

**I'm
green**

TM

SUSTAINABLE
SOLUTION FOR
A CIRCULAR
ECONOMY

Braskem 

Building a CIRCULAR FUTURE

A new way of thinking about production and consumption, this is how Braskem can support the transition to a Circular Economy. The evolution of the I'm green™ sustainable portfolio, which now has products from renewable and recycled sources, is helping partners achieve their sustainability goals and close the loop.

I'm green™ represents a revolution in sustainable sourcing, the result of our commitment and investment into innovation and research to find the best life-cycle solutions that combine bio-based resources and post-consumer waste, bringing benefits to the planet and the society.





I'm made from
**SUGAR
-CANE**
I'M RENEWABLE

- I'm HDPE, LDPE, LLDPE and EVA
- I'm blow-molded, injection molded, extruded
- I may be in **contact with food**
- I'm **capturing CO₂** from the environment
- I'm tackling **climate change**



I'm made of
**RECOVERED
PLASTIC**
I'M RECYCLED

- I'm rHDPE, rLPDE and rPP
- I'm blow-molded, injection molded, extruded
- I'm **closing the loop**
- I'm being recovered avoiding waste
- I'm tackling **climate change**



I'm creating a positive
**IMPACT ON
ENVIRONMENT**
**I'M BIO-BASED
& RECYCLED**

- I'm rHDPE, rLDPE and PP
- I'm blow-molded, injection molded and extruded
- I'm **closing the loop**
- I can be a **carbon neutral solution**
- I'm a combination of **recycled & bio-based**
- I'm tackling **climate change**

I'm green™ PORTFOLIO EVOLUTION



Launch of the I'm green™ to identify Braskem's bio-based source products.

INAUGURATION OF THE BIO-BASED ETHYLENE PLANT

Southern Brazil

Braskem becomes a world leader in the production of biopolymers by installing a bio-based ethylene and polyethylene production on an industrial scale.

2010

FAST COMPANY

Braskem is nominated as one of the 50 most innovative companies in the world by Fast Company magazine. The only Brazilian company to be listed and recognized for its research on bio-based products, such as I'm green™.



2014

2007



BIO-BASED ETHYLENE

Production of the first sample of green ethylene made from sugarcane ethanol.

2015



Launch of the first post-consumer recycled resins.

2002



CREATION OF BRASKEM

Announcement of the public commitment that identifies Braskem's principles and values, including its contribution to economic and social growth and its operation following principles of sustainable development.



REVERSE LOGISTICS FOR PP PLASTIC CUPS PROGRAM

The program seeks to guide and encourage companies in Brazil to adopt better logistics procedures for the proper destination of plastic cups after their use, cooperating with the entire value chain to promote plastic reuse and recycling. The cups are collected, recycled and transformed into new products, such as caps for cosmetic packaging and houseware.

EXTENSION OF THE RECYCLED RESIN PORTFOLIO

Expansion of the post-consumer resin portfolio.



RECYCLED SOLVENT

Braskem develops a hydrocarbon solvent from renewable sources that can be used in the rubber, adhesive and other markets.

2018



BIO-BASED EVA

The new resin is made from sugarcane, and is used in the footwear, automotive, transportation, among other sectors.

2019



ALLIANCE TO END PLASTIC WASTE

(AEPW - Industry commitment and engagement)

- Braskem becomes a founding member of the Alliance to End Plastic Waste, an organization that aims to develop solutions to eliminate plastic waste in the environment.
- \$1.5 billion has been destined for the next 5 years and will finance projects worldwide. Focus will be to improve waste management infrastructure in Asia and technological development in Europe.
- More than 45 global companies in the entire value chain contribute: plastic producers and processors, brand owners and recyclers.

2020...

I'm green

EXPANSION OF THE PRODUCTION CAPACITY OF BIO-BASED AND RECYCLED PRODUCTS.



JOIN THIS JOURNEY!

