Circulen Brochure

LyondellBasell

Everyday Circularity

Unlock the circular potential of plastics

circulen
By LyondellBasell

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Everyday circularity

We believe in the circular possibilities of plastics, supporting people through applications in homes, packaging, transportation and more.

Our *Circulen* brand of recycled and renewable-based polymer offers complementary, innovative, sustainable solutions that contribute to our customers' sustainability goals.

Our solutions help our customers develop more sustainable products, lower their carbon footprint and **unlock the circular potential of plastics**.

LyondellBasell (LYB) launched the CLCS business to support our ambition to produce and market at least 2 million metric tons of recycled and renewable-based polymers annually by 2030.[1] Our *Circulen* portfolio of products supports the reduction of plastic waste by using recycled materials as a feedstock, and a lower carbon footprint by using renewable-based content to replace feedstock from fossil-based sources.

The ***Circulen*** product portfolio includes:

- ***Circulen*Recover** products are made from plastic waste through a mechanical recycling process and can also be blended or compounded with traditional fossil-based products, allowing us to deliver high-quality polymers with an optimal balance of performance characteristics and mechanically recycled content. These polymers can be used in a wide variety of industrial, household and consumer products and packaging applications.
- ***Circulen*Revive** products are made using an advanced (chemical) recycling process to convert plastic waste back to its molecular level, which is then used as a feedstock in our conventional production processes to produce new polymers, using an ISCC PLUS-certified mass balance approach. These polymers can be used in highly regulated applications, such as food contact and healthcare.
- ***Circulen*Renew** products are made from renewable feedstocks derived from bio-based wastes and residual oils, using an ISCC PLUS-certified mass balance approach. The use of renewable feedstocks offers a lower carbon footprint, compared to fossil-based feedstocks, and the polymers can also be used in highly regulated applications such as food contact and healthcare.

As part of a multi-pronged approach to the company's sustainability ambitions, the launch of the CLCS business is another concrete action the company is taking to advance the circular economy today, innovate and invest for the future and partner across the value chain. By bringing sustainable solutions to life, LYB is helping address the global challenges of ending plastic waste and taking climate action while meeting customer and brand owner needs.

Circulen products can be used in a variety of markets and applications. To learn more about the LYB ***Circulen*** family of sustainable solutions and its availability in your region, please visit our website at **lyb.com/Circulen** or connect with your LYB sales representative.

[1] Production and marketing includes (i) joint venture production marketed by LYB plus our pro rata share of the remaining production produced and marketed by the joint venture, and (ii) production via third-party tolling arrangements.

Industry-leading sustainability ambitions and goals

LYB is a leader in the global chemical industry creating solutions for everyday sustainable living. Through advanced technology and focused investments, we are enabling a circular and low carbon economy. Across all we do, we aim to unlock value for our customers, investors and society. We have structured our sustainability approach around three global challenges: ending plastic waste, taking climate action and supporting a thriving society. This approach shapes how we manage our business and execute strategic objectives.

Ending plastic waste & building a circular economy

Plastic pollution is a critical issue, this is why we are accelerating our efforts to innovate, scale and deliver solutions to turn post-use plastics into everyday products and enable a circular economy.

Taking climate action

We are committed to reducing GHG emissions from our global operations and value chain, and to delivering solutions which advance our customers' climate ambitions and support society's transition to a low carbon world.

Supporting a thriving society

We actively contribute to a thriving society through our community engagement and our relentless pursuit of safety, operational excellence, and a diverse, inclusive and equitable workforce.

Circulen family of sustainable solutions

The global portfolio is organized into three primary and complementary categories; *Circulen*Recover, *Circulen*Revive and *Circulen*Renew.

*Circulen*Recover

*Circulen*Recover polymers offer a consistent, high-quality product containing recycled material that can be used in a number of applications, such as consumer rigid packaging and caps and closures.

