



Avantium update

CITEO

23-NOV-21



Achievements and next steps in scaling-up FDCA/PEF



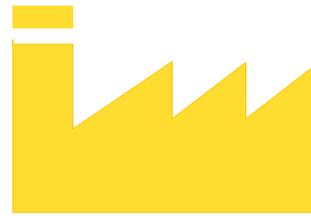
LABORATORY

- 2008
- Amsterdam
- Kilogrammes/annum
- Innovative research



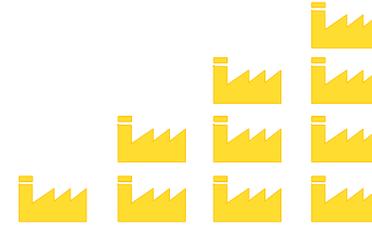
PILOT

- 2011 - today
- Geleen
- Tonnes/annum
- Technology development



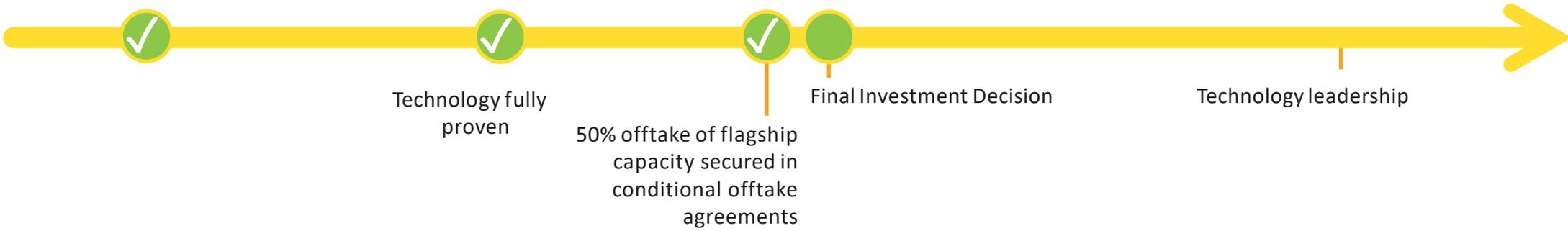
FLAGSHIP

- 2023 onwards
- Delfzijl (NL)
- 5 kt/a operated by Avantium
- Commercial launch
- Phase 1 price: € 8-€ 10 / kg

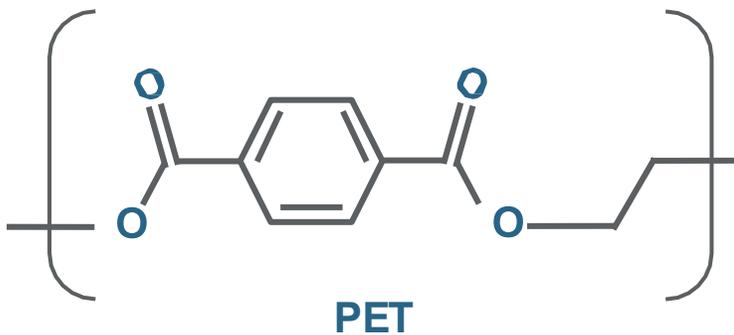
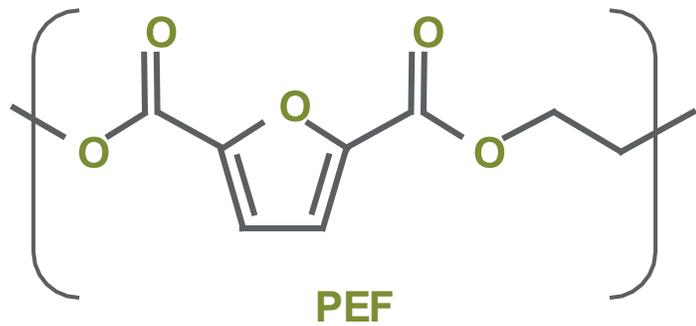


INDUSTRIAL

- 2024 and beyond
- Global
- Licensing: cashflow and profit growth driver
- Phase 2 (~100 kt/a) Price: € 4- € 5 / kg
- Phase 3 (>300 kt/a): € 1.50- € 2.50 / kg



PEF compared to PET: similar structure, different properties



PEF's performance characteristics offer unique opportunities

Superior performance, sustainable and well-positioned for (high-) value applications

PEF is the only barrier material that can be applied as monomaterial packaging AND is compatible with PET; the most recycled polymer in the world

High-value PEF applications



Multi-layer bottles

PEF as barrier layer provides shelf-life improvement offering a sustainable alternative for incumbent barrier solutions.



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 applied in all polyester high barrier film for improved recycling or as film used in electronics applications (e.g. displays)



Improved recycling of high barrier packaging with PEF as a barrier material

- Products such as juices require high barrier packaging solutions
- PEF has comparative performance as a passive barrier technology with polyamides and EVOH
- PEF multilayer structures do not require tie layers and have a low tendency to delaminate
- Most barrier technologies need to be separated from PET flake during recycling to ensure quality of rPET
- PEF is compatible with PET and does not lead to haze in and even to improved performance of the resulting rPET



See article in ComPETence magazine (March 2020):

“PET and PEF: a combination fit for future sustainable barrier packaging solutions”





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