OUR RESINS MADE FROM SUGARCANE



With the I'm green™ bio-based portfolio, that is made of responsibly-sourced, sugarcane ethanol, Braskem's partners can offer their customers a range of unique products that contribute significantly to the reduction of greenhouse gas emissions along the chain.

Bio-based products are drop-in solutions that can replace their conventional version without the need to invest in new plastic processing machinery.



Drop-in solutions

Replace conventional resin with no investment in new plastic conversion machinery



Renewable source

Made from sugarcane, a renewable raw material



Recyclable

Use the same recycling chains developed for conventional resins



CO₂ capture

Sugarcane captures CO₂ from the atmosphere, helping to slow down climate change



LIFE CYCLE ANALYSIS



To deal with the growing demand from society for more sustainable solutions and the pressing concerns of citizens about climate change, "Life Cycle Thinking" is one of the major challenges for industries and governments when creating products and proposing new regulations. In order to better understand the impacts associated with the production of I'm green™ bio-based polyethylene, Braskem conducts LCA, Water Footprint and Land Use studies for the product.



PE

I'm green™ bio-based

Applications

I'm green™ bio-based polyethylene can be used in rigid and flexible applications already available in the market, as well as in foamed plastics.

The support of Braskem's technical teams during the development process, increases the chances of a fast approval while maximizing the renewable content in the final products.

Main applications



I'm green™ bio-based polyethylene is the renewable alternative to fossil polyethylene, a thermoplastic resin widely used in packaging in the consumer goods sectors, such as food, beverages, hygiene and cleaning products, as well as toys, trash cans and plastic bags.

The I'm green™ bio-based polyethylene portfolio offers approximately 25 grades in the HDPE, LLDPE and LDPE families that cover a wide range of applications. In most grades the renewable carbon content ranges

from 80% to 100%, which can be certified by measuring the biogenic carbon content, according to the ASTM D6866 standard.

There are labs that carry out carbon dating analysis and certifying bodies in Europe, USA and Asia. The certifying bodies in Europe, USA and Asia offer labels for the renewable content of a material or product based on the standard.

At the end of its life, I'm green™ bio-based polyethylene can be recycled in the same way as conventional polyethylene.

Merely illustrative exemplary applications. The possibility of using this product for a specific purpose may change according to the country and should be analyzed by the interested party. Braskem does not guarantee the possibility of using the product with other materials for the desired application. Please check the RIS (Regulatory Information Sheet) or contact Braskem for specific regulatory information.

PE I'm green™ bio-based

Injection molding

| Typical Properties | Melt Index (190 °C/2.16 kg) | Density | Minimum C14 content |
|--------------------|---|-------------------|---------------------|
| ASTM method | D 1238 | D 792 | D 6866 |
| Units | g/10 min | g/cm ³ | % |
| HDPE | SHA7260 | 20 | 0.955 |
| | Buckets and bowls, lids, toys, thin-walled parts, houseware and cosmetic packaging. | | |
| | SHC7260 | 7.2 | 0.959 |
| | Industrial containers, safety helmets, toilet seats, houseware, toys, lids, pallets, crater for beverage bottle, crater for fish and vegetables and cosmetic packaging. | | |
| | SGE7252NS | 2.0 | 0.952 |
| | Beverage bottle caps. | | |
| LDPE | SPB208 | 22 | 0.923 ^a |
| | Masterbatches, injection of parts with a large flat area such as snap lids. | | |
| | SPB608 | 30 | 0.915 ^a |
| | Masterbatches, injection of parts with a large flat area such as snap lids. | | |

Test specimens prepared from compression molding, according to ASTM D 4703. a) Value obtained by the ASTM D1505 method.

