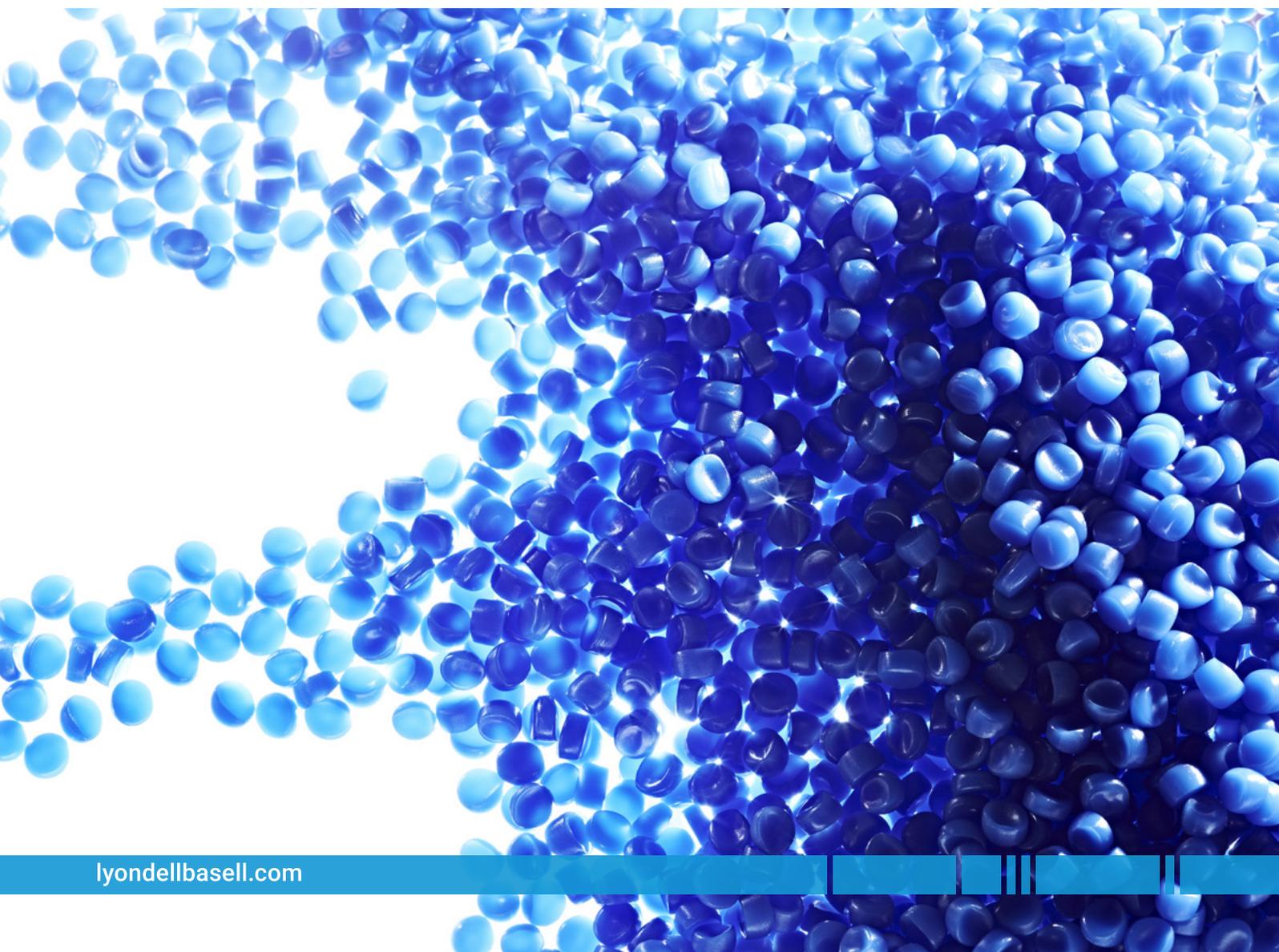


# Product Portfolio Overview

## Focus: Polymers





# 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](http://www.lyondellbasell.com).**

# Our Key Product Areas

The LyondellBasell team is inspired by the power of possibility. We are passionate about the role we play in supporting our customers' efforts to develop products to meet the challenges of today while advancing innovations that will improve tomorrow. To do so, LyondellBasell develops products and solutions in **five key areas**



## POLYMERS

Our versatile plastic resins are used to create a variety of products including:

- ▮ rigid and flexible packaging
- ▮ textiles
- ▮ wire and cable
- ▮ automotive
- ▮ appliances
- ▮ healthcare
- ▮ piping

## ADVANCED POLYMERS

Our diverse portfolio is used to create customizable products including:

- ▮ automotive parts
- ▮ differentiated packaging
- ▮ electronics/appliances
- ▮ building and construction materials
- ▮ oil field services
- ▮ aerospace
- ▮ pipe
- ▮ agriculture
- ▮ gelcoats

## CHEMICALS

We produce the chemical building blocks for:

- ▮ automotive fluids
- ▮ furniture / household goods
- ▮ coatings / adhesives / cleaners
- ▮ cosmetics / personal care products

## FUELS

Our refinery in the U.S. produces:

- ▮ gasoline / fuel components
- ▮ low-sulfur diesel
- ▮ jet fuel
- ▮ lubricants
- ▮ oxyfuels

## TECHNOLOGIES

We license our state-of-the-art manufacturing and process technologies

## Our materials and technologies are advancing solutions in:



**Food safety and access** through food packaging and films that improve freshness, portability, extend shelf-life and prevent contamination.



