Saccharides, the preferred feedstock for Avantium's Renewable Chemistries and Polymers Agenda

Prepared for Saccharide Agenda
28-Jan-2021

Avantium

Who are Avantium?

- Established in 2000, headquartered in Amsterdam, The Netherlands
- We lead the transition of the chemical industry towards the use of renewable chemicals and polymers
- Develop breakthrough technologies to make sustainable, plant-based products that compete on performance and costs
- Commercialize these technologies in partnership with industrial companies

Avantium's Business Units

Renewable Polymers

- Catalytic conversion of plant-based sugars into FDCA
- Polymerization from FDCA into PEF
- PEF: 100% plant-based & recyclable packaging material



Renewable Chemistries

- DAWN : industrial sugar from non-food biomass
- RAY: 1-step conversion to plant-based MEG
- Volta: CO_2 to chemicals via electrochemistry

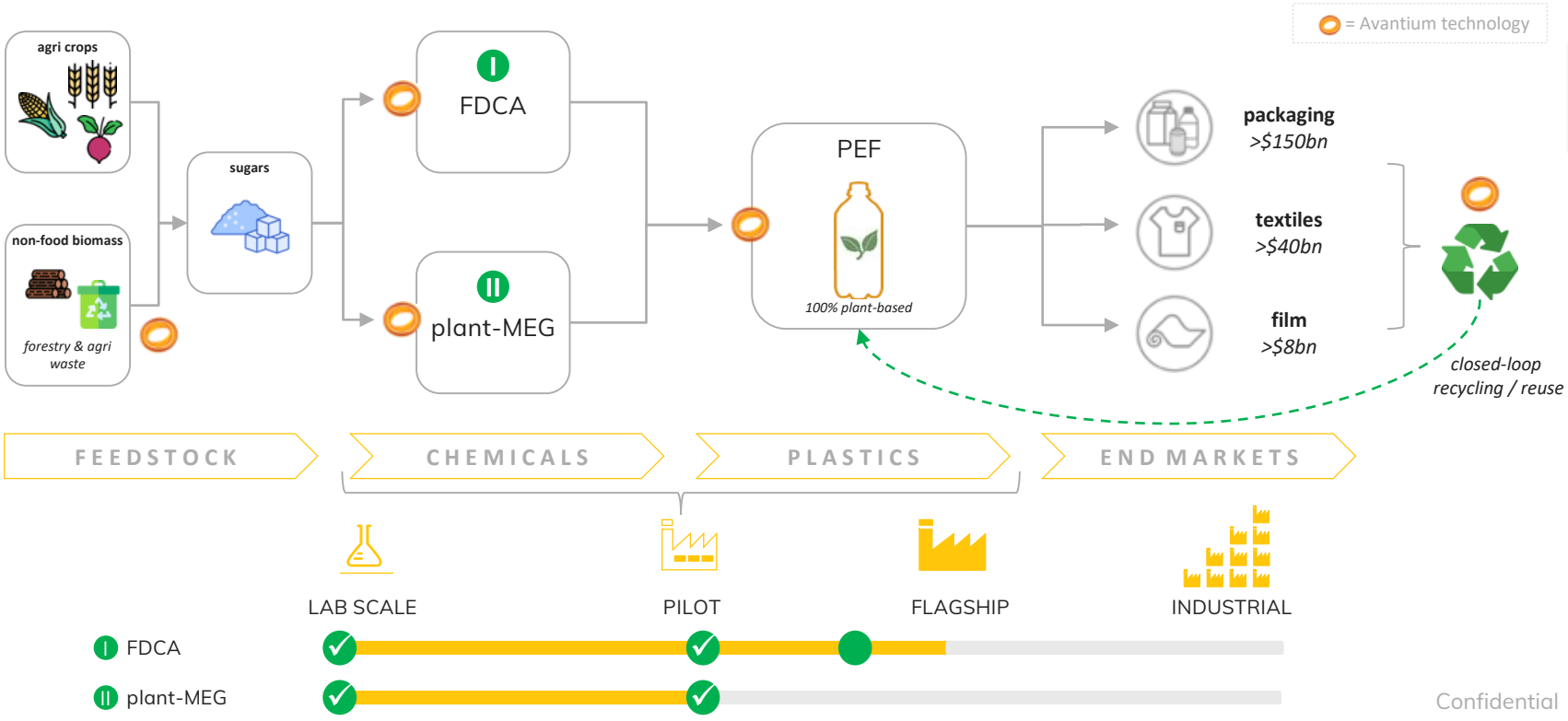


Catalysis

- Leading service and systems provider
- Blue chip clients

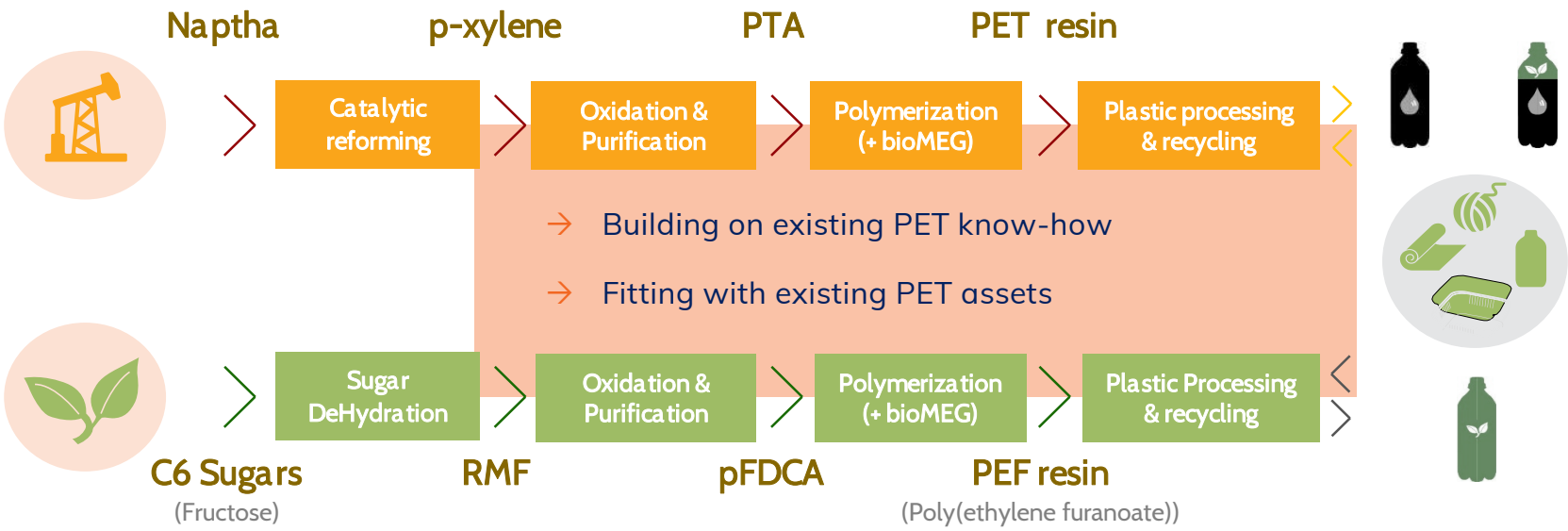
A coherent portfolio of renewable products

Focused on plant-based plastics, advancing towards commercialisation



FDCA and PEF: Renewing existing value chains

FDCA / PEF is based on a strong technology foundation and can be used in existing assets



Each step of Avantium's YXY technology is proven and de-risked at pilot plant scale

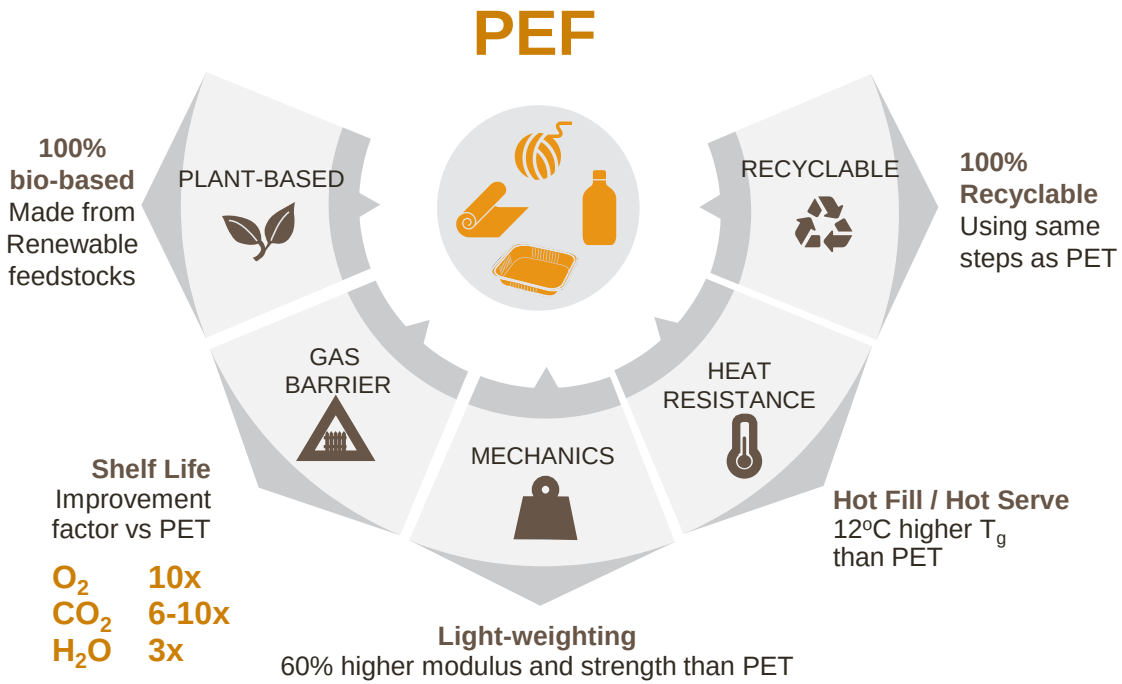
PEF: Adding more functionality with less material

