roots in renewable resources?** Everglide® Performance Series is a collection of formulated lubricant masterbatches based on green/renewable resource additive technology. Designed with performance in mind, Everglide® PS gives users a chance to match performance of a standard Everglide® material at an additional cost savings. For those looking to make an injection molded product, just 2% dosage of Everglide® PS can improve COF in processing and abrasion resistance of final product.



### **Bio-Based PBS Coated Paperboard**

**Need versatility in addressing your sustainability goals?** Bio-based PBS is your solution for coated paperboard for use in on-the-go hot beverage cups, food/soup containers, or frozen food retail containers, paper lids and more. Bio-based PBS is food contact approved, is certified recyclable/repulpable as well, is compostable and produced from renewable resources! Bio-based PBS is a drop in to LDPE without need for modifications and has good processability compared with other bioplastics. It exhibits good adhesion to paper with excellent heat seal strength at lower seal temperatures, excellent printability without surface treatments. Options for both home and/or industrial compostable solutions are available!



## Flexible Packaging

Flexible packaging is versatile, light weight and low cost. We have you covered for all your flexible packaging needs, supplying high-quality resins and film roll stocks. As part of our commitment to providing eco-friendly options, we offer bio-compostable and sustainable materials to help minimize the negative impact on our environment.

### Reduction



#### **mLLDPE (Metallocene Linear Low Density Polyethylene)**

- Superior strength, clarity and heat-seal properties while providing opportunities to downgauge.
- Provides an exceptional balance of physical properties and processability.

#### **Barrier Paper**

- Looking to reduce your use of plastics in your flexible packaging? Take a step to achieving your plastic reduction goals and simplifying your packaging structure by utilizing our portfolio of fiber based barrier materials.
- Options include bleached, unbleached papers and metallized options designed to provide barrier against oxygen, aromas, water vapor, grease, and solvents.
- Help your packaging stand out with grades optimized to provide high quality print surfaces.
- Various sealant layer chemistries can be applied depending on your packaging goals.
- Need help picking the best sealant layer solution, we can help.

#### **Everglide®**

- This Ultra High Molecular Weight Siloxane technology gives users a unique set of processing benefits, ranging from thermal and COF stability, increased scratch and mar resistance, and excellent print and paint adhesion.
- Traditional additives such as Erucimides “bleed out” and require overengineered formulations - Everglide® is permanent, non-migratory and can achieve better processing with lower dosage.
- Everglide® products are PFOA free and a perfect solution for those looking to replace traditional fluoro processing aids.

## Recycled Content



### PET Melt Viscosity Improver

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- Mitsui's MAH-polymers are low VOC, and minimize free Maleic Acid content on the final polymer – leaving customers with less worry of polymer degradation.

### POE (Polyolefin Elastomer)

- Provides critical durability benefits such as impact, puncture and high-heat resistance for Retort packaging (sterilization and packaged food)
- Boasts high clarity and anti-whitening resistance properties.
- Additional functional properties include Low Heat Seal Initiation Temperature (HSIT), Hot-tack properties and Easy-peel or Easy-open function.

## Renewable



### TPX™

- With high heat resistance, this plastic resin is suitable for high-temperature applications. It features a low surface tension, second lowest compared to fluorine polymers, giving it excellent release-ability against various materials.
- It has a high chemical resistance compared with traditional polymers.
- TPX™ (PMP) has excellent transparency and high UV transmittance, comparable to that of glass. Its low density makes PMP ideal for applications requiring a light weight.
- As of November 2021, TPX™ will include material derived from renewable hydrocarbons.

### Ultra High Molecular Weight Polyethylene (UHMWPE)

- As of November 2021, this resin is produced using renewable hydrocarbons originating from biogenic materials. These materials come from oils, fats, waste and residues of vegetable origin or from waste animal fat materials. These renewable hydrocarbons are deemed Kosher and Halal by relevant authorities.
- UHMWPE is also Halogen and PFOA free.

## Flexible Packaging

### Recyclability



#### ZrXL Series

- Additive blend that protects polyolefins 1-5 passes through the extruder with minimal polymer degradation.
- Designed to protect color, melt flow, and polymer integrity including low odor.