**Sustainable and modern living** through components in solar panels and a variety of products such as children's toys, cosmetics, leak-proof and shatter-proof containers.



**Cleaner air and fuel efficiency** through stronger, lighter plastics that allow for the production of more fuel efficient cars and trucks and through special gasoline additives that help reduce air pollution from vehicles.



**Quality healthcare** through a variety of medical supplies including synthetic latex gloves, hand sanitizers, biohazard bags, medicine containers and pill coatings.

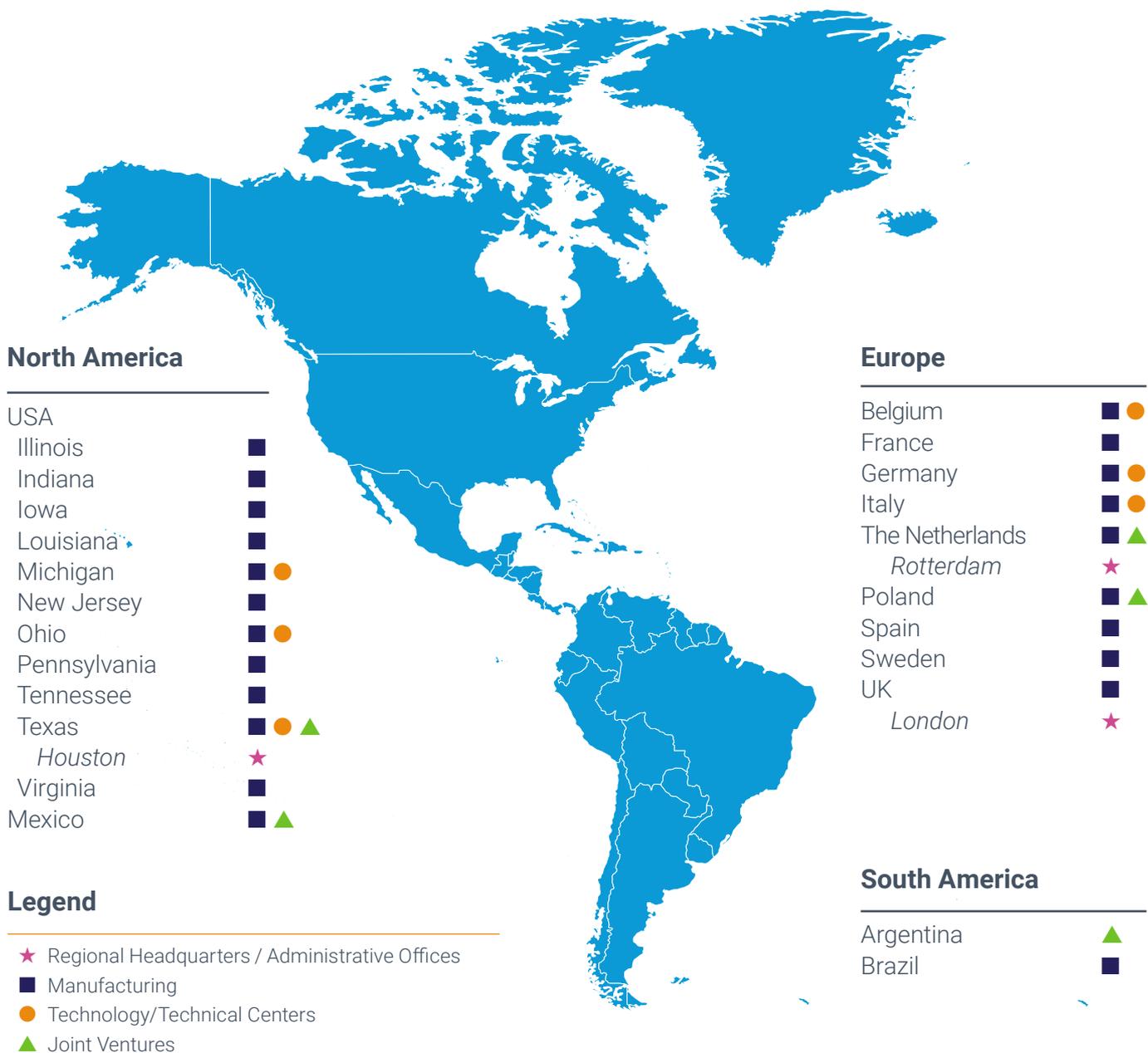


**Clean water** through strong, long-lasting pipes used in municipal water systems and key elements used in water filtration systems.



**Agricultural efficiency** through lighter machinery, crop protection and soil conditioning, as well as in greenhouses, landscaping and waste disposal.

# Global Presence



## A LEGACY OF INNOVATION AND LEADERSHIP

1953-54  
Hoechst, a predecessor company, **initiated industrial-scale production** of PE in Frankfurt, Germany.

1955  
Predecessor company scientists Professor Karl Ziegler and Giulio Natta make **breakthrough discoveries in the creation of polyethylene (PE) and polypropylene (PP)**.

