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Advancing Possible

Retort-able solutions for PP flexible packaging market

Advancing design for recycling (mono-material solutions)

Design for recycling and carbon footprint reduction in retort-able applications

LyondellBasell produces materials that are key to advancing solutions to modern challenges like recyclability of flexible packaging for high demanding applications.

LyondellBasell offers a full range of products that are suitable for mono-material retort applications, for all conversion processes: bi-oriented polypropylene film (BOPP), mono- oriented polypropylene film (MDO), cast film and blown film.

The plants producing the grades of this portfolio are ISCC PLUS certified, therefore *Circulen*Renew certificates can be provided, addressing the carbon footprint of packaging on top of their recycleability.

The retort-able solutions offer includes:

- High stiffness homopolymer grades, used in the core layer and outer layers in contact with sealing bars
- Random copolymers, used in the core layer or in the sealing layer
- Copolymers based on *Catalloy* technology, used as a skin in the sealing layer
- Polybutene-1 grades, lowering and widening the seal initiation temperature window of the sealing layer
- Masterbatches, a wide range of additives and white masterbatches

Polypropylene, *Catalloy* and Polybutene-1 (PB-1) Resins

Polypropylene resins enable mono-material – ready for potential recycling – solutions. LyondellBasell recently broadened its family of retort grades by bringing to the market a family of products based on non-phthalate catalyst and designed to advance sustainability. Those grades are aimed at replacing PET or PA in complex film structures, while providing downgauge and improved properties. They are also available as *Circulen*Renew, helping brands on their journey towards carbon neutrality.

Homopolymers

LyondellBasell offers a wide range of homopolymers for all needs and applications, featuring MFR (230°C/2,16 kg) from 0.8 to 9 g/10 min, which are suitable for retorting. Products of increased stiffness, with flexural modulus up to 2200 MPa, help downgauging the film structure and allow mono-material solutions.

NEW! *Adstif* HA622M

This grade is a very high stiffness homopolymer with high thermal stability. It is designed for hot filling applications requiring rigidity; it is suitable for high-speed lines. With MFR 7 g/10 min (2.16 kg/230°C), *Adstif* HA622M is nucleated and achieves a tensile modulus of 2200 MPa.

NEW! *Adstif* HA620J HP

Adstif HA620J HP is a non-phthalate low catalyst residuals homopolymer. With MFR 3 g/10 min (2.16 kg/230°C), it is appreciated by BOPP customers for its enhanced processability on high-speed lines.

Adstif HA622H

This high cristallinity homopolymer offers good optical properties, increased film rigidity and barrier. It is designed for the production of biaxially oriented polypropylene films (BOPP), including metallizable films and both plain and coextruded structures.

Random and heterophasic copolymers

When it comes to mono-material solutions for food applications requiring thermal resistance, the main challenge is providing a structure that is sealable and retort-able at the same time, while keeping good seal strength and barrier after retorting. LyondellBasell offers a wide range of random and heterophasic copolymers suitable for that scope.*

NEW! *Moplen* RP410M HP

This random copolymer is designed to be employed in the sealing layer of mono-material structures for high retorting applications. Main features are high melting temperature, broad processability window and high seal strength after retorting. It is appreciated in BOPP as well as in cast structures due to its good processability and optical properties.

Moplen EP310D and Moplen EP310D HP

Those heterophasic copolymers represent an industry benchmark when it comes to cast and blown film high retorting applications. They exhibit superior mechanical properties and deliver high impact and thermal resistance over a broad range of temperature. Low fluidity, does not contain anti-blocking and slip additives.

Moplen EP310J HP

This heterophasic copolymer is suitable for high retorting conditions. It is nucleated and has a higher fluidity and increased transparency when compared to EP310D HP. It offers high thermal stability for food sterilization, high seal strength and seal integrity and exhibits high impact, good puncture and good tear resistance.

Moplen EP310M HP

This heterophasic copolymer offers great balance between impact properties (at room and low temperatures) and stiffness, while featuring good puncture and tear resistance, high seal strength and seal integrity. Optimal processability on cast film lines.

** The compliance to the requirements of Regulation 10/2011/EC (in terms of OML and SML determinations) are the responsibility of the manufacturer of the finished plastic food contact material or article.*

Catalloy

No spills and no contamination of your product!

