

PEFERENCE - FROM BIO-BASED FEEDSTOCKS VIA DI-ACIDS TO MULTIPLE ADVANCED BIO-BASED MATERIALS WITH A PREFERENCE FOR POLYETHYLENE FURANOATE

MON 29 MARCH 2021 | 15:40 BRUSSELS TIME ONLINE



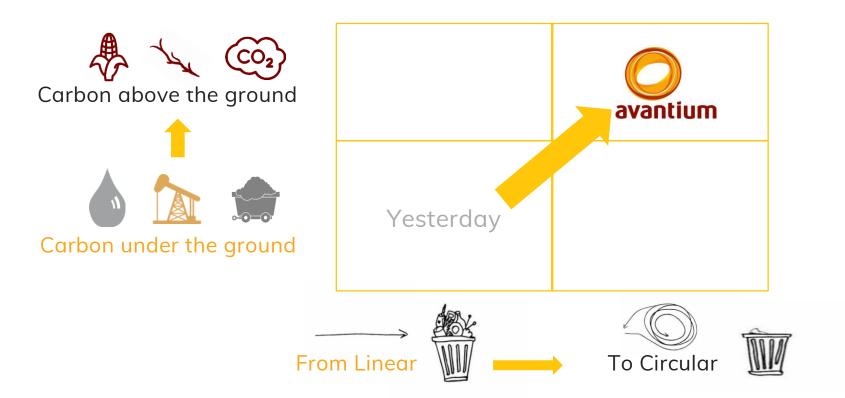




PEFerence has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation program under grant agreement No. 744409.



Inevitable transition of the chemical industry



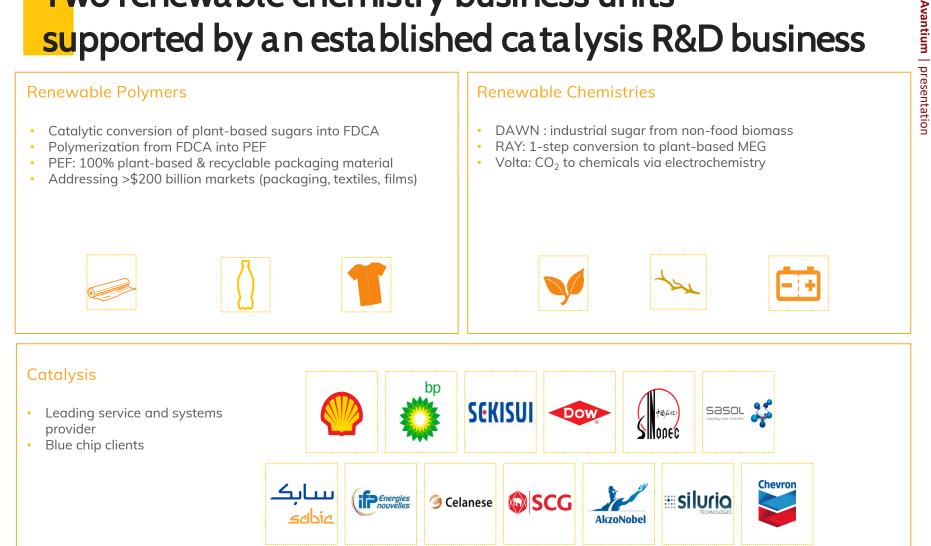
Avantium's role in this transition

- Lead the transition of the chemical industry to renewable chemicals and polymers
- Develop breakthrough technologies to make sustainable, plant-based products that compete on performance and costs
- Commercialise these technologies in partnership with industrial companies





Two renewable chemistry business units supported by an established catalysis R&D business

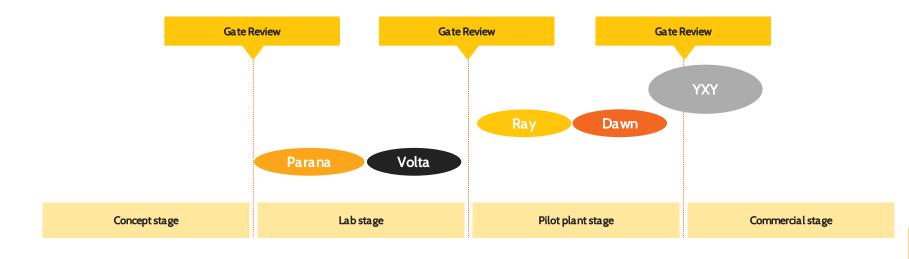




A coherent portfolio of technologies



Pursuing the most attractive opportunities through stage gate process





High-value PEF applications



Multilayer packaging

Replace with single material PEF layers, reducing cost of packaging while enabling recycling



Enhanced bottles

PEF in small volume soft drink/beer bottles or as barrier layer providing performance and enabling recycling



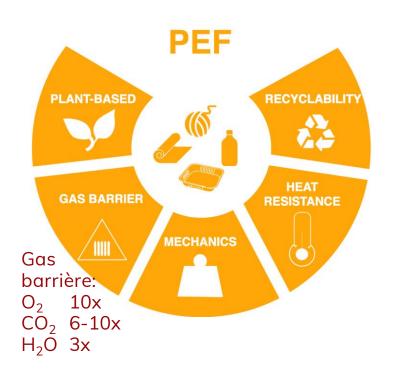
Optical film

Enable thinner LCD/OLED displays



PEF benefits

A novel plant-based plastic material with superior properties



What is PEF?