1957  
Montecatini, a predecessor company, became the **first to produce the thermoplastic resin** on an industrial scale at its Ferrara, Italy plant.

1963  
Ziegler and Natta are jointly awarded the **Nobel Prize in Chemistry**.

1969  
Predecessor company, Atlantic Richfield Company (ARCO), **develops the PO/TBA process** (propylene oxide with tertiary butyl alcohol (TBA) as the co-product).

1975  
Start-up of the **first Hostalen** high density polyethylene (HDPE) process plant.

1980  
The Glacido Acetic Acid process **first commercialized by LyondellBasell** predecessor company.

1982  
*Spheripol* process, currently the most widely used polyolefins process technology, **first introduced by predecessor company Montedison**.

1985  
**Lyondell Chemical Company** is formed from selected chemical and refining assets of Atlantic Richfield Company (ARCO).



**Asia Pacific**

- Australia
- China
- Hong Kong
- India
- Indonesia
- Malaysia
- South Korea
- Thailand

**Middle East**

- Turkey
- Saudi Arabia

Basell completes start-up of the **world's largest low density polyethylene plant (LDPE)** in Berre, France, with a single line capacity of 320,000 tons per year.

LyondellBasell listed on the **NYSE** (Ticker symbol: LYB).

LyondellBasell began construction of **new Hyperzone HDPE plant** in La Porte, Texas utilizing the company's new proprietary technology.

LyondellBasell finalizes acquisition of **A. Schulman Inc.**, creating the industry's largest compounding business.

LyondellBasell launches **Circulen** and **Circulen Plus** bio-based polymers.

2000    2001    2007    2010    2014    2017    2018    2019    2020

**Basell** is formed through the merger of Montell, Targor and Elenac; a 50/50 joint venture between BASF and Shell.

Basell acquires Lyondell to become **LyondellBasell** Industries - one of the world's largest polymers, chemicals and fuels companies.

LyondellBasell is named **'Responsible Care Company of the Year'** by the American Chemistry Council.

LyondellBasell enters into joint venture with SUEZ to operate **Quality Circular Polymers (QCP)**, a high standard plastics recycling company in Sittard-Geleen, Netherlands.

LyondellBasell is named to Fortune magazine's list of the **"World's Most Admired Companies"** for the third consecutive year.

# Polymers at a Glance

## LyondellBasell Portfolio

LyondellBasell produces versatile polymers and advanced polymers. These materials produce a variety of products that are used to advance solutions in nearly every sector of the economy.



### Polymers

LyondellBasell is one of the world's largest producers of ethylene and propylene, base for versatile plastic resins, such as polypropylene and polyethylene.

### Key Advantages

Cutting edge and differentiated polymer product portfolio.

Advancing solutions in nearly every sector of the economy, including automotive, renewable energy technologies, packaging, piping, textiles and healthcare.

### Selected Products

HDPE  
LDPE  
LLDPE  
Tie Layers  
Homopolymers PP  
Impact Copolymers PP  
Random Copolymers PP

### End Uses

- Rigid and flexible packaging
- Textiles
- Wire and Cable
- Automotive
- Appliances
- Healthcare
- Piping



### Advanced Polymers

LyondellBasell offers a full product portfolio of masterbatch solutions, engineering plastics, engineered composites, specialty powders, *Catalloy*, PB-1 resins, PP compounds, custom performance colors and distribution services. Our high-performance resins and plastics compounds are used as raw materials in a variety of markets.

### Key Advantages

Vertically integrated global manufacturer - end to end customer solutions - expanded reach into growing markets - scalable growth platforms - focused innovation.

### Selected Products

*Catalloy* Process Resins  
Polybutene-1  
Polypropylene Compounds  
Masterbatches  
Color Concentrates  
Specialty Powders  
Engineered Polymers  
Engineered Composites

### End Uses

- Automotive parts
- Differentiated packaging
- Electronics / Appliances
- Oil field services
- Building and construction materials
- Aerospace
- Pipe
- Agriculture
- Gel coats



# Polymers Overview

LyondellBasell is a leading worldwide producer of polyethylene and polypropylene. Our polymers are used in extrusion, blow molding and injection molding processes for a wide variety of end markets including food and beverage packaging, construction, wire and cable, healthcare and automotive markets.

## Key Advantages

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- Products used in a broad range of applications and in products that people use every day with increasing demand in developing markets
- Operate multiple major integrated olefin and olefin derivative sites, which provide cost efficiencies through economies of scale and optimization
- U.S. access to shale gas, low cost NGLs, and the ability to process NGLs up to 90 percent of ethylene production
- Feedstock advantaged joint ventures and differentiated premium grade polyolefin products



*Hyperzone* PE technology produces HDPE that enables our customers to obtain an optimal balance between ease of processing and high performance end-product physical properties.

## Selected Products

### ■ POLYETHYLENE:

– **High-density polyethylene:** HDPE resins are thermoplastic materials made from the polymerization of ethylene in gas phase, slurry or solution reactors. Polymerization takes place under low-pressure conditions with the support of catalysts. HDPE is characterized by a linear polymer chain with few branches, and contains smaller amounts of comonomers such as butene, hexene or octene. These resins are used in a variety of processing techniques such as extrusion, extrusion blow molding, injection and rotational molding. HDPE forms the largest product family in polyethylene, and is used in numerous customer applications such as pipe, plastic fuel tanks, industrial packaging, bottles, healthcare articles, containers, toys, films, tapes and fibers.

