



## BOPEF – A novel substrate for flexible packaging

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# Synvina company profile

## SYNVINA: Joint Venture between Avantium and BASF

- Established September 23<sup>rd</sup> 2016
- SYN = Synergies, VI(a) = The Road, NA = Nature

### Global Company with Locations in:

- HQ and R&D: Amsterdam, Netherlands
- Pilot plant: Geleen, Netherlands
- Commercial plant site: Antwerp, Belgium
- Satellites: Canada, Hong Kong, Japan, USA

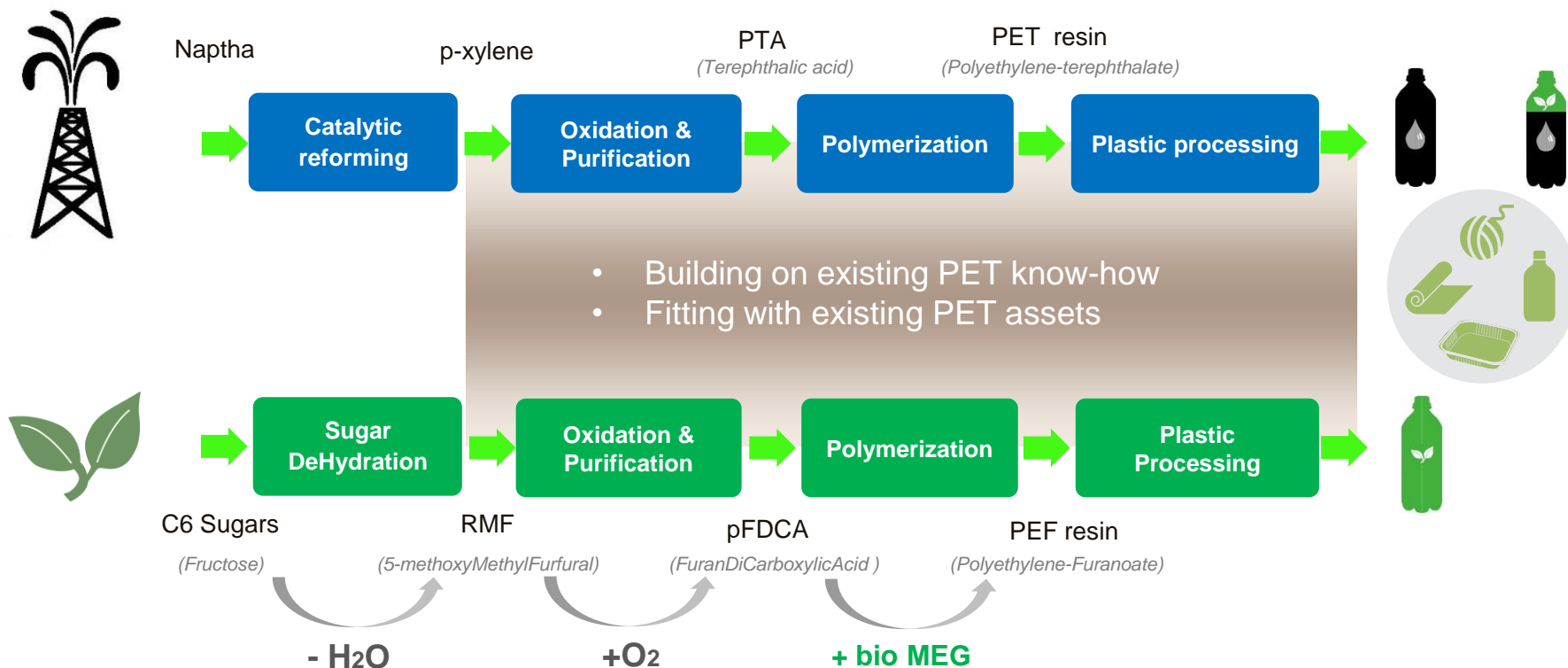
### ~70 Employees

- Process Development, Operation & Engineering
- Product, Application & Business Development
- Management, IP / Legal & Support



