



PLA business update



CSM Investor Event
Gorinchem, 27 April 2011
Arno van de Ven
Vice President Chemicals & Pharma

Agenda

- Development of the bioplastic market
 - Outlook 2020
 - Drivers
 - New Applications
 - Market growth
 - Framework conditions
- Purac developments
 - Development partners
 - Business partners
 - New Lactide plant
 - Synbra
- Conclusions

The market size for PLA is estimated to reach ~ 3,000 kton in 2020

Segments with highest penetration potential for PLA

Packaging

- Largest market for PLA
- Simple application with high visibility for consumers relying on price premium and lower recycling tax than oil based polymers

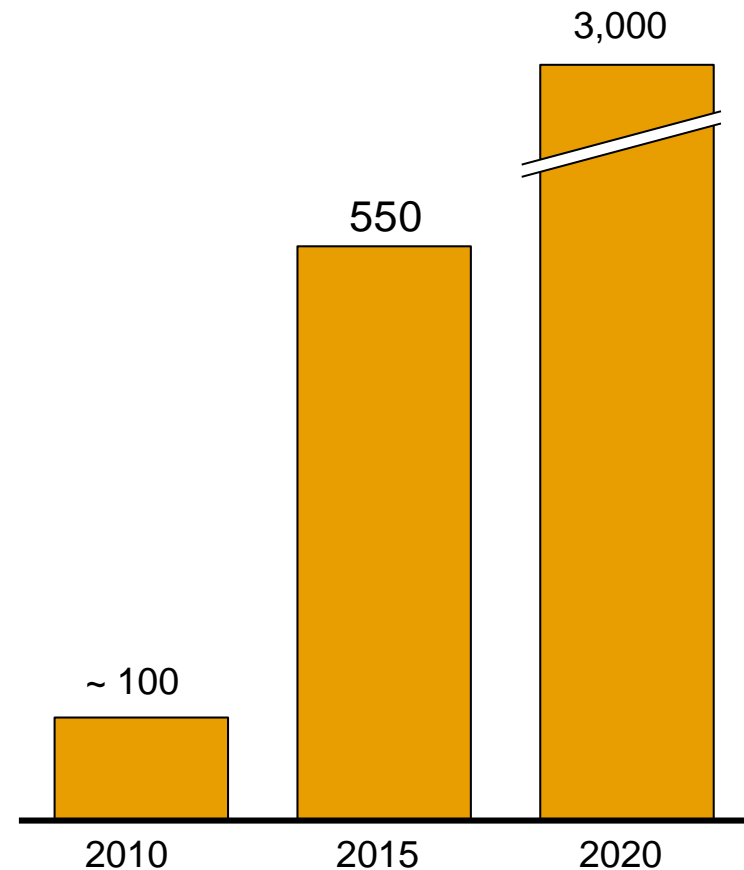
Fibers

- Close match of PLA and PET fiber properties, need for high temp resistance prompting for high temperature PLA (sc-PLA)
- Penetration in high end apparel markets and some non-woven products

Consumer products

- Mostly PS replacement in durables

Estimated market potential for PLA kton



Source: McKinsey

Drivers for bioplastics

- Consumer demand for “sustainable” products
- Retailers and brand-owners longing for “green” image
- Reducing CO₂ emissions
- Oil availability limitations
- Positive framework conditions
- Adding value to agricultural industry



PLA is already used in many applications today...

PLA is starting to replace polyester (PET) and polystyrene (PS) on the basis of costs and performance

Key properties of PLA

- Multiple conversion technologies feasible
 - Film blowing
 - Thermoforming
 - Fiber spinning
 - Foaming
 - Etc.
- Large range of application temperatures
 - PLA -70°C
 - sc-PLA – 200°C
- Biodegradable