**Highlighted Product Brands:** *Alathon* (Global), *Hostalen* (Global), *Hyperzone* (Global), *Luflexen* (Europe), *Lupolen* (Global), *Microthene* (Global), *Petrothene* (Global), *Plexar* (Global), *Purell* (Europe)

– **Low-density polyethylene:** LDPE resins are thermoplastics made from the polymerization of ethylene in tubular or autoclave reactors at very high pressures. Unlike low-pressure polymerization technologies, high-pressure polymerization produces highly-branched polymer structures and allows the co-polymerization of ethylene with polar comonomers, such as vinyl acetate or butyl acrylate. LDPE is a versatile polymer offering an

excellent balance of properties including good melt strength, flexibility, and excellent optics, making it suited for a number of applications such as film, healthcare and wire & cable.

**Highlighted Product Brands:** *Lucalen* (Global), *Microthene* (Global), *Petrothene* (Global), *Plexar* (Global), *Purell* (Global), *Ultrathene* (Global)

– **Linear low-density polyethylene:** LLDPE resins are thermoplastic materials made by the polymerization of ethylene in presence of alpha-olefinic comonomers in low-pressure catalytic processes. Contrary to high pressure resins, LLDPE materials are characterized by their linear structures. In combination with their high flexibility these products are used in a variety of processing techniques, like film, molding and compounding.

**Highlighted Product Brands:** *Microthene* (Global), *Petrothene* (Global), *Plexar* (Global)

– **Tie Layers:** Under the *Plexar* brand, a broad array of resins is available that provide excellent adhesion to ethylene vinyl alcohol (EVOH), polyamide (nylon), PET and polyolefins. They are used in multilayer structures to bond dissimilar polymers together. LyondellBasell *Plexar* resins provide superior performance in coextrusion applications such as blown and cast film, extrusion coating, blow molding, sheet extrusion, wire and cable technology, and in other industrial bonding applications

**Highlighted Product Brands:** *Plexar* (Global)

### ■ POLYPROPYLENE:

– **Homopolymers:** Polypropylene homopolymers are thermoplastic resins produced through the polymerization of propylene. The homopolymers can be used in different processing technologies, such as injection molding, film, fiber, sheet extrusion and thermoforming where stiffness and temperature resistance are relevant and provide a broad set of properties to meet the market needs in packaging, household goods, textiles, film, healthcare and pipe as well as applications in the automotive and electrical industries.

**Highlighted Product Brands:** *Adstif* (Global), *Metocene* (Global), *Moplen* (Europe and Asia), *Profax* (Americas), *Purell* (Europe and Asia)

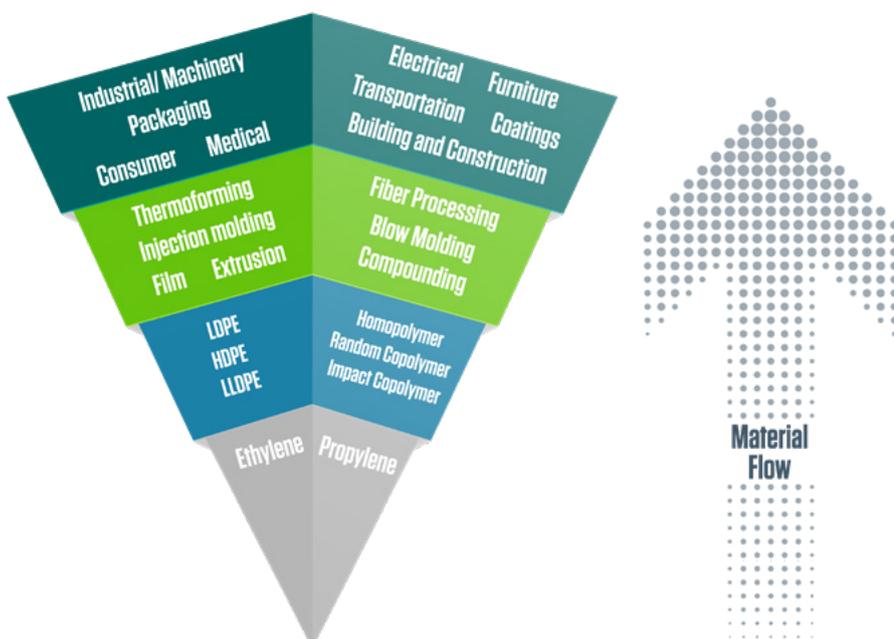
– **Impact Copolymers:** Polypropylene impact copolymers are thermoplastic resins produced through the polymerization of propylene and ethylene or butylene. Their synthesis consists of a heterophasic amorphous structure inside a semi-crystalline PP homopolymer matrix providing high impact properties and thermal resistance. Due to their broad range of properties, impact copolymers are used in packaging, houseware, film, and pipe applications, as well as in the automotive and electrical segments.