Tubes extrusion & blow molding

| Typical Properties | Melt Index (190 °C/2.16 kg) | Density | Minimum C14 content |
|--------------------|--|-------------------|---------------------|
| ASTM method | D 1238 | D 792 | D 6866 |
| Units | g/10 min | g/cm ³ | % |
| HDPE | SGF4950 | 0.36 | 0.956 |
| | Bottles for hygiene and cleaning products, bottles for beverages, compression molded caps and cosmetic packaging. | | |
| | SGF4960 | 0.34 | 0.961 |
| | Bottles for food and beverages, bottles for dairy products, rigid containers for cosmetics and lubricant oils and caps & closures molded by compression. | | |
| | SGF4950HS | 0.21 | 0.951 |
| | Canisters from 2 to 20L for chemical products, bottles for concentrated detergent, bottles for food, tanks for wind shield and air ducts. | | |
| LDPE | SEB853 | 2.70 | 0.923 ^a |
| | Tubes for food and cosmetics. | | |
| | STN7006 | 0.60 | 0.924 |
| | Tubes for food and cosmetics. | | |
| | SBF0323HC | 0.32 | 0.923 ^a |
| | Tubes for food and cosmetics. | | |

Test specimens prepared from compression molding, according to ASTM D 4703. a) Value obtained by the ASTM D1505 method.

Extrusion coating

| Typical Properties | Melt Index (190 °C/2.16 kg) | Density | Minimum C14 content | Additives |
|--------------------|---|-------------------|---------------------|-----------|
| ASTM method | D 1238 | D 792 | D 6866 | - |
| Units | g/10 min | g/cm ³ | % | - |
| LDPE | SBC818 | 8.30 | 0.918 | 95 |
| | Low neck-in applications, good film stability, good adhesion to porous substrates, carton packs for food & beverages. | | | |

Test specimens prepared from compression molding, according to ASTM D 4703.

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Fiber Extrusion

| Typical Properties | Fluidity Index (190 °C/2.16 kg) | Density | Thermal Deflection Temperature (0.45 MPa) | Minimum C14 content |
|---|---|-------------------|---|---------------------|
| ASTM method | D 1238 | D 792 | D 648 | D 6866 |
| Units | g/10 min | g/cm ³ | °C | % |
| HDPE | 20 | 0.955 | 67 | 94 |
| | Two-component non-woven fabric and fibers in general. | | | |
| | 1.0 | 0.948 | 76 | 94 |
| SHE150 Raschel, protection and shadow nets and strings. | | | | |

Test specimens prepared from compression molding, according to ASTM D 4703. a) Tests performed on samples of 3 mm.