Current applications of PLA



Cups and lids



Gift cards



Bottles



Labels



Consumer-goods packaging



Containers

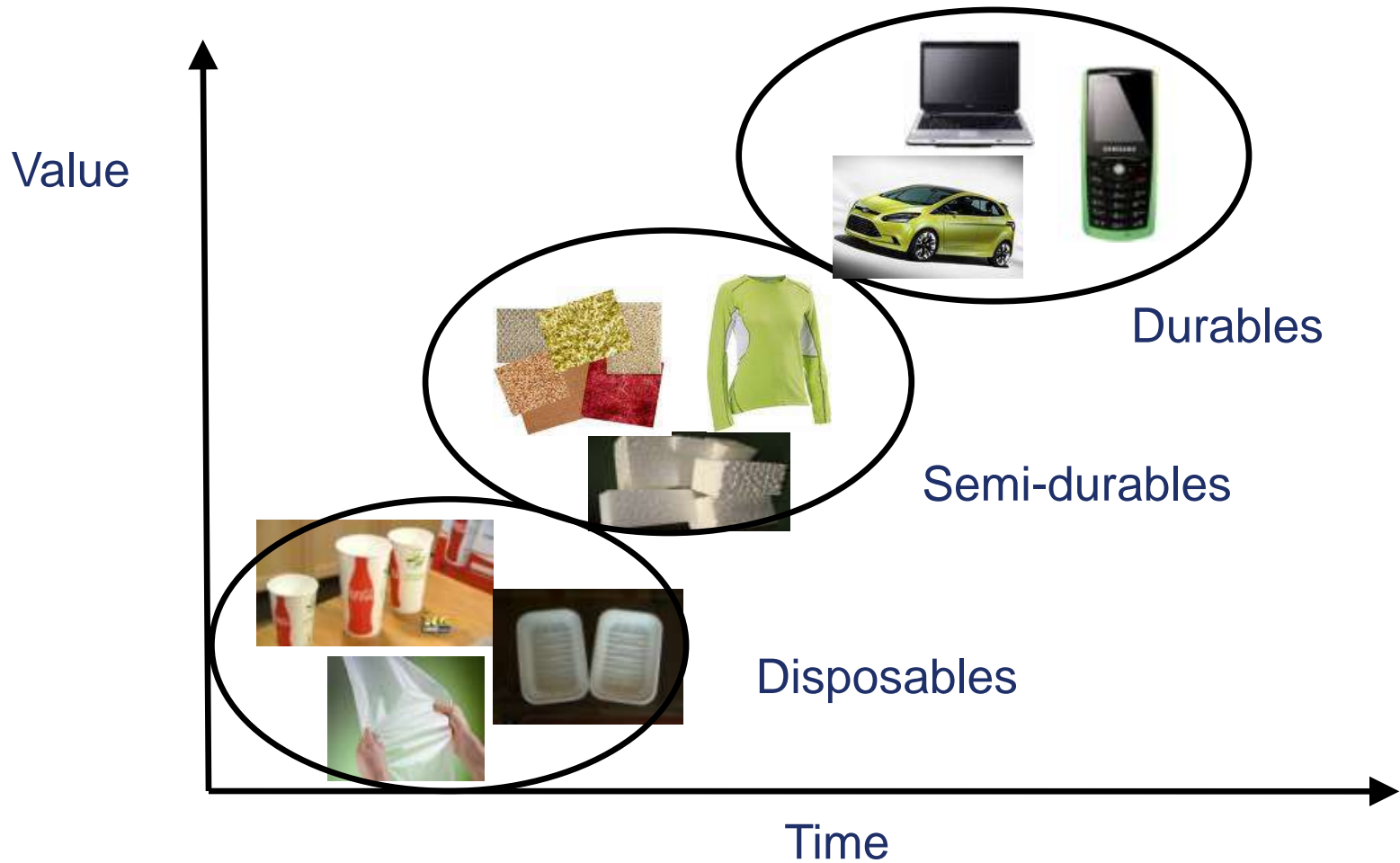


Bedding

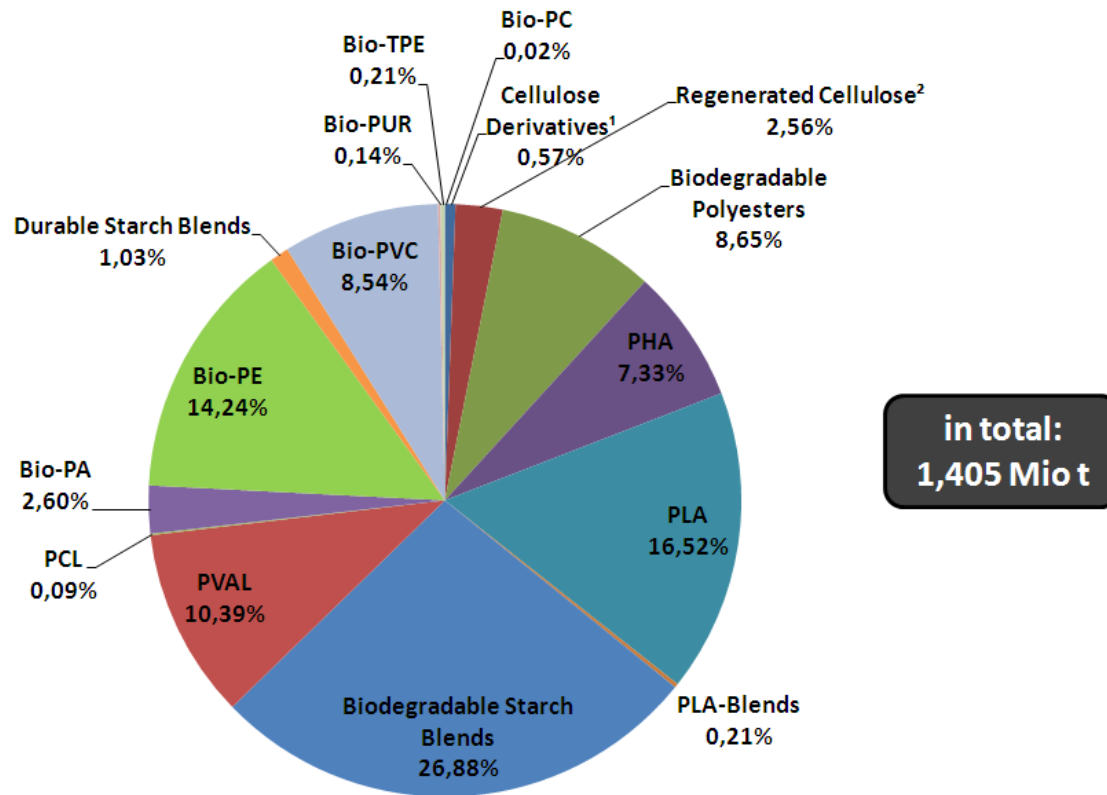


Apparel

With further expanding applications use of Purac's enabling technologies expected