**Mission: Market leadership in FDCA and PEF**

# A New Value Chain: From Sugars to PEF



- Catalytic processes, developed with high throughput screening technology

# Scale up & Market introduction



LAB-  
SCALE



PILOT PLANT  
SCALE

**2008**

**2011/2016**

**Amsterdam**

**Geleen**

Kg's

Tons

Innovative research

Technology  
development



COMMERCIAL  
SCALE

**2021**

**Antwerp**

≈50kt

Commercial  
launch of FDCA &  
PEF



INDUSTRIAL  
SCALE

**2025**

**Licensee Site**

Industrial Scale

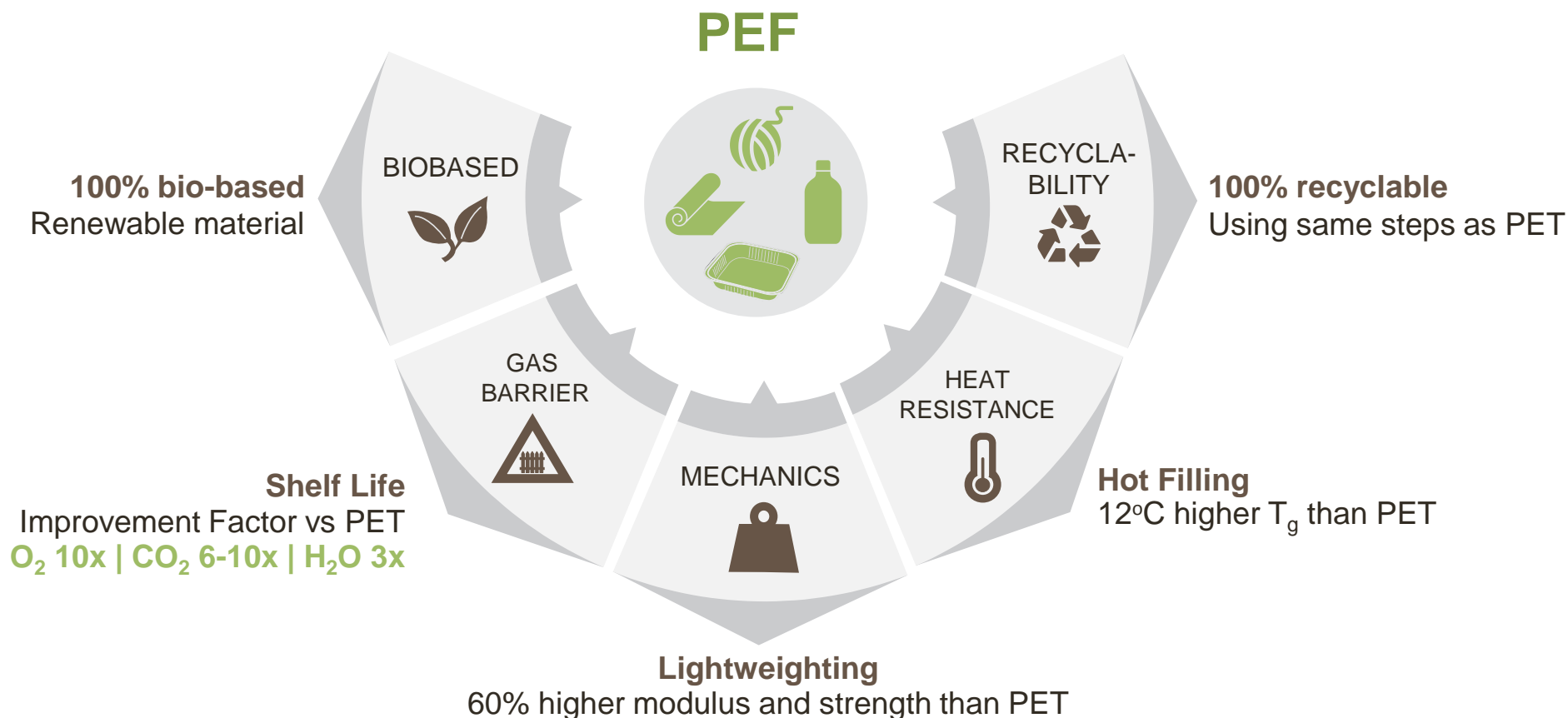
Roll-out of FDCA &  
PEF at larger scale