**Highlighted Product Brands:** *Hostalen* (Europe), *Profax* (Americas), *Purell* (Europe and Asia)

– **Random Copolymers:** Polypropylene random copolymers are thermoplastic resins produced through the polymerization of propylene, with ethylene, butene or hexene bonds introduced in the polymer chain. The resins provide a broad range of characteristics, and are used in a wide range of applications as high clarity/transparency packaging, injection molding, blow molding, cast, BOPP and blown film, pipe and thermoforming. They provide numerous benefits included very good transparency and glass, broad range of melting points and seal initiation temperature (SIT), very good aesthetic characteristics, and the best radiation resistance amongst polypropylene resin types.

**Highlighted Product Brands:** *Moplen* (Europe and Asia), *Profax* (Americas), *Purell* (Europe and Asia)

## Material to End Market



# Advanced Polymers Overview

LyondellBasell is a leading supplier of high-performance plastics compounds and resins offering a full portfolio of masterbatch solutions, engineering plastics, engineered composites, specialty powders, *Catalloy* and PB-1 resins, PP compounds, custom performance colors and distribution services. We offer this product portfolio on a global scale and in a wide range of markets, ranging from automotive, electrical, building and construction, pipe, oil and gas, to agriculture and packaging.

LyondellBasell's rich product portfolio and deep market understanding allows for innovative custom solutions to ensure our customers succeed in the market place.

## Key Advantages

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- Vertically integrated global manufacturer
- End-to-end customer solutions
- Expanded reach into growing markets
- Scalable growth platform
- Focused innovation



## Selected Products

### ■ Catalloy Process Resins

A technology creating reactor thermoplastic polyolefins that combine the advantages of polyolefins with those of elastomers

**Highlighted Product Brands:** *Hifax* (Global), *Softell* (Global), *Adsyl* (Global), *Adflex* (Global)

### ■ Color Concentrates

Offering a wide color portfolio paired with custom color matching for your most challenging color applications

**Highlighted Product Brands:** *Polybatch* (Global), *Polycycle* (Europe), *Cord-o-bond* (Americas)

### ■ Engineered Composites

A diverse thermoset portfolio of BMC, SMC, TMC and our Quantum Engineered Structural Composites for industrial to niche markets

**Highlighted Product Brands:** *Quantum Engineered Structural Composites* (Global)

### ■ Engineered Polymers

Specializing in the design and manufacture of high-performance plastic compounds and resins to meet demanding applications and colors

**Highlighted Product Brands:** *Schulamid* (Global), *Schuladur* (Europe), *Ronfalin* (Europe)

### ■ Masterbatches

Enhanced additive concentrates that improve the appearance and performance of resins across many processes

**Highlighted Product Brands:** *Polybatch* (Global), *Polywhite* (Global), *Polyblak* (Global)

### ■ Polybutene-1

High molecular weight isotactic, semi-crystalline thermoplastic polyolefins produced through the polymerization of butene-1 and ethylene

**Highlighted Product Brands:** *Koattro* (Global), *Toppyl* (Global), *Akoalit* (Global), *Akoafloor* (Global)

### ■ Polypropylene Compounds

Thermoplastic resins produced using base polyolefins with various components like fillers and reinforcements, and pigments and additives

**Highlighted Product Brands:** *Hostacom* (Global), *Hifax* (Global), *Softell* (Global)

### ■ Specialty Powders

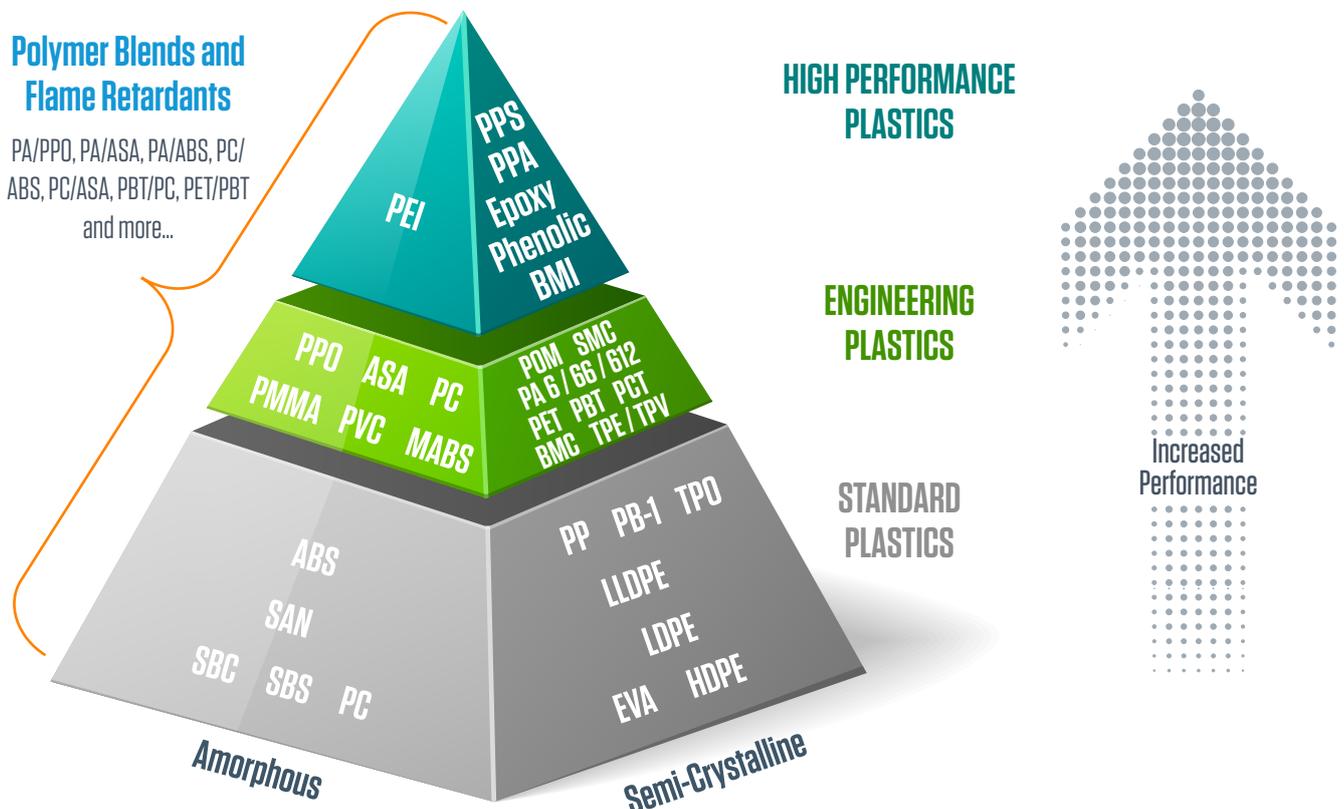
Size reduction technology to deliver powders to suit many markets and applications such as Oil & Gas and Rotomolding