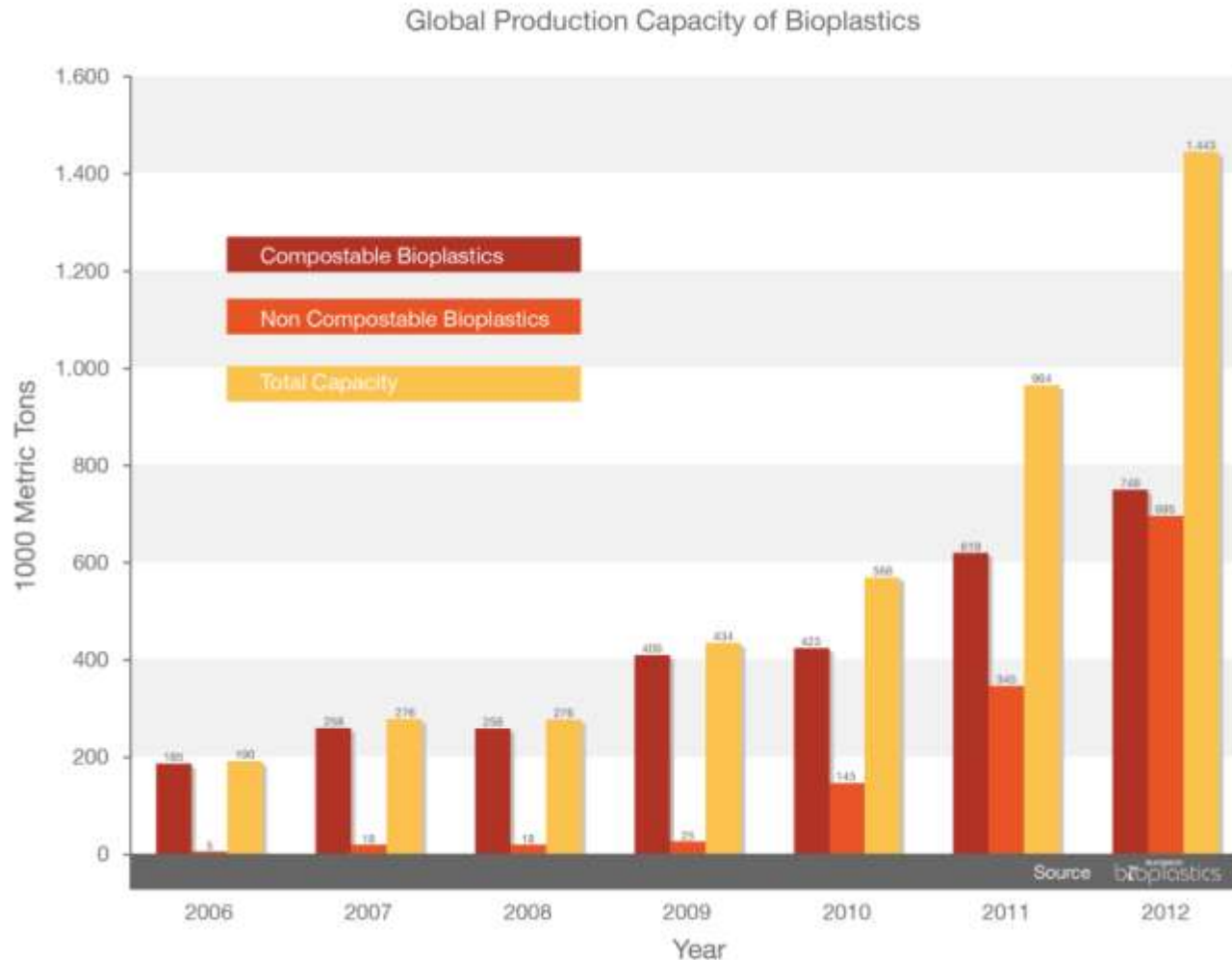


Bioplastics vision becoming a reality



- Bioplastics and PLA increasingly being used in durable applications
- A study has shown that 85% of plastics (42 mio tonnes in Europe only) could be replaced by bioplastics*

Bioplastics have reached a critical mass



Bioplastics business shifting from a market push to a market pull as brand owners are increasingly using it



PepsiCo unveils new plant bottle to rival Coca-Cola



Integrating renewable materials into our bottles is a key milestone in our journey to reduce the carbon footprint



Announced use plastic derived from renewable resources



Heinz and Coca Cola team up on plastics bottle



plant bottle™

*up to 30% plant-based
100% recyclable bottle
redesigned plastic recyclable as ever



Coca Cola reaffirmed Coca Cola's commitment to using 30% bioplastic in their bottles and packaging



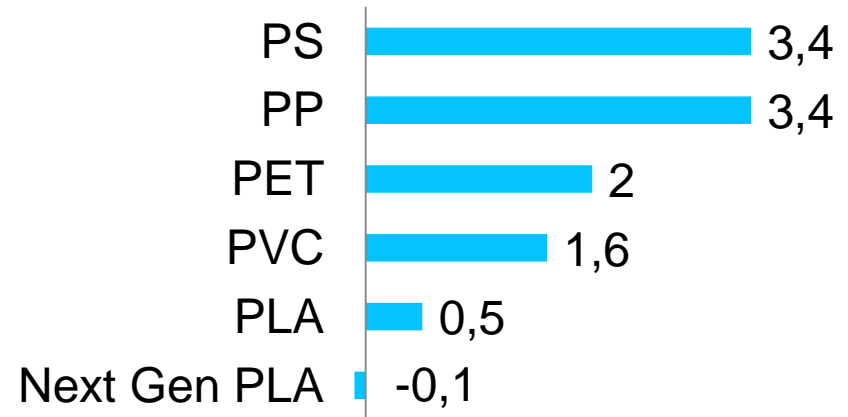
GREENHOUSE GASES