Licensing



- 1 | Commercial plant for proof of concept & market development
- 2 | Licensing to rapidly expand market

# Why PEF?



PEF is chemically similar to PET, but has superior material characteristics

# Opportunities in rigid packaging

## Culminating the trend to small size bottles

Bottle	PET		PEF	
Volume (oz / mL)	8 / 237	12 / 355	8 / 237	12 / 355
Weight (g)	9	13	10	14
Drop test @ 1.8m	Pass	Pass	Pass	Pass
3.0 Vol. CO <sub>2</sub> Shelf life to -17.5% (wks)	4	8	20	27
4.2 Vol. CO <sub>2</sub> Shelf life to -17.5% (wks)	4	6	12	20



### Compared to same bottle in PET:

- Equal pressure and breaking resistance → Conventional safety of plastic vs glass
- Up to 6x CO<sub>2</sub> shelf life and 2x top load → Enables existing supply chains and sales channels for small plastic bottles

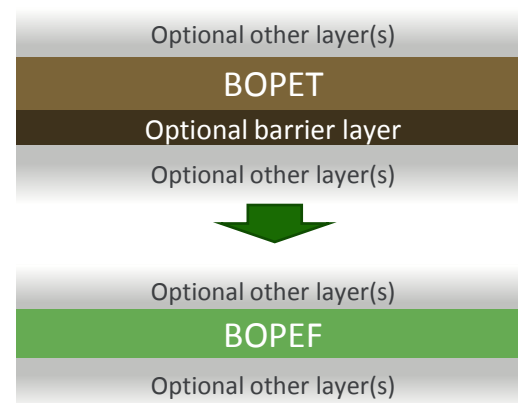
### Opportunities:

- Brand differentiation: 100% Bio-based, full transparency and shape freedom
- Also highly suitable for oxygen sensitive products, e.g. juices/nectars, teas/coffees and sauces
- Minor to no additional equipment investment and recyclable: EPBP interim approval in EU

# Opportunities in flexible packaging

## A new bio-based high-barrier substrate film

Biaxially Oriented film	BOPET		BOPEF	
Gauge (μm)	12	16	12	16
Strength (MPa)	230		260	
Break elongation (%)	100		47	
Oxygen transmission (cc/m <sup>2</sup> .day.atm)	120	90	11	9
Moisture transmission (g/m <sup>2</sup> .day)	50	38	15	11



### Compared to BOPET-based packaging

- Equal thermo-mechanical & surface properties
- 11x higher O<sub>2</sub> and 3x higher moisture barrier (also at high humidity)

→ Conventional coating, printing and lamination  
→ Avoids need for barrier layers such as PVDC and EVOH

### Opportunities:

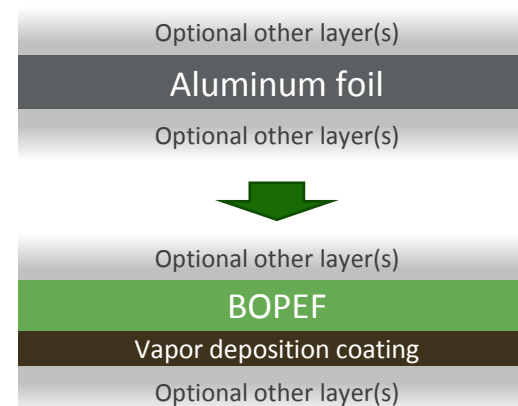
- Brand differentiation through increased bio-based content, while reducing complexity
- Compatible with clean energy recovery at reduced GHG emissions
- Step closer to recyclable flexible packaging