- Available in a wide range of colors
- Carefully sorted and cleaned to ensure consistent quality feedstock
- We continue to take steps to boost our mechanical recycling footprint globally. Our approach to mechanical recycling includes joint ventures and acquisitions in Europe, Asia, and North America. This will enable us to further expand our *Circulen*Recover portfolio of mechanically recycled polymers, creating high-quality solutions for our customers while diverting plastic waste that could end up in landfills, incineration or the environment.

*Circulen*Revive

Using advanced (chemical) recycling technology, *Circulen*Revive polymers are on their way to becoming one of the solutions that can address the challenge of hard-to-recycle plastics at scale.

*Circulen*Revive polymers support taking plastic waste that is not easily recovered by mechanical recycling and converting it into a feedstock to produce new polymers. This allows for larger volumes of plastic waste to return back into the value chain as high-quality polymers

- A drop-in solution for all types of applications
- An advanced recycling process is used to convert hard-to-recycle plastic waste into feedstock for the production of *Circulen*Revive polymers. The advanced recycled feedstock is mixed with conventional feedstocks in our process, and attributed to *Circulen*Revive products using a mass balance approach certified according to the ISCC PLUS standard.
- *Circulen*Revive polymers enable our customers to produce materials for applications that must meet strict regulatory requirements such as food packaging and healthcare items
- Are equivalent to virgin polymers while offering an environmental value proposition to brand owners around the world
- The LYB crackers located in Wesseling, Germany, and Channelview, Texas, U.S, as well as select polymer manufacturing sites are ISCC PLUS certified

The LYB comprehensive approach to advanced recycling includes secure access to third-party pyrolysis oil and leveraging our innovation capabilities to develop and further scale up our proprietary advanced recycling technology, *MoReTec*. LYB *MoReTec* technology improves the ability to transform plastic waste to feedstock for high-end quality polymers while offering CO_2 footprint advantages such as the ability to be powered by renewable electricity. In 2023, we made the final investment decision to build a first-of-its-kind, commercial-scale advanced recycling plant, *MoReTec*-1, using our proprietary *MoReTec* technology at our site in Wesseling, Germany. Construction of *MoReTec*-1 is expected to be completed by the end of 2025.

*Circulen*Renew

With renewable raw materials, such as used cooking oil, as a feedstock, *Circulen*Renew polymers offer a variety of polypropylene (PP) and polyethylene (HDPE, LLDPE and LDPE) grades that are equivalent to virgin polymer quality while reducing fossil feedstock use and helping to reduce CO_2 over the product life cycle.

These renewable-based polymers offer the same properties in terms of product performance and regulatory approval processes. *Circulen*Renew and *Circulen*Renew Plus products (or grades) can therefore be applied to the same applications as fossil-based equivalents offering the same properties and performance. This makes these new grades a perfect drop-in solution for applications like food packaging and/or high-quality requirement films such as surface protection films.

- The renewable feedstocks are used in our conventional production processes along with conventional feedstocks, and are attributed to *Circulen*Renew products using an ISCC PLUS-certified mass balance approach.
- *Circulen*Renew Plus products have a measurable renewable-based content, which can be determined by C14 analysis. The renewable-based content is measured and stated as a parameter on the Certificate of Analysis (CoA)
- LYB has select crackers and polymer manufacturing sites in the United States and Europe that are ISCC PLUS certified. According to a peer reviewed Life Cycle Assessment (LCA) study in accordance with ISO 14040/14044, *Circulen*Renew polymers have a significantly lower carbon footprint than their fossil-based equivalents.

About Us

We are **LyondellBasell (LYB)** – a leader in the global chemical industry creating solutions for everyday sustainable living. Through advanced technology and focused investments, we are enabling a circular and low carbon economy. Across all we do, we aim to unlock value for our customers, investors and society. As one of the world's largest producers of polymers and a leader in polyolefin technologies, we develop, manufacture and market high-quality and innovative products for applications ranging from sustainable transportation and food safety to clean water and quality healthcare. For more information, please visit **www.lyb.com** or follow **@LyondellBasell** on LinkedIn.

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