Halve the greenhouse gas impact of our products across the lifecycle by 2020.*

Bioplastics can help reduce CO₂ emissions

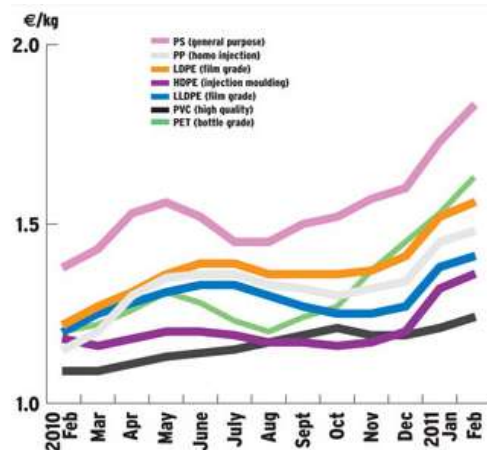
- Massive differences between carbon intensities of feedstocks
- GHG regulation may make production based on emission-intensive feedstocks more costly
- Environmental benefits of biobased production (e.g., biodegradability, reduced fossil energy consumption)

Emissions from production of common polymers Tons CO₂e/ton



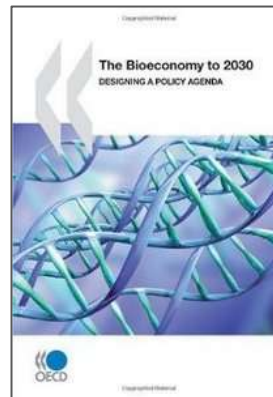
Increasing awareness about constraints oil based economy creates support for biobased economy

- Peak Oil
- Oil prices are close to reaching new highs
- Fossil based plastics prices at record price levels, making bioplastics economically attractive
- Concern about pollution and landfilling of plastics leading to bans in several countries (EPS ban in parts of USA)
- Concerns on the security of oil supply due to political tensions accelerates interest in bio-economy