# Opportunities in flexible packaging

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## Compared to BOPET-based packaging

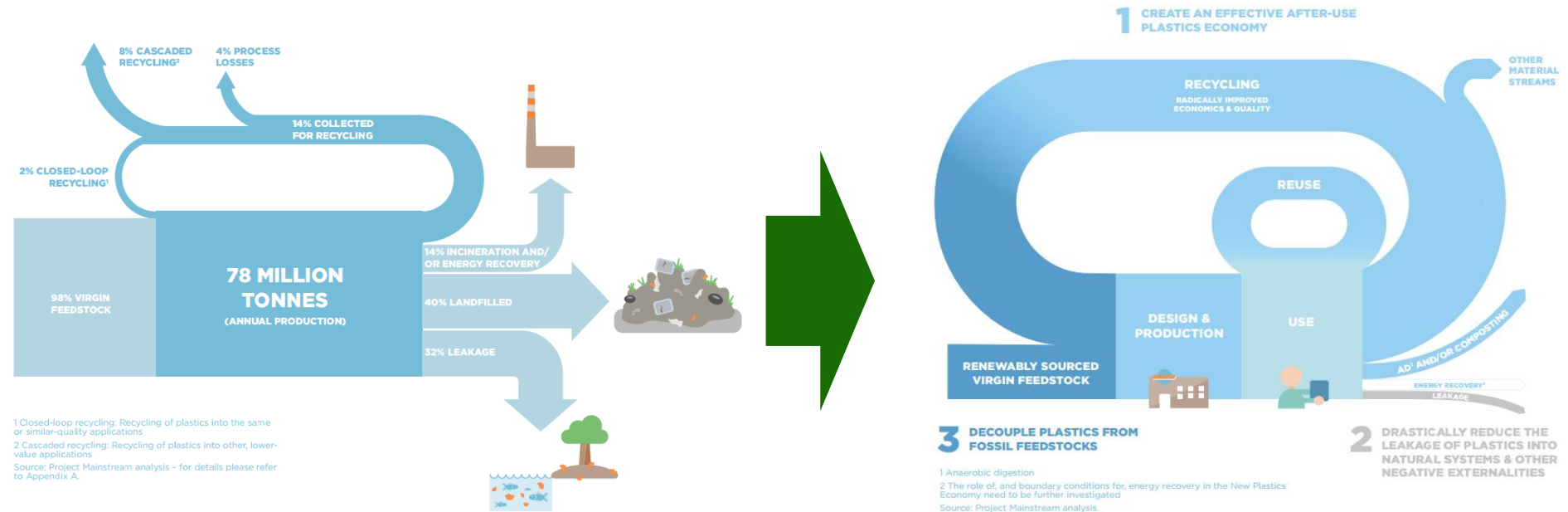
- Number of 'defects' in a in a vapor deposition coating is similar, but each defect has 11x higher O<sub>2</sub> barrier → SiOx/AlOx coated or metalized BOPEF substantially closer to a 'perfect' barrier

## Opportunities:

- Brand differentiation through increased bio-based content, while reducing complexity
- Further reduction of the need for Aluminum foil while maintaining optional transparency
- Compatible with clean energy recovery at reduced GHG emissions



# Circular economy



Source: Ellen McArthur Foundation - *The New Plastics Economy* (2016)

- The packaging industry is still taking major steps, mainly in re-design and waste management
- The need for multi-material functionality remains a key challenge, PEF offers a solution that is renewable, recyclable and reduces material needs while offering the same food protection

**PEF is the next step towards a circular economy**



# SYNVINA

functional. sustainable. bioplastics.