Cast and Tubular films

| Typical Properties | Melt Index (190 °C/2.16 kg) | Density | Minimum C14 content | Additives |
|---|---|-------------------|---------------------|-----------|
| ASTM method | D 1238 | D 792 | D 6866 | - |
| Units | g/10 min | g/cm ³ | % | - |
| HDPE | - | 0.952 | 96 | AF |
| | Retail bags, promotional bags, produce bags and frozen food packaging. | | | |
| | 1.0 | 0.948 | 94 | AF |
| SHE150 Cereal packaging and blends with LLDPE and LDPE. | | | | |
| LLDPE | 1.0 | 0.916 ° | 87 | - |
| | SLL118 Stretch films, blends with LDPE and HDPE and general use packaging. Other applications: blends for irrigation pipes, industrial sacks, liners and cosmetic packaging. | | | |
| | 1.0 | 0.918 ° | 87 | AB, D |
| | SLL118/21 Automatic packaging (FFS) and blends with LDPE and HDPE. | | | |
| | 1.0 | 0.916 ° | 84 | - |
| | SLH118 Stretch films, blends with LDPE and HDPE and general use packaging. Other applications: blends for irrigation pipes and cosmetic packaging. | | | |
| | 2.3 | 0.916 ° | 84 | - |
| | SLH218 Stretch films, blends with LDPE and HDPE and general use packaging. Other applications: blends for irrigation pipes, insulation of low and medium XLPE wires and cables. | | | |
| | 0.80 | 0.92 ° | 84 | AB, AF |
| | SLH0820/30AF Industrial sacks and blends with LDPE and HDPE. | | | |
| LDPE | 0.32 | 0.923 ° | 95 | - |
| | SBF0323HC Industrial sacks, agricultural films, co-extruded and heat-shrinkable films for palletizing and cosmetic packaging. | | | |
| | 0.60 | 0.924 | 95 | - |
| | STN7006 High transparency films for food products packaging by coextrusion such as: cheese, meat, sausages, sliced ham, etc.; flat films for tablecloth, curtains and laminated fabric, flexible bottles for solids, liquids or paste products for hygiene and cleaning and cosmetic packaging. | | | |
| | 0.60 | 0.925 | 95 | AB, D |
| | STS7006 High clarity films for coextrusion food product packaging, such as: cheese, meat, sausages, sliced ham, etc. | | | |
| | 2.7 | 0.923 ° | 95 | - |
| | SEB853 Typical applications of blown film including diaper films and other general uses in addition to blends with LLDPE and HDPE. | | | |
| | 2.7 | 0.923 ° | 95 | AB, D |
| | SEB853/72 Lamination film and general use, automatic packaging of solid products (FFS), automatic packaging for various products and high transparency for tissue paper. | | | |
| LDPE | 3.8 | 0.922 ° | 95 | - |
| | SPB681 Extrusion of blow and flat films, injection molding, blends with LDPE and HDPE and cosmetic packaging. | | | |
| LDPE | 3.8 | 0.922 ° | 95 | AB, D |
| | SPB681/59 Lamination films and general uses and automatic packaging for solid products. | | | |

Test specimens prepared from compression molding, according to ASTM D 4703.. Additives: AB = anti-blocking, S = sliding, FA = flow aid. a) Value obtained by the ASTM D1505 method.

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EVA

I'm green™
bio-based

I'm green™ bio-based EVA, made from sugarcane, is the sustainable alternative for several segments that use EVA in their products.

Bio-based content ranges from **45% to 80%**, based on the ASTM D6866 standard.

At the end-of-life, I'm green™ bio-based EVA can be **recycled/reused** in the same way as conventional EVA.

Applications

I'm green™ bio-based EVA is ideal for applications such as: shoes, adhesives, toys, wires & cables, tatami mats and foams in general.

The support of Braskem's technical teams during the development process, increases the chances of a fast approval while maximizing the renewable content in the final products.

Main applications



Shoes



Tatami mats



Sport items

Brassiere



Ball



Toys and educational games



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Foamed Products

| Typical Properties | Fluidity Index (190 °C/2.16 kg) | Vinyl acetate content | Minimum C14 content |
|---|------------------------------------|-----------------------|---------------------|
| ASTM method | D 1238 | Braskem | D6866 |
| Units | g/10 min | % | % |
| | 2.1 | 19 | 80 |
| EVA SVT2180 Polymer used as a base for manufacturing foamed and reticulated plates and soles (unisolet midsole) for shoes, toys, sporting items, etc. The resin can be processed by injection molding or compression. | | | |

Test specimens prepared from compression molding, according to ASTM D 4703.

Braskem Evance

| Typical Properties | Fluidity Index (190 °C/2.16 kg) | Vinyl acetate content | Minimum C14 content |
|---|------------------------------------|-----------------------|---------------------|
| ASTM method | D 1238 | Braskem | D6866 |
| Units | g/10 min | % | % |
| | 2.1 | 14 | 45 |
| EVA Evance SVT2145R Semi-amorphous thermoplastic resin with medium Vinyl Acetate content, easily crosslinkable and good compatibility with different thermoplastics, inorganic fillers and pigments. It has an excellent soft touch, good grip, good resistance to abrasion and resilience. | | | |

Test specimens prepared from compression molding, according to ASTM D 4703.

