



Borealis

Borealis is one of the world's leading providers of advanced and sustainable polyolefin solutions and a European front-runner in polyolefins recycling. In Europe, we are a market leader in base chemicals and fertilizers.

Borealis aims at tackling the challenge of increasing plastic waste and help defossilise the industry. It plans to do this by developing new technologies and entering into a diverse range of collaborations with different industry partners, including other RCI participants. Borealis' strategic ambition is to significantly increase the capacity of circular products and solutions (including recycled and renewables, both polyolefins and base chemicals) to reach a capacity volume of 600 kt by 2025 and 1,800 kt by 2030.



Interview

with **Stephan Roest**
Strategic Business Platform Leader
– **Circular Economy Solutions**
Borealis, Austria



Stephan Roest is Strategic Business Platform Leader – Circular Economy Solutions (CES) at Borealis. In this role, he is overseeing the projects on chemical recycling also known as Borcycle™ C.

Stephan works for its entire professional career in sustainability and circular economy, 7 years as sustainability consultant at PwC, and now for 8 years in the chemical industry on biobased and circular plastics. He is trained as Chemical Engineer and has an MBA.

Based on Borealis' advanced mechanical recycling technology, a commercial plant will go into operation in 2025. What are the differences and which are the advantages of this technology in comparison to traditional mechanical recycling?

Borealis has been engaged in mechanical recycling since 2016 when it acquired the German recycler mtm plastics. This was followed by the acquisition of Ecoplast in Austria in 2018. Since then, we have been developing and improving mechanical recycling solutions for polyolefins. Borcycle™ is our portfolio of transformational recycling technology solutions, giving polyolefin-based waste another life. It's a full-suite solution, enabling all plastic waste to be converted into new polyolefins and offering recycled plastic through a wide product portfolio range.

These recycled plastics are equipped for highly demanding requirements such as healthcare, or for less demanding applications secondary packaging. Borcycle M is an advanced way of mechanical recycling, in which we apply advanced technologies (including sorting and washing technologies) to achieve high quality, low odour and high purity recyclates.

What proportion of recycled materials can be reached in Borealis' recyclates with this technology and how is this proportion estimated?

Different recyclates and compounds are produced with different concentration of PCR, ranging from 25% to 100% recycled content. The grades are developed for different type of applications, serving the needs of our customers and industries. The percentage of recycled content is balanced with the properties that the specific grade needs to have.

How important is Mass Balance & Free Attribution in this context?

Our other recycling portfolio is called Borcycle C, which is our transformational technology solution for chemical recycling, that enables both virgin-level grade materials and high safety and performance qualities, fit for demanding applications (such as food packaging and healthcare). As the Borcycle C feedstock passes through our crackers, replacing fossil feedstock, it must be tracked with the mass-balance approach, to properly allocate the sustainable feedstock to the final product. We use the ISCC PLUS certification for mass-balance to keep track of this allocation of sustainable feedstocks. In line with the ISCC PLUS's current standard, this is done with free attribution.

In support of the EU recycling goals, Borealis will offer a chemical recycling solution in the future.

What are the advantages of your technology, which waste streams of PO will go into chemical recycling and what level of purity can be expected from this circular feedstock in comparison to virgin feedstock?

The advantage of chemical recycling is that low quality mixed plastic waste streams can be used. For our type of technology, the waste streams only need to contain a high proportion of polyolefin content. Following the Borealis circular cascade, sorted polyolefin fractions first enter the mechanical recycling process; Only rejects of mechanical recycling and mixed plastic waste will be available for chemical recycling.

The advantage of the pyrolysis process, is that it creates a synthetic oil that can substitute fossil feedstock in our existing installations (crackers). In order to do this, it needs to have a certain purity level, but can then directly be used to produce virgin-quality PP and PE.

Chemical recycling is very energy intensive and the use of fossil energy sources would be counterproductive for defossilisation of the industry.

How will Borealis meet the challenge?

How efficient is the recycling process? Are there additional CO₂ emissions? Which energy source do you use to run the process, today and in the future?

For the plastics to break down to pyrolysis oil, high temperatures and therefore a high amount of energy is needed. If this energy is produced using fossil feedstocks, there will be additional CO₂ emissions. We are constantly looking into ways to improve the LCA of our processes, including pyrolysis, by finding energy-efficiencies. For example, we are engaged in an industry-wide project to look into electrifying our crackers, another energy-intensive process that we like to de-fossilise.

Which options for the production of renewable chemicals from biomass, CO₂ and recycling are in the focus of Borealis?

Our renewable portfolio for polyolefins is branded as The Bornewables, which is our portfolio of PP and PE based on renewable feedstock (biomass). For our renewable chemicals we offer the Borvida™ B portfolio, consisting of base chemicals produced with the renewable feedstock. We are also exploring the use of 'atmospheric carbon' (CO or CO₂) as feedstock.

We already showed a concept at the K-show in October 2022, from our collaboration with Lanzatech and ON running, making the EVA midsole from Lanzatech's CO-based feedstock. Next to our recycling technologies, renewable based solutions will also play a key role in achieving our 1.8 Mio circular solutions by 2030, next to our recycling solutions.

Not only the producers of renewable chemicals should act sustainable in terms of CO₂ emissions but also all value-chain partners. What solutions are imaginable for this challenge?

Indeed, the transition to a circular economy is something that needs to happen across the value chain. We are working very extensively with our existing suppliers as well as engaging with new suppliers, to obtain sustainable feedstocks (renewable, circular). We are also working closely with customers and brand-owners/OEMs to help them achieve their targets. For many of our customers the highest proportion of their CO₂ emission comes from scope 3 emissions, to which we, the chemical industry, play a major part. By transitioning to sustainable feedstocks, we can help these customers reduce their carbon footprint.

How does Borealis profit from its participation in RCI and what is the added value of Borealis' membership for the RCI?

Borealis wants to drive the journey towards climate neutrality and a circular plastics business model. We will develop our business by moving away from fossil feedstocks and using greener, more circular alternatives to produce plastics, thanks to our technologies and collaborations.

We use three alternative source approaches to protect and retain carbon in the system (dubbed ABC): Atmospheric carbon; Biomass, using carbon captured in bio-based renewable feedstocks; and Circular technologies. We, as the entire industry, need to accelerate this transformation. For this, we need research, fact-sharing, consistent messaging, the appropriate regulatory environment to nurture renewable carbon business, and cooperation across the entire value chain.

We believe that this is what the Renewable Carbon Initiative stands for, and we hope that we as Borealis can actively contribute to this initiative.