PEF is 100% plant-based, 100% recyclable plastic with superior performance properties compared to today's widely used petroleum-based packaging materials

Market potential of PEF >€ 200 billion



Packaging material >€150 billion

Source: Canadean (2013)



Film €8 billion

Textile €41 billion



PEF benefits – After use

Designed for recycling and reuse

- Proven fit with existing sorting and recycling facilities
- 100% recyclable, incl. the enhanced small size bottles which is not the case for PET
- Addressing goals set by governments (e.g. in the EU, all plastic bottles will need to contain at least 30% of recycled material by 2030)

What happens if PEF ends up in nature?

- Degradation tests by Organic Waste Systems (OWS)show that PEF is degradable under industrial composting conditions (250-400 days with air / oxygen @ 58°C in soil)
- Degradability of PEF under ambient conditions is currently under investigation in an Avantium-led 10-year field trial



- Engineer and build the flagship plant for the production of purified FDCA (5,000 tonnes/year)
- Demonstrate and validate at least three 100% bio-based materials in end user applications
- Commercialize the 100% bio-based end products demonstrated in the project
- Demonstrate and optimize the new local bio-based value chain from raw material sourcing to PEF end products
- Evaluate the environmental and socio-economic performance of the developed products



PEFerence: Project Target and Value Chain Partners

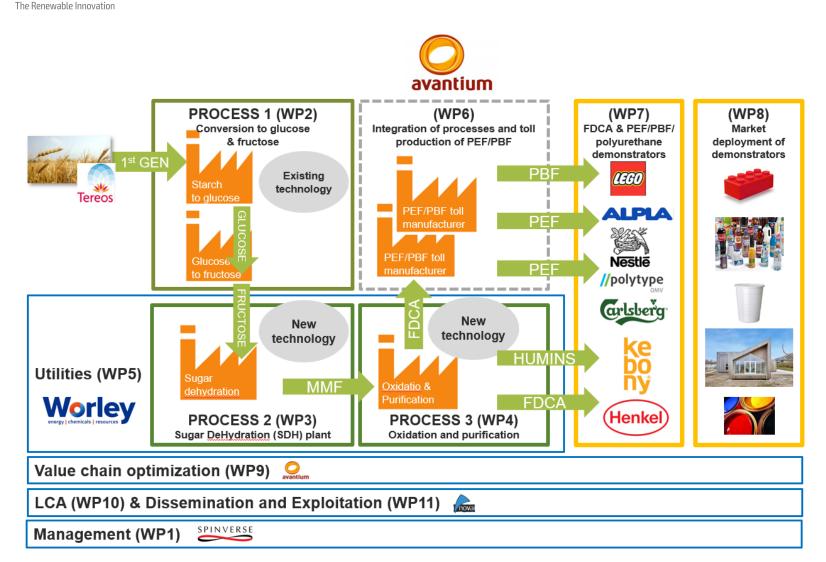
Project Puspose: Contribution to the build of the PEF flagship plant and market launch of PEF with project partners, including sustainability assessments



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PEFerence Consortium

PFFerence







Flagship Plant – rendering



Information Materials





Information materials

Brochure, roll-up banner with QR code





External Communications





Published press releases, newsletters, social media

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Avantium secures financing milestone with €25 million EU funding for FDCA flagship plant

Press reinane

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Five-year EU flagship project PEPerence is active again PEFerence project aims to replace a significant share of fouril-based polyesters with 100% plant-based



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Video explaining the technological background of PEFerence flagship project: <u>https://youtu.be/e7zOKHE03tA</u>

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Business plan focusses on superior performance of PEF to target high-value applications





Multi layer bottles

High-value PEF applications

PEF as barrier layer providing performance and enabling recycling





Single layer bottles

Single layer PEF in small bottles for soft drinks, beer and juice; replacing glass bottles, aluminum cans and multilayer bottles, enabling closed-loop recycling

Film

PEF film in recyclable flexible packaging or as film used in electronics applications (e.g. displays)

Review meeting – RP1, 1.12.2020



Some Current Activities

- Iso-certified LCA to be completed in Q2 2021
- Upscaling of the demonstrators
- Starting the EPC
- Additional off-take agreements
- Intensifying dissemination activities



Overall conclusions



- PEFerence is on track to engineer and build the first-of-a-kind FDCA flagship plant
- Initial results of bio-based materials and end products are promising
- The interim results of the environmental performance of the developed products shows a clear benefit of using PEF in place of PET in multiple applications
- More information: ed.dejong@avantium.com