**Highlighted Product Brands:** *Icorene* (Global)

## Advanced Polymers - Technology Overview

### Polymer Blends and Flame Retardants

PA/PPO, PA/ASA, PA/ABS, PC/ABS, PC/ASA, PBT/PC, PET/PBT and more...



**Innovation + Portfolio Breadth = Best-fit products to meet application needs**

# Advancing Circular Economy

## RECYCLED POLYMERS

Quality Circular Polymer (QCP), a joint venture between LyondellBasell and SUEZ, delivers a 100 percent mechanically recycled polymer offering. QCP uses presorted polyethylene and polypropylene waste and turns it into high-quality polymers. These polymers are used in consumer products like detergent bottles, strollers and even a new eco luggage collection from Samsonite.

## POLYMERS BASED ON RENEWABLE FEEDSTOCK

LyondellBasell is offering a new range of polymers called *Circulen* and *Circulen Plus* made from renewable raw materials such as cooking and vegetable oil waste. With the same high-quality properties as virgin plastics require, as well as regulatory approvals, it's a perfect solution for sustainable food packaging, films, toys and cosmetics.

## MOLECULAR RECYCLING

LyondellBasell is further developing its proprietary chemical recycling *MoReTec* technology, which has the potential to take mixed plastics waste down to the molecular level to become a feedstock in creating new polymers. The company has built a pilot plant at its research center in Ferrara, Italy with the aim of optimizing the technology towards commercial scale.

## RECYCLED COMPOUNDS

These materials are based on a network of recyclers used to source high quality recycled raw materials. The range includes post-consumer and post-industrial grades of filled and unfilled PP, PE, PS, PA, ABS, PC/ABS, and PBT/PET complementing the Advanced Polymer Solutions portfolio and satisfying our customers varied requirements. The LyondellBasell reputation for quality materials will guarantee that you will benefit from performance recycled materials.



# Other Key Product Areas



## Chemicals

Our chemical offering produces and markets propylene oxide and its derivatives, oxyfuels and related products, and intermediate chemicals such as styrene monomer, acetyls, and ethylene oxide and derivatives. We are the world's second largest producer of propylene oxide and oxyfuels.

### Key Advantages

Leading proprietary technologies  
 Diversity and linkage of our integrated product portfolio  
 Access to low cost natural gas

### Selected Products

Propylene oxide  
 Styrene monomer  
 Propylene glycols and ethers  
 Methanol and acetyls  
 TBA intermediates  
 Ethylene oxide  
 Ethylene glycols and ethers  
 Oxygenated fuels

### End Uses

- Insulation
- Home furnishings
- Adhesives
- Automotive
- Consumer products
- Coatings
- Fuel additives



## Fuels

Our Houston refinery is capable of refining heavy, high-sulfur crude oil into refined products including gasoline and distillates. Our significant hydrotreating and coking capacity positions us well in a market with increasingly stricter sulfur regulations.

### Key Advantages

Capability to process diverse crude mix  
 Strategic location on the Gulf Coast  
 Capable of meeting the Tier III sulfur specification

### Selected Products

Gasoline  
 Ultra low-sulfur diesel  
 Jet fuel  
 Aromatics

### End Uses

- Automotive fuels
- Aviation fuels
- Heating oil
- Oils



## Technology

Our Technology segment develops and licenses chemical and polyolefin process technologies and manufactures and sells polyolefin catalysts. More than 280 polyolefin lines around the world utilize LyondellBasell-licensed technology representing more than 50 million tons of annual production capacity.