Performance benefits:

- Extending shelf life
- Lighter / stronger material enables lightweighting and using less material
- Simplifying packaging - from multi- to mono-layer structures
- Reducing manufacturing costs during packaging and filling processes

Societal benefits:

- Enabling full circularity
- Reducing carbon footprint



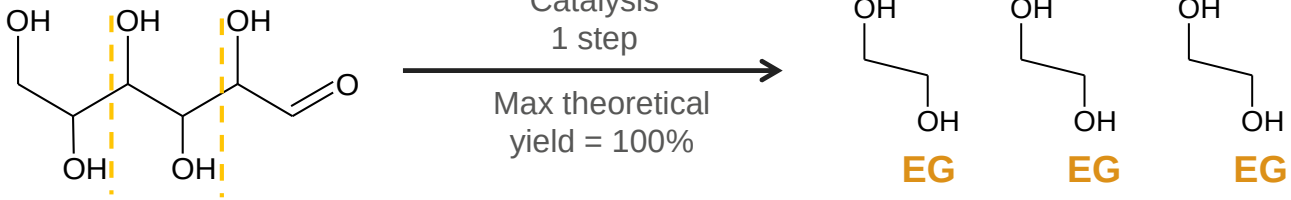
Ray™ Technology Process – Industrial Sugars to MEG

About

- Production of plant-based MEG
- Chemical catalytic process
- Superior carbon efficiency
- Aims to help fulfilling the growing MEG demand; ~50 million ton in 2035

Hydrogenolysis

Glucose:



Mono-Ethylene Glycol is a Key Component for Textiles and PET/PEF

Growth is Driven by Textiles and Packaging Demand

MEG

55%

Polyester fiber

Textiles

26%

PET/PEF resin

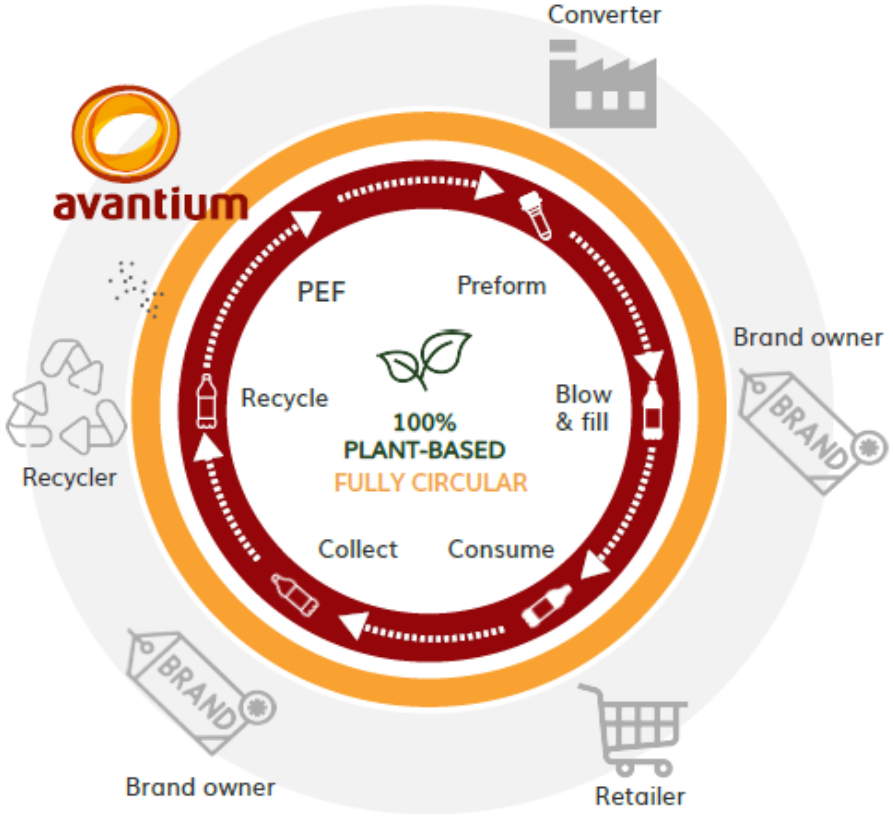
Packaging

19%

- 8% Antifreeze
- 6% PET films & others
- 5% Industrial applications

Simplified overview, showing key markets. Percentages derived from Plastic Insight, 2016

