Avantium

The Cleantech Revolution
in the Chemical Industry

Tom van Aken
Chief Executive Officer
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<tr>
<th>Leading chemical technology company</th>
<th>Based in Amsterdam, the Netherlands 150 employees</th>
<th>IPO March 2017 raised €109 million Euronext Amsterdam &amp; Brussels Ticker symbol: AVTX</th>
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<td>Pioneer in renewable chemistry</td>
<td>Founded in 2000 as spin-off Royal Dutch Shell</td>
<td>Analyst coverage ING, KBC, Kepler, Oddo</td>
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<td>Cleantech Top 100 company from 2010-2017</td>
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Avantium in a nutshell

**Synvina: Joint Venture with BASF**
- 100% biobased, recyclable PEF with superior properties
- Major market potential in packaging materials and fibers

**Renewable Chemistries**
- Zambezi: sugar from non-food biomass
- Mekong: 1-step conversion to bio-MEG
- Volta: CO$_2$ to chemicals via electrochemistry

**Catalysis R&D business**
- Leading service and systems provider
- Blue chip clients
The chemical industry today

- Fossil based (impact on climate)
- Linear (impact on environment)
The chemical industry today

- Not sustainable

Source: Ellen MacArthur Foundation
The chemical industry tomorrow

- Based on renewables
- Circular
Leading the transition in the chemical industry

Requires:
- Access to renewable and sustainable feedstock
- Economic and scalable process technology
- Price and performance competitive materials
- Partners for supply chain and market access
- Capital
Case study: Avantium

1. **Access to renewable and sustainable feedstock**: moving to sugars to non edible-biomass and CO$_2$ feedstock

2. **Economic and scalable process technology**: proprietary catalytic technologies developed in-house, scaling to industrial pilot plants and preparing for industrial production plants

3. **Price and performance competitive materials**: superior performance over existing packaging materials

4. **Partners for supply chain and market access**: formed a Joint Venture with BASF and partnered with major brand-owners such as The Coca-Cola Company and Danone to create market pull

5. **Capital**: raised ~EUR 100 million through 4 private financing rounds (primarily Venture Capital) and EUR 109 million through IPO in March 2017
## Feedstock

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<tr>
<th>Sugars</th>
<th>Avantium</th>
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<tr>
<td><strong>Advantages:</strong>&lt;br&gt;- Available&lt;br&gt;- Affordable</td>
<td><strong>Issues:</strong>&lt;br&gt;- Perception: competes with food&lt;br&gt;- Price volatility</td>
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<th>Biomass</th>
<th>Avantium</th>
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<td><strong>Advantages:</strong>&lt;br&gt;- Available, stable prices&lt;br&gt;- No competition with food</td>
<td><strong>Issues:</strong>&lt;br&gt;- Quality (biochemicals vs biofuels)&lt;br&gt;- Economics today are not viable</td>
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<th>CO₂</th>
<th>Avantium</th>
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<td><strong>Advantages:</strong>&lt;br&gt;- Available at no costs&lt;br&gt;- Turning waste into feedstock</td>
<td><strong>Issues:</strong>&lt;br&gt;- Economics are far away from viable&lt;br&gt;- Requires renewable energy</td>
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Process technology

Idea
Out of the box
Disruptive
Target selection

Advanced R&D
Speed
& IP
Parallel testing

Pilot Plant
Discipline and patience
Market focused
Scale-up

Industrial production
Cost competitive
Maintain innovation
Manufacturing

10 years
EUR 100 million

2
Price and performance competitive products

PEF has the advantages of being a plastic material:

- Lightweight
- No breakage
- Low cost
- Recyclable
- Transparent
- Barrier properties
- Lower taste impact

...with superior properties compared to the most widely used plastic (PEF vs PET)

**Superior barrier performance**
- 10 times higher oxygen barrier
- 4 times higher carbon dioxide barrier
- 2 times higher water barrier

**Environmental footprint**
- 100% bio-based
- 70% smaller carbon footprint
- 100% recyclable

**High heat resistance**
- Higher glass transition temperature
- Potential for hot-fill, microwavable, pasteurization and retorting

**Enhanced strength**
- Enhanced mechanical stiffness, 40% higher Modulus than PET increasing shaping possibilities
Partners for supply chain and market access

Joint venture with BASF

Objective: market & technology leader
- Build first commercial scale FDCA plant
- Develop the PEF market
- License the technology worldwide

Create market pull

Strong support of major brand owners and industrial companies
- Signed Joint Development Agreements (2011-2013)
- Equity investment (2014)
Capital

2008: EUR 17.5 million
2011: EUR 30 million
2014: EUR 36 million
2016: EUR 20 million

Raised EUR 109 million (March 15, 2017)
Listing Euronext Amsterdam & Brussels

Timing is everything
Conclusions

- The transition from the petrochemical industry today to the renewable and circular chemical industry of tomorrow is under way and creates massive new opportunities for disruptive technologies.

- Our experiences:
  - Bold ideas & winning technology: it starts by building a great team
  - Strong partners are the key to successful commercialization
  - You need to spend a significant part of your time to find lots of capital