Used as sealing layers (modifiers) in cast and blown film structures, the family of *Adflex* Q 100 F and *Adflex* C 200 F provide a food compliant, good organoleptics and high performance solution for stand-up pouches for retorting at 125 - 140° C. Also available in non- phthalate versions as *Adflex* Q 190 F and *Adflex* C 290 F.

When used as blending partner in 15-20% in sealing layer, *Adflex* Q 100 F/Q 190 F and *Adflex* C 200 F/ C 290 F show:

- Stiffness
- Toughness at low and high temperatures
- Tear and puncture resistance
- Retorting stability
- Low gel content

Polybutene-1 (easy-peel/peel-seal feature)

LyondellBasell grouped products used in easy-peel technology for PP film with the *Toppyl* C range.

Customers use these products in a broad range of film extrusion technologies like cast film, blown film, sheet extrusion and BOPP to easy-peel to PP and to itself (bags/pouches).

Typically, *Toppyl* C used in multilayer PP retort-able solutions are:

Toppyl SP 2101 C

This grade is used by customers for heat-sterilizable applications, which require an average peel force ± 3 – 4 N/15mm ** before film lamination. *Toppyl* SP 2101 C is fully formulated with slip and antiblock agents.

Toppyl SP 2103 C

In case customers need an easy-peel solution with a higher peel force compared to Toppyl SP 2101 C and still to PP for heat-sterilizable applications, LyondellBasell has developed *Toppyl* SP 2103 C.

The average peel force of *Toppyl* SP 2103 C is around ± 6 – 8 N/15mm ** before film lamination.

Toppyl SP 2103 C is a barefoot material and it does not contain slip and antiblock additives.

* *The Toppyl C grades will be available as non-phthalate (NP) versions from 2023 onwards and will replace the today (ZN) versions. Both versions (ZN and NP) will be commercially available till the end of 2023. Starting from Q1/2024, only the NP versions will be available*

** *Results measured with internal LYB test method, non-laminated cast film against non-laminated PP cast film - based on ASTM D882-90*

*** *For regulatory compliance information, see Product Stewardship Bulletin (PSB) and Safety Data Sheet (SDS). To obtain copies of these documents, please contact your LyondellBasell product safety representative.*

Masterbatches

LyondellBasell provides a full line of additive & white masterbatch solutions that can be customized to meet Biaxially-Oriented Polypropylene (BOPP), blown and cast PP film structure need.

Selection can be made upon the process of

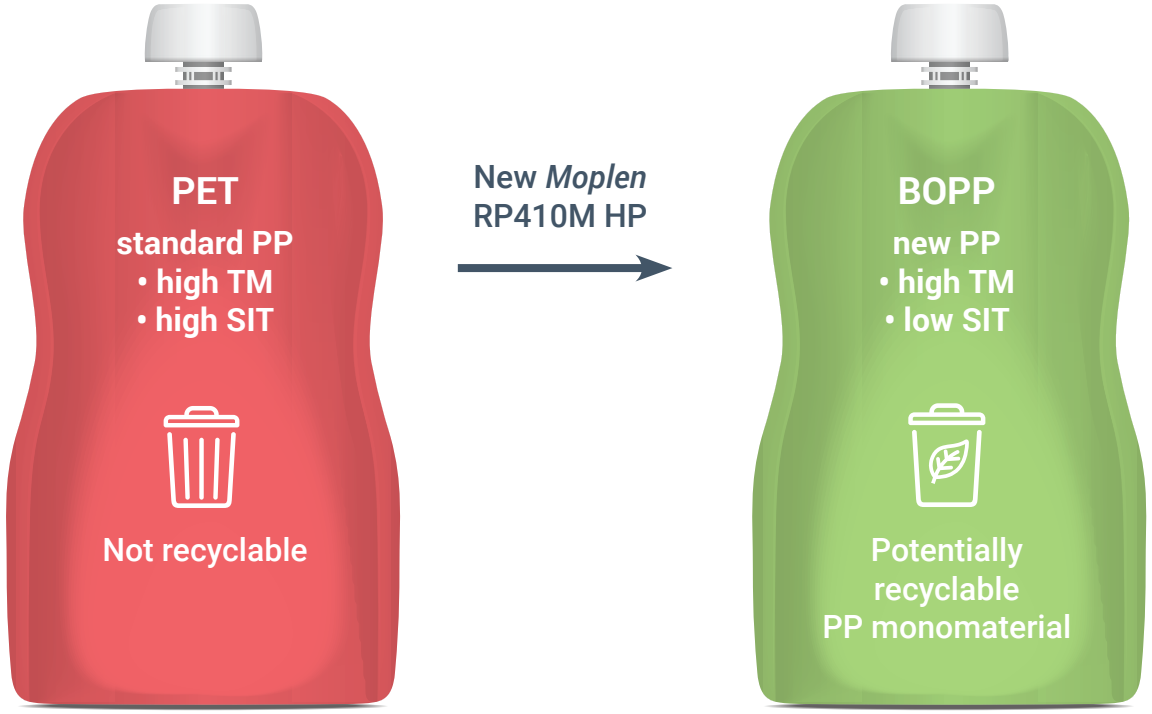
- Lamination and reverse or surface printing
- Coatings and Enhanced Vacuum Deposition Process (PECVD) of Al, SiOx and AlOx
- Heat process of pasteurization, hot fill, semi and high retortable applications.