EU Policy putting the biobased economy high on the agenda

- Europe 2020
- Knowledge Based Bio-economy
- Lead Markets Initiative for biobased products



Purac value proposition

- Lactides offering
 - Efficient route to PLA
 - Lowering entry barriers
- Value from D-Lactides technology
 - Higher Heat Stability
 - More efficient processing due to faster crystallization
 - D-Lactic Acid micro-organism exclusively licensed from Myriant. Scaling-up and manufacturing knowledge is proprietary Purac know-how
- Next generation PLA technology
- Purac-Sulzer polymerization process
- Partnership model



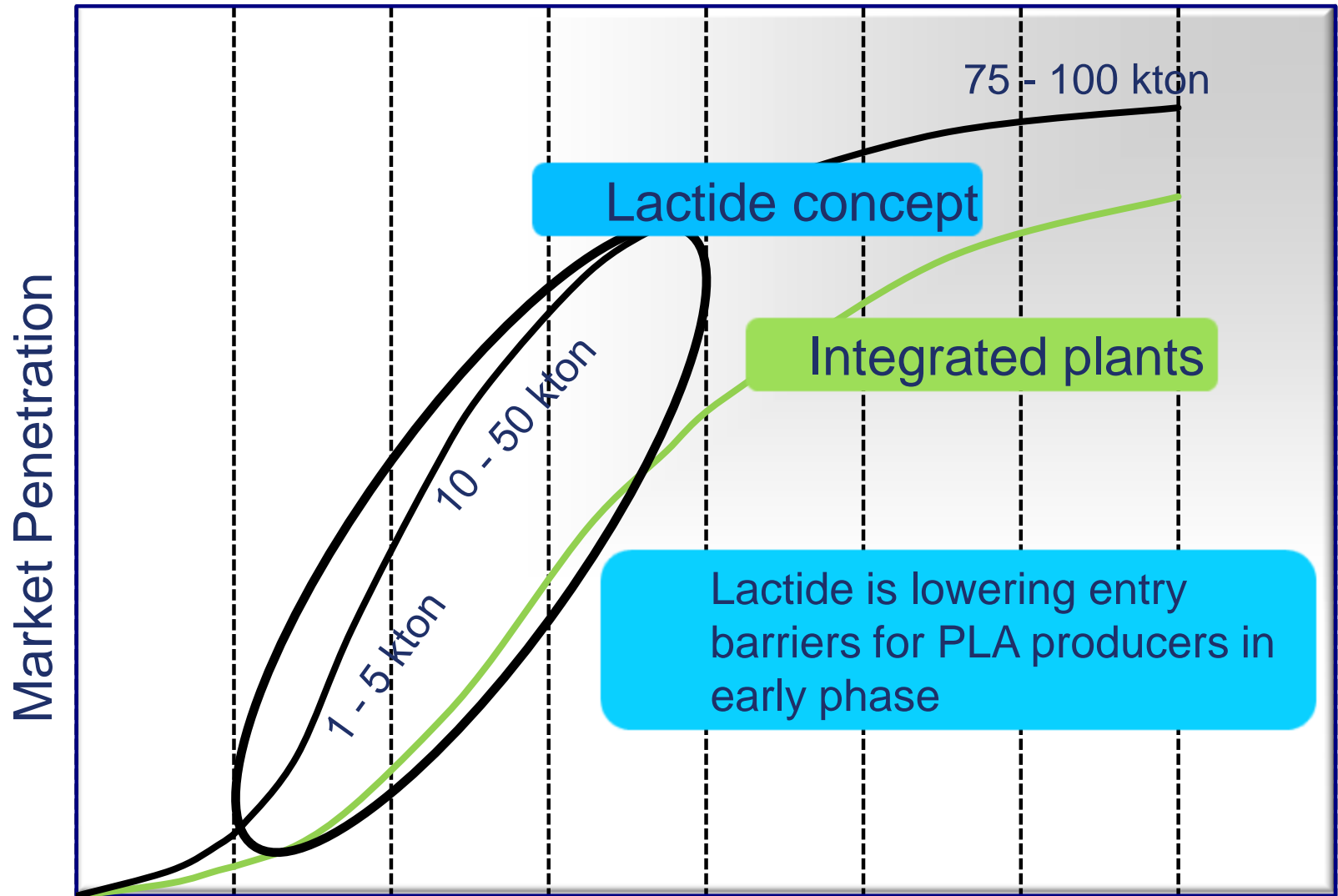
Purac PLA yield on carbohydrate higher compared to industry references