### Key Advantages

Industry leading polyolefin process technologies  
 Leading portfolio of polyolefin catalysts

### Selected Products

Process licensing  
 Catalysts sales  
 Technology services

### End Uses

- Polyolefin and chemical manufacturers

# Market Overview

## Oil Field Services

Our products are used in a wide range of on shore and off shore services include diversion and fracking technologies from specialty powders to structural components requiring high heat and pressure resistance including frack plugs, frack balls, centralizers, pipe spacers thermal insulation pipe liners and buoyancy solutions.

## Aerospace

Our carbon fiber and fiberglass-reinforced vinyl ester, epoxy and phenolic materials are used for secondary and interior aircraft structures which are lightweight and have flame retardant properties.

## Renewable Energy Technologies

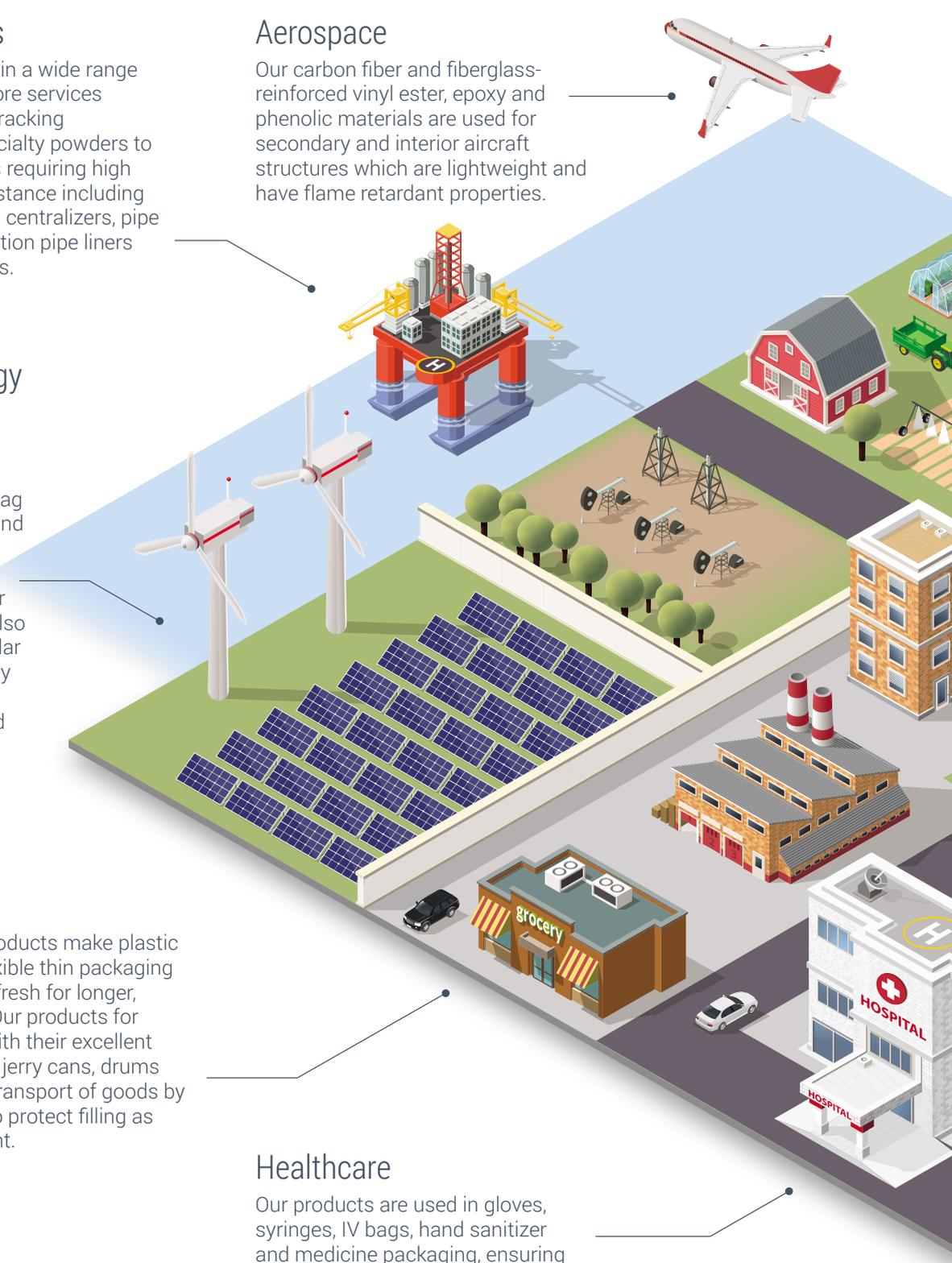
Our products make coatings for wind turbines that reduce drag and extend blade life, and create wire and cable casings that conduct power and secure solar panels. Our products also enhance through bi-polar plate technology energy storage and transfer in back flow batteries and fuel cells.

## Packaging

Our food packaging products make plastic films, and rigid and flexible thin packaging to keep food safe and fresh for longer, reducing food waste. Our products for industrial packaging with their excellent property profiles make jerry cans, drums and IBCs safe for the transport of goods by road, rail, sea and air to protect filling as well as our environment.

## Healthcare

Our products are used in gloves, syringes, IV bags, hand sanitizer and medicine packaging, ensuring sterile and sanitized supplies, as well as in structural applications involving prosthetic feet and medical cots.



