Avantium’s Profile

- Spin-off from Royal Dutch Shell in 2000
- Strong IP position of over 30 patent families
- Backed by strong strategic and financial partners
- 100 employees; 5,200 m² of high-tech laboratories and offices

Created to develop new products and processes faster, more cost effective and with a superior rate of success
Moving to 100% biobased

- PET is the most widely used polyester made of PTA and EG
- Plantbottle launch in 2009 - PET with biobased EG and oil-based PTA
- PEF by Avantium: biobased FDCA + biobased EG = 100% green
Starting points for winning

<table>
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<th>Feedstock</th>
<th>Conversion</th>
<th>Green products</th>
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<td>Feedstock flexible</td>
<td>Superior economics</td>
<td>Favorable properties</td>
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<td></td>
<td>Fit with existing assets</td>
<td>Versatile building block</td>
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Compete on price, performance and environmental footprint
YXY Technology
Feedstock

- YXY technology is based on carbohydrate feedstock

- Strategy:
  - Work on feedstock of today (corn, sugarcane, starch)
  - Work toward using the feedstock of tomorrow (cellulose, woodchips, grass, agricultural waste streams)

- Considerations:
  - Consumers prefer biobased products on basis of non-edible feedstock.
  - 2nd generation feedstock is expected to be more expensive for the foreseeable future
**Proprietary process technology:**

- Chemical-catalytic process: fast and efficient
- 100% carbon efficient
- Low scale-up risk
- Fit with existing production installations
- Protected by strong patent portfolio
FDCA
Polyesters
PEF resin Water/CSD bottles
PEF Film
PXF fibers Carpet/textile
Polyamides
Furamides Food packaging
Furaramides Eng. plastics
Polyurethanes
TPU Bullet proof gear
Flexible
Polyester resin Footwear
Epoxy resins Furniture
Thermosets
Polyester resin Powder coatings
Epoxy resins Composites
Plasticizers
Esters
PVC cables

YXY Technology
Broad range of applications
Lead application: PEF bottles

Biomass Feedstock

1st gen Carbohydrates
2nd gen Carbohydrates

YXY building blocks (FDCA)

PEF

Green MEG

100% bio-based 100% recyclable PEF bottle
The key questions

Compared to oil-based products...

- Can YXY compete on price?
- Can YXY compete on performance?
- Can YXY deliver a significantly better environmental footprint?
Can YXY Compete on Price, Performance and LCA?

✓ PEF has the potential to beat PET
  - Better or similar properties compared to PET
  - Based on carbohydrates instead of oil
  - Recyclable

✓ PEF has great barrier properties
  - O2 barrier > 6 times better than PET
  - CO2 barrier > 2 times better than PET
  - H2O barrier > 2 times better than PET

✓ PEF has production costs < PET
  - USD 1200/t vs USD 1600/t

✓ PEF environmental footprint:
  - 40-50% lower NREU
  - 50-60% lower CO2 emission
Avantium’s leverages its Services & Systems business for the fast development of its YXY technology:

- Proprietary technology platform for enhanced catalysis screening
- Unique infrastructure for the rapid development of new catalytic processes
- Expertise & Experience: 10-year track record in the chemical and refinery industry for the most complex catalytic processes
- Strong network & reputation in the chemical and refinery industry
- Profitable and growing business

Strong synergies between Avantium’s YXY technology and its S&S business for the coming years
Why the Netherlands?
Why Amsterdam?
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Why the Netherlands? Why Amsterdam?

• Access to Chemical Knowledge
  – TU/Eindhoven
  – TU Delft
  – TU Twente
  – University Utrecht

• Access to Industry Base
  – Royal Dutch Shell
  – DSM
  – Akzo Nobel
  – DOW
  – GE/Sabic

• Access to Talent
  – 35% PhD degree, 40% BA-MBA degree
  – 15 nationalities

• Access to the World
  – Plain, train, metro, bicycle
  – Electronic gateway
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