Purac

'Industry'

PLA plant construction in phases

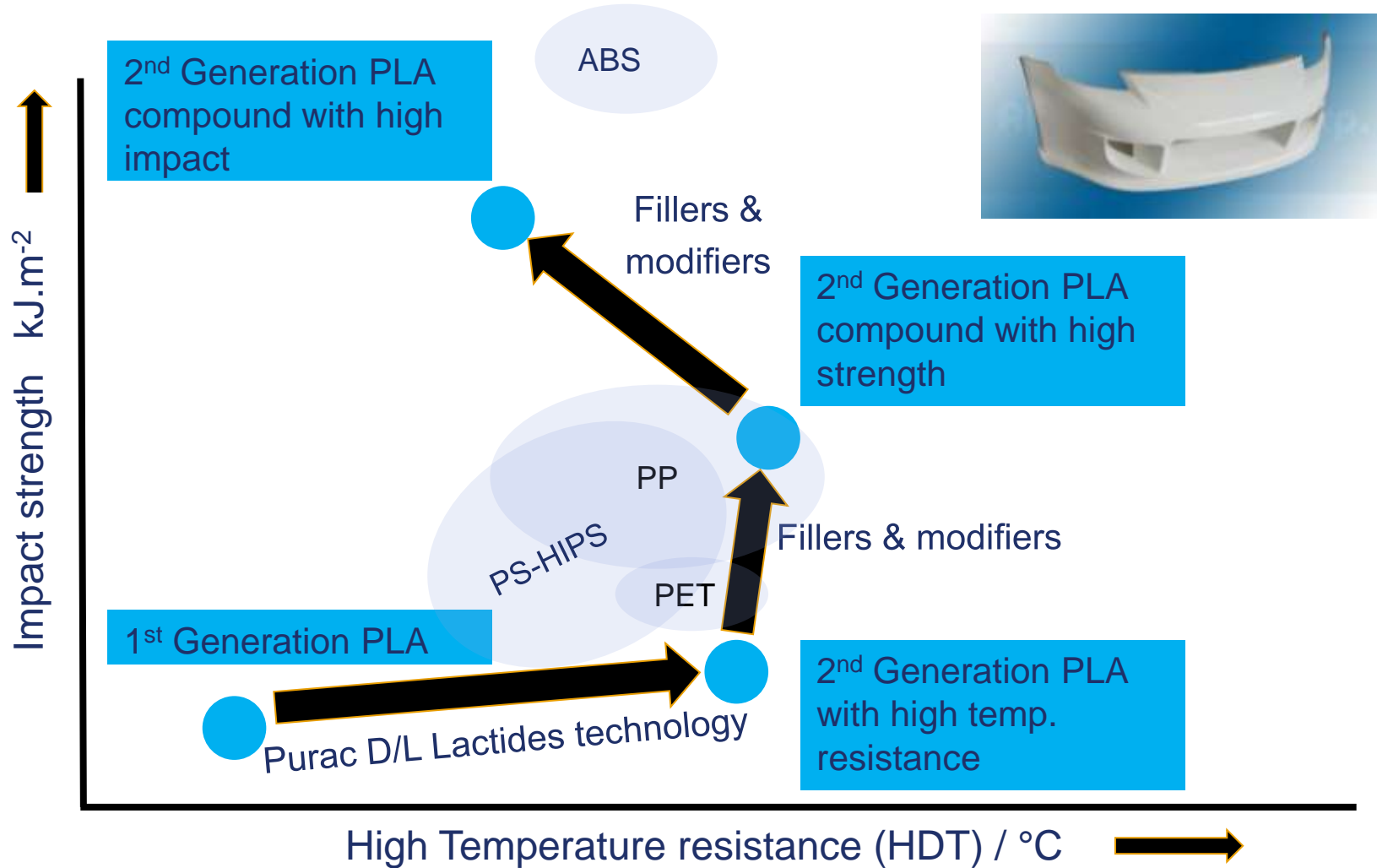


Thailand lactide construction on schedule

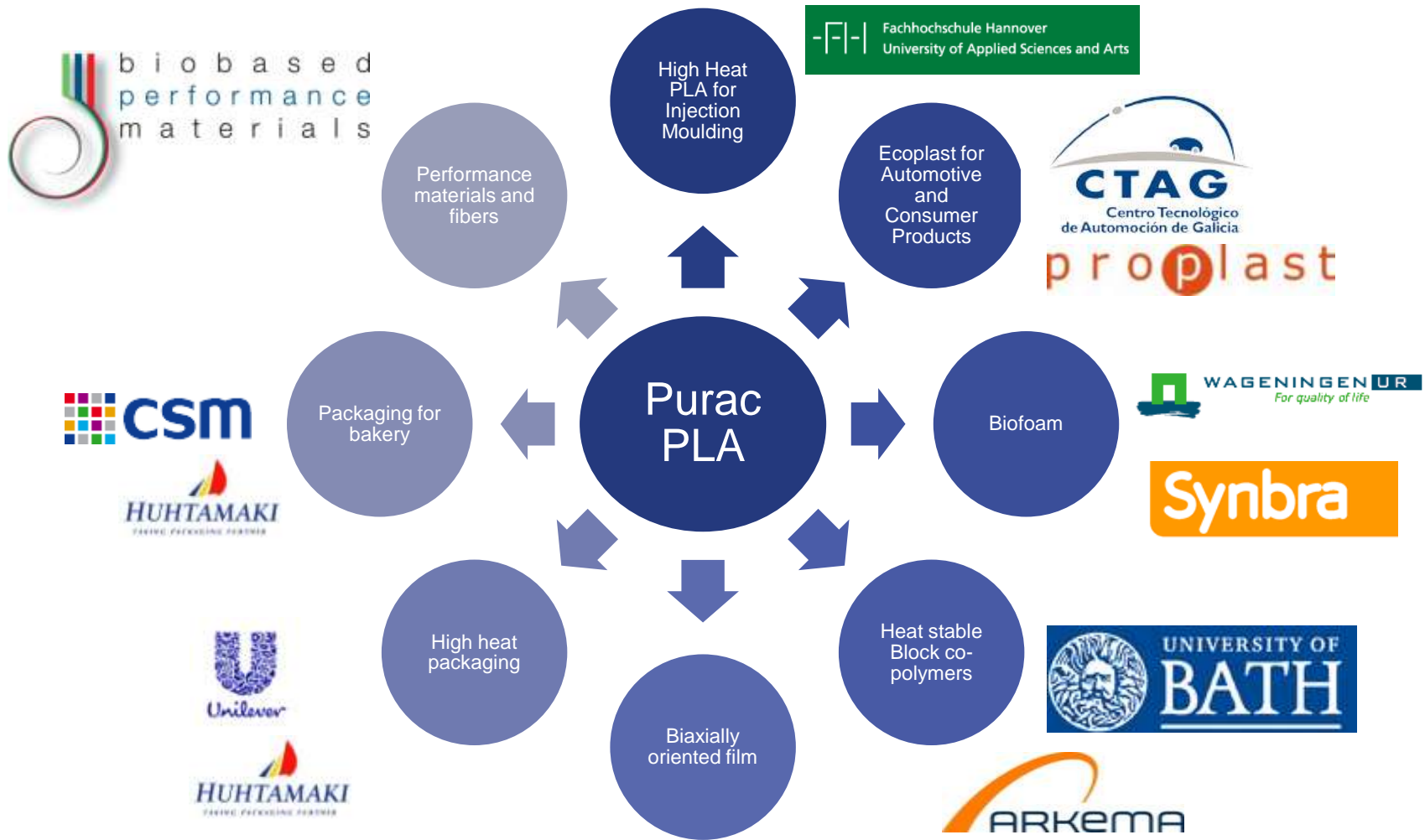


PLA with ABS like properties

Excellent balance between impact strength and heat resistance



Purac PLA development programs covering a wide range of markets



PLA technology development path

1st generation PLA

A low-performing amorphous polymer

2nd generation PLA

PLA's based on L and D lactides with superior heat resistance properties opening new application areas

3rd generation PLA

PLA's based on a gypsum free lactic acid process that are carbon neutral

4th generation PLA

PLA's based on a gypsum free lactic acid process using biomass as substrate. No more competition with food chain. Becomes a carbon sink.