Functionality	Polybatch / Polywhite Types & features	Description
Antiblocking	Standard Low abrasion Low COF	The addition of antiblock in films prevents their tendency to stick together (block). A variety of antiblock masterbatches are available. Selection can be made depending on the required film properties (optical properties, surface roughness, scratch resistance). Specific masterbatches are available for the Enhanced Vacuum Deposition Process (PECVD) of Al, SiOx and AlOx. Special antiblock agents can be applied as non-migrating slipping agent.
Slip & combined Slip / Antiblocking	Migrating Non-migrating Permanent	The reduction of film to metal and film to film coefficient of friction (COF) enables higher processing and handling speeds. A variety of slip masterbatches are available providing low, medium and high COF reduction with a short, long or permanent performance in packaging film. Combined Slip / Antiblocking masterbatch are available, reducing complexity in film recipes.
Antistatic	Long term Short term Broad FC compliancy	The antistatic agents prevents electrostatic charges typically caused by friction between two materials for example in the production and converting of packaging film. Antistatic agents keeps packed goods free of dust. Short- and long term antistatic performance masterbatches are available with broad Food Contact Compliancy.
White	Polywhite	LYB offers a wide range of high quality white masterbatches up to 80% titanium dioxide. Polywhite provide the packaging film high opacity and whiteness combined with high gloss. These masterbatches are appropriate for labels, lamination film, high quality print and many other applications.

LyondellBasell Masterbatch Solutions for high reliability, easy processing and customized film properties.

Case study: The full PP high retort-able pouch

LyondellBasell actively engages with film producers, converters and brand owners to develop solutions. Here is an example of value chain collaboration for the realization of a mono-material PP pouch which is intended to serve a wide variety of applications, from pasteurization of juices to high retorting applications. In its design it replaces mixed structures containing PA, PET or PE to offer a full potential recyclability.



This activity was performed with the support of following main partners:

The adoption of the new ***Moplen*** **RP410M HP** in the cast film and of the ***Adstif*** **HA622H** in the BOPP gives full flexibility in retorting conditions.

Moplen **RP410M HP** features:

- SIT ≤ 135°C
- Melting Temperature ≥ 155°C

For this specific collaboration, pouch was tested in following conditions:

- Sterilization for 4 min @121°C

and exhibited promising features:

- High seal strength after retorting, ≥ 23,5 N/15mm
- Good water and oxigen barrier after retorting

ABOUT US

LyondellBasell (NYSE: LYB) is one of the largest plastics, chemicals and refining companies in the world. Driven by its employees around the globe, LyondellBasell produces materials and products that are key to advancing solutions to modern challenges like enhancing food safety through lightweight and flexible packaging, protecting the purity of water supplies through stronger and more versatile pipes, improving the safety, comfort and fuel efficiency of many of the cars and trucks on the road, and ensuring the safe and effective functionality in electronics and appliances. LyondellBasell sells products into more than 100 countries and is the world's largest producer of polymer compounds and the largest licensor of polyolefin technologies. More information about LyondellBasell can be found at www.LyondellBasell.com.

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