#### Acid Scavenger

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- Regular-type hydrotalcite is commonly used in polyolefin production.
- Dehydrated hydrotalcite is used in production where higher processing temperature is needed.
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### Increased Shelf Life



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- Excellent chemical and oil resistance.
- Various grades of EVOH available containing between 29-44% of ethylene.

#### POK (Polyketone)

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- For every two tons Polyketone produced, one ton carbon dioxide removed from the environment.
- Oxygen barrier properties at similar levels to EVOH depending on application details.

#### Nylon

- Acts as a Medium Barrier and offers puncture resistance, and rigidity.
- Heat resistant properties.

## Compostable



### Bio-Based PBS

- Patented, certified-compostable resin offers high temperature resistance, good heat sealing at low seal temperatures, good printability without pretreatment.
- Compatible with natural fibers and other biodegradable materials, excellent processability and is food-contact approved.

### Polylactic Acid (PLA)

- Your go to solution if seeking a plant-based and compostable resin, and looking to significantly reduce your carbon footprint. PLA is certified compostable and it's applications are limitless - from flexibles to non-wovens and more. PLA offers the highest of optical clarity in the bioplastic offerings today. PLA is also compatible for compounding with PBS, PBAT and more recently, PHA.

### Polybutylene Adipate-Co-Terephthalate (PBAT)

- These resins offer a lower cost alternative solution for compostable packaging and film. PBAT exhibits a wide melting point with good flexibility and toughness, thereby ideal for blending with TPS. PBAT is excellent for use in flexible packaging such a produce or shopping bags, mulch film and extrusion coating.

### RTU Compostable Compounds

- Technological solutions can be found through the use of RTU (Ready-to-Use) compounds for enhanced performance and processability. Available options including a range of injection molding, ISMB, extrusion coating, and extrusion/thermoforming compounds to provide a solution for transforming to a circular economy.

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## Flexible Packaging

### Application Examples

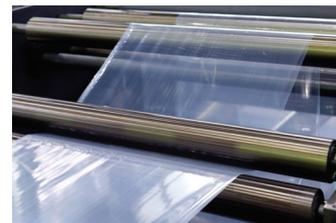
#### **PFAS Free Lubricant – Everglide®**

**PFAS processing aids are labeled ‘forever chemicals’ due to the fact they don’t break down over time.** Paired with studies showing adverse health effects, there is a growing market movement away from PFAS-based processing aids. How2Recycle announced in December 2021 that packaging containing PFAS will now be assigned the “Not Yet Recycled” How2Recycle label.

Mitsui is proud to offer Everglide®, a PFAS-free processing aid that users can find perform well when compared with traditional fluoro-materials. With Everglide®, film producers will achieve excellent melt processability, print adhesion, and a stable COF over a broad temperature range, allowing faster speeds on lines. Mitsui will work with you to fine-tune your additive approach to get the most out of your film production while moving away from traditional PFAS PPAs.

#### **BioBased Lubricant – Everglide®**

**Looking for a processing aid with roots in renewable resources?** Everglide® Performance Series is a collection of formulated lubricant masterbatches based on green/renewable resource additive technology. Designed with performance in mind, Everglide® PS gives users a chance to match performance of a standard Everglide® material at an additional cost savings. For those looking to make an injection molded product, just 2% dosage of Everglide® PS can improve COF in processing and abrasion resistance of final product.





### **e•qui•b - Mass Balance**

As the demand for eco-conscious packaging rises, we are poised to increase the percentage of bio-based renewable sources going into our production lines. Using e•qui•b's mass balance products are vital to help us move away from reliance on non-renewable resources and work towards a more sustainable future. The mass balance approach is applied to all e•qui•b's products, such as shelf stable dry foods, frozen foods, industrial products, pharmaceuticals, apparel, and more.

#### **Product Benefits:**

- Reduces greenhouse gas emissions
- Saves fossil resources
- Mass balance products ensure identical product quality and properties
- Uses renewable resources
- No need to adapt formulations, equipment, or processes



# The **Future** Of Packaging Is **Sustainable**



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