Continuous innovation

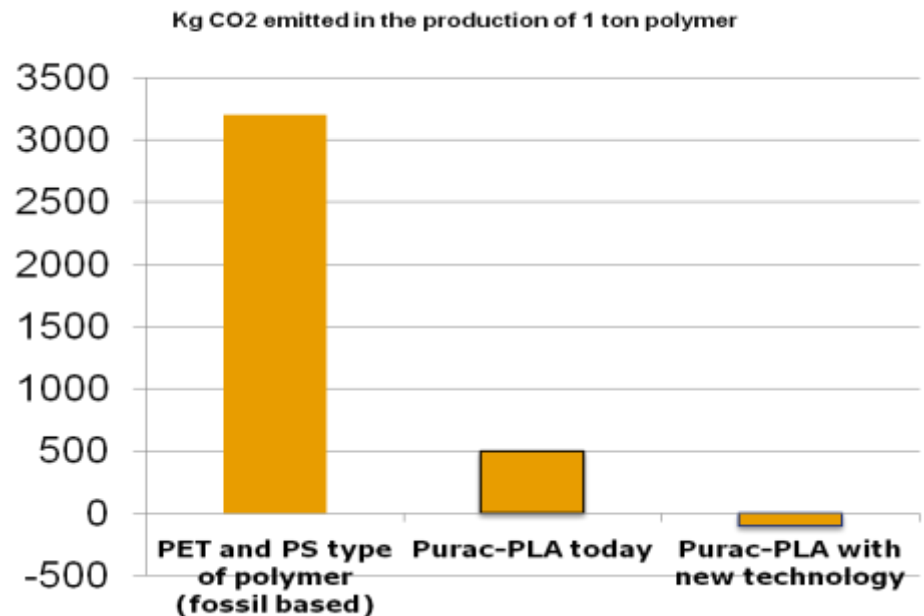


- 3rd generation PLA: Gypsum Free Technology

- Less Chemicals
- Lower environmental load
- Significant improvement in LCA
- Net CO₂ absorption

- 4th Generation PLA: Cellulose based Lactic acid

- No competition with food products
- Improve Carbon usage
- Fully sustainable



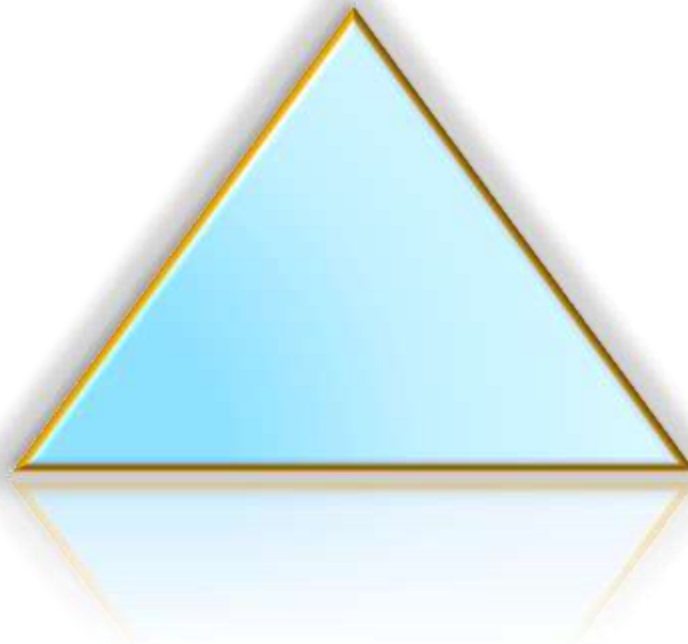
Partnership between Purac, Sulzer and PLA producers

SULZER

Polymerization equipment



Lactides



PLA producers

- Sulzer polymerization process only available for Purac partners
- Efficient process: up to 24 x faster compared to others

Purac PLA network



- Partner location
- Purac factory

Indorama and Purac in alliance discussions for setting up PLA facility in Thailand



Introduction to Indorama video

Conclusions

- Bioplastics market is entering its growth phase
- Change from technology push to market pull
- PLA has an upward potential for massive growth
 - PLA market estimated at 3 million tons by 2020
 - Ambition level to attain 50% market share
 - This equates 20 times the size of our Thailand factory
 - EBITA and ROCE at min. 15%
- Commercial quantities of Purac Lactides available by end 2011 and Synbra PLA available today
- Well on track towards the next generation PLA
- Application development network established
- Increasing number of partners



Purac Biomaterials for medical and pharma markets continues steady growth

- Purac Biomaterials is the market leader in resorbable polymers for medical and pharmaceutical applications
- Products are used in:
 - Orthopedics (screws, plates, etc)
 - Sutures
 - Cosmetic surgery
 - Cardiovascular devices
 - Controlled Release Drugs
- Customers base include the leading Pharmaceutical and Medical Device companies in the world
- Unique technology



Purac Biomaterials investing in new production plant in USA

- September 2010 the investment in a new facility for Biomaterials in the USA was announced
- Drivers for investment:
 - Purac Biomaterials business is steadily growing
 - Existing facility in the Netherlands reaching its maximum capacity
 - 2nd facility reduces supply chain risks
 - Close to important USA market
 - Development of new technologies requires additional manufacturing space



Planning new Biomaterials plant in USA

- Facility will be located in the South-East of the USA
- Construction of the facility will be finalized early 2012
- Facility will be operational mid 2012