100% bio-based, fully circular solutions driving change in the packaging industry



Scaling-up FDCA/PEF: first-to-market advantages

LABORATORY

- 2008
- Amsterdam, NL
- Kilogrammes/year
- Innovative research

PILOT

- 2011 - today
- Geleen, NL
- Tonnes/year
- Technology development

FLAGSHIP

- 2023 onwards
- Delfzijl, NL
- 5 kilotonnes/year
- Commercial launch

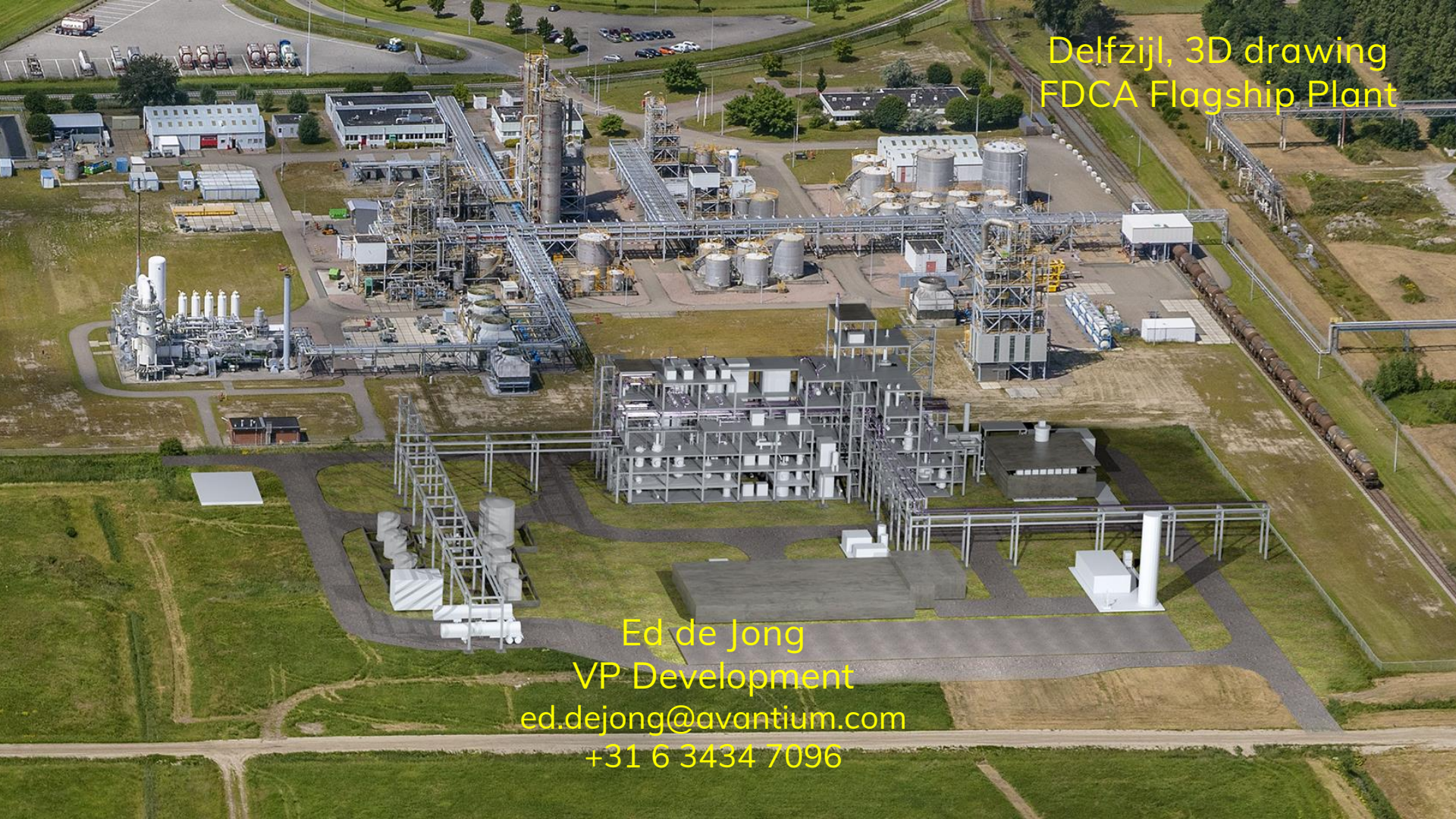
INDUSTRIAL

- 2024 and beyond
- Global
- >100 kilotonnes/year/plant
- Licensing: cashflow and profit growth driver

Technology fully proven

Final Investment Decision

Technology leadership (i.e. no new inventions required)



Ed de Jong
VP Development
ed.dejong@avantium.com
+31 6 3434 7096