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OUR SOLUTIONS WITH RECYCLED CONTENT



The portfolio of resins with recycled content is a Braskem innovation reflecting our commitment to bring the Circular Economy from concept to reality. The goal is to promote businesses and initiatives to create value for post-consumer plastic waste and the recycling chain, through partnerships with customers, recyclers, cooperatives and brand owners.

Main applications



Lids



Home appliances

Furniture



Packaging



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RIGID



About 34.7% of the global plastic market is made up of rigid packaging and technical parts. These products have incorporated the concept of Circular Economy, both in the packaging proposal and in the manufacturing process. Braskem develops post-consumer resin solutions to combine sustainability with the high technical requirements of each application. The I'm green™ recycled portfolio was developed to meet sustainable projects that demand quality, traceability and, above all, compliance.



PE - Polyethylene

| Family | Commerce | Grade | MFI (190 °C / 2.16 kg) | Density | Color | Process- ability | Rigidity | Drop test | Chemical resistance | Weldability | Tear resistance |
|--------|----------|------------|------------------------------|---------|---------|---------------------|----------|-----------|------------------------|-------------|--------------------|
| Units | | | g/10 min | g/cm³ | | | | | | | |
| HDPE | | DA054B | 0.30 | 0.955 | Black | ●● | ●●● | ●●● | ●● | - | - |
| | | DA055A | 0.35 | 0.955 | White | ●● | ●● | ●● | ●● | - | - |
| | | DA065A | 0.20 | 0.960 | White | ●● | ●●● | ●●● | ●●● | - | - |
| | | DA065B | 0.20 | 0.960 | Black | ●● | ●●● | ●●● | ●●● | - | - |
| | | RPR 3A1 NL | 0.38 | 0.955 | Natural | ●●● | ●●● | ●●● | ●●● | - | - |
| | | RPR 5A1 WE | 0.40 | 0.955 | Natural | ●●● | ●● | ●● | ●●● | - | - |

PP - Polypropylene

| Family | Commerce | Grade | MFI (230 °C / 2.16 kg) | Color | Process- ability | Rigidity | Drop test | Dimensional stability |
|---------------------|---|------------|------------------------------|-------|---------------------|----------|-----------|--------------------------|
| Units | | | g/10 min | | | | | |
| PP Heco/ Copo |  | DP237C | 9 | Black | ● | ●● | ●●● | ● |
| | | DP237F | 9 | White | ● | ●● | ●●● | ● |
| PP Copo | | DP237A | 24 | Black | ●●● | ● | ●● | ● |
| | | DP237D | 24 | White | ●●● | ● | ●● | ● |
| PP Homo | | DP237B | 11 | Black | ●● | ●●● | ● | ●● |
| | | DP237E | 11 | White | ●● | ●●● | ● | ●● |
| | | RPH 4J7 WE | 7 | White | ●● | ●●● | ● | ●● |
| | | RPC 0L7 BK | 14 | Black | ●●● | ●● | ●● | ●● |
| |  | RPH 9H2 BK | 6.5 | Black | - | - | - | - |

● Good ●● Great ●●● Excellent

FLEXIBLE



Flexible packaging represents 65.3% of the global plastic sector. The transition to a Circular Economy, which is currently being consolidated in the world, is bringing a new concept of packaging development and brand communication with consumers. This transformation comprises the understanding of new packaging materials and concepts and is extended to the correct handling and proper disposal, that will allow the materials to remain in the value chain and stay away from landfill.