## Agriculture

Our products make irrigation more efficient, reducing water leakage. They are also used for greenhouse structures and stretch wrap packaging. Our fiberglass-reinforced product range improves safety and performance for heavy agricultural equipment. Our rotomolding powders provide strong, tough, durable and lightweight solutions for farming machinery.

## Pipe

Our products make pipes that are lighter and more durable; making installation faster and easier, allow for safe transport of water and gas, as well as for modern solutions for plumbing, heating and cooling.

## Textiles

Our products are used in a diverse set of textile applications ranging from geo-textiles which stabilize our roads to non-woven fabrics which help to keep the baby's skin dry. Offering light-weight fabrics with high loft and transmitting moisture they are used also for sanitary products.

## Automotive

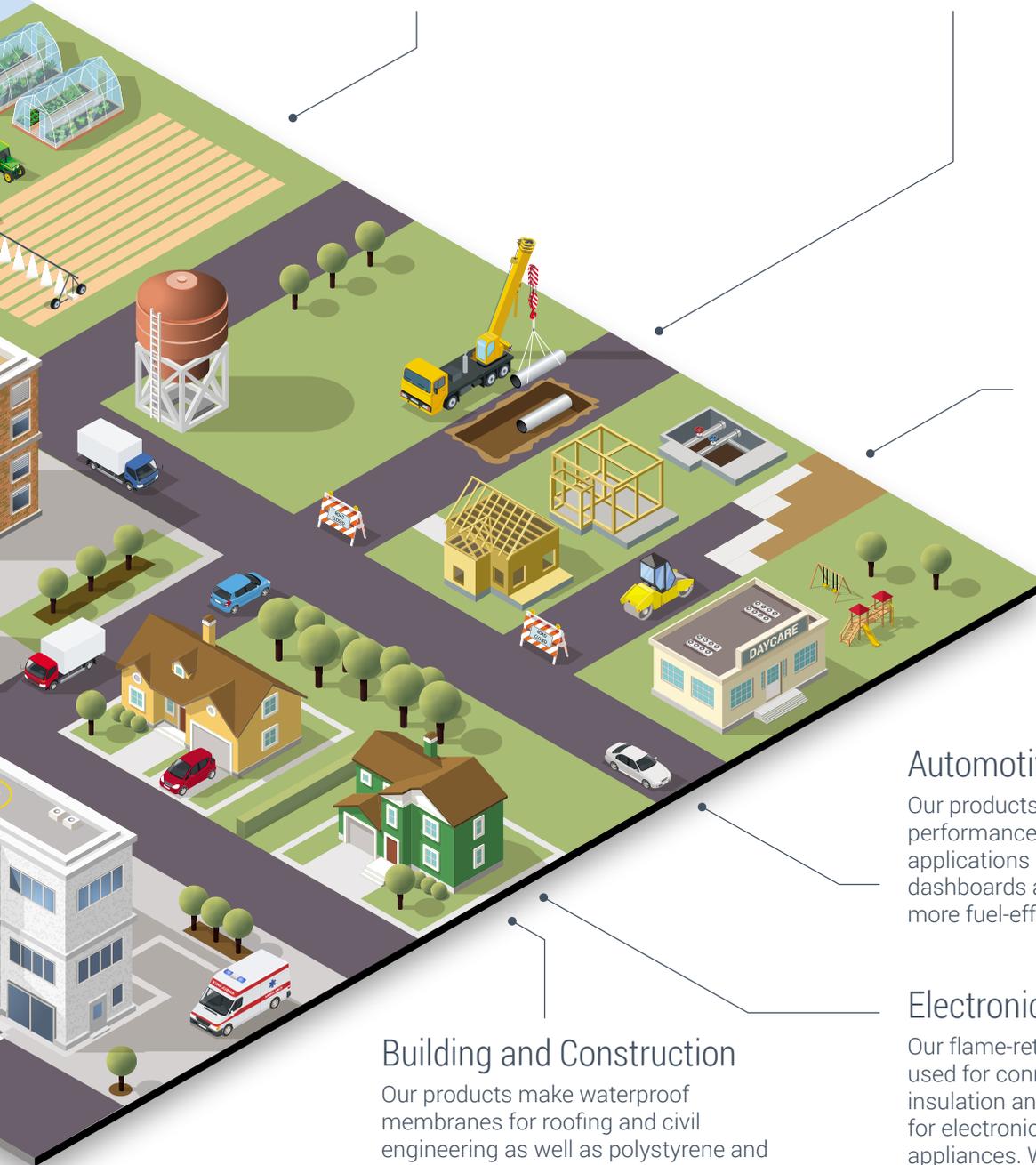
Our products are used in high performance fuel systems and applications making car bumpers, dashboards and trims lighter and more fuel-efficient.

## Electronics / Appliances

Our flame-retardant products are used for connectors, in cable insulation and as protective covers for electronic components and appliances. While our polypropylene compounds create housings and fans for appliances, our engineered polymers make strong casings for power tools.

## Building and Construction

Our products make waterproof membranes for roofing and civil engineering as well as polystyrene and polyurethane insulation foam for walls, roofs and floors; conserving energy for heating and cooling buildings. Our products are used in HVAC, under floor heatings, man hole covers, and various other infrastructure components.



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