Bags



Sacks



Pad packaging

Main applications




Toilet paper packaging



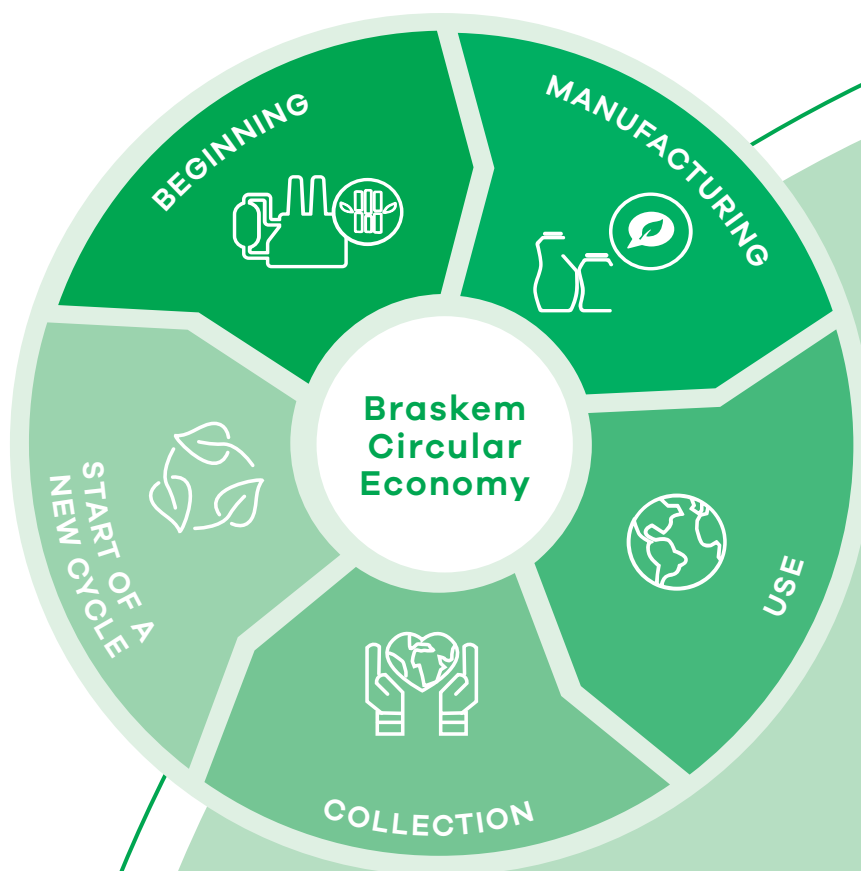
Trash bags

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PE - Polyethylene

| Family | Commerce | Grade | MFI (190 °C / 2.16 kg) | Density | Color | Processability | Rigidity | Drop test | Chemical resistance | Weldability | Tear resistance |
|--------|---|------------|---------------------------|---------|-------------|----------------|----------|-----------|---------------------|-------------|-----------------|
| Units | | | g/10 min | g/cm³ | | | | | | | |
| LDPE |  | RPL 4C5 WE | 0.90 | 0.925 | White | ●● | ●●● | ●● | - | ●●● | ●● |
| | | RPL 4C2 BL | 1.50 | 0.925 | Translucent | ●● | ●●● | ●● | - | ●●● | ●● |
| |  | RPL 5A1 NL | 0.60 | 0.921 | Natural | ●●● | - | - | - | ●●● | ●● |
| | | RPL 5C1 NL | 1.85 | 0.921 | Natural | ●●● | - | - | - | ●●● | ●● |

● Good ●● Great ●●● Excellent



Braskem: global presence

With a global vision of the future, focused on people, Braskem strives every day to improve people's lives by creating sustainable solutions through chemicals and plastics.

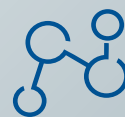
Braskem is the largest producer of thermoplastic resins in the Americas and the main producer of biopolymers in the world.

Our products are exported to, approximately, 100 countries and we have 40 industrial units, located in Brazil, the United States, Germany and Mexico, the latter in partnership with the Mexican company Idesa.

For more information, please visit www.braskem.com.



+20 MM TONS/YEAR



production of
thermoplastic resins
and other chemicals

Export to customers
in about

100 COUNTRIES



8,000
team members



40 industrial units:
28 plants in Brazil
6 plants in the USA
2 plants in Germany
4 plants in Mexico

