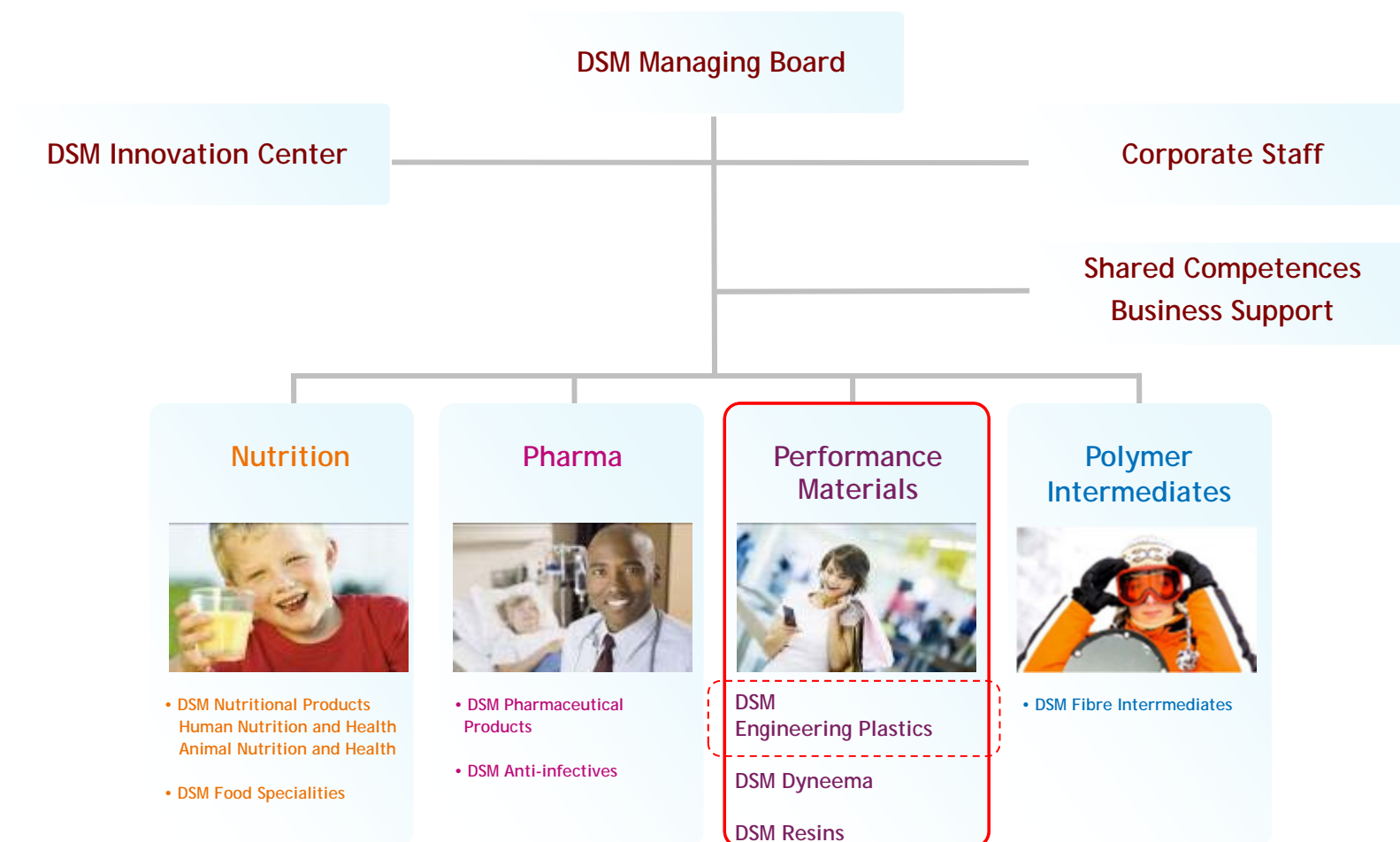


Biobased ECO+ Solutions from DSM

Applications in Green Plastics:

Emile Homsy, Ph.D., LL.M.
VP R&T DSMEP
May 10-2013

DSM Organization chart.....



DSM Proprietary Informations

Unique business positions



Health



Nutrition



Materials

- Global leader in nutritional ingredients for feed, food and personal care
- Market leader in anti-infectives and key pharma custom manufacturing player
- Market leader in sustainable high performance materials
- Merchant market leader in nylon precursor caprolactam
- Innovator active in advanced biofuels, bio-based chemicals and biomedical materials

United over 200 locations across all continents



... meeting our sustainability strategy...

- The quest for sustainable development will be the main trend in the coming decades.
- Differentiators today will become qualifiers in all major EP markets;
 - Low or neutral carbon footprint of materials and applications
 - Elimination of hazardous substances
 - Recycling with the ultimate goal to reach cradle to cradle solutions
 - Bio-based polymers able to perform in critical technical components



Eco efficiency



Recycle based



Hazardous free



Bio-based

Our aim is to create sustainable growth via our ECO+ solutions;
products and services that create more value with less environmental impact

...embarking on bio-based opportunities



- Solutions for global Climate & Energy needs
- Highly attractive markets
- Leadership position in conversion technologies for 2G biofuels with #1 position in yeast
- Understanding the end market needs
- We have the necessary competences including: biotech, chemistry & polymerization

Bio-based Energy

2G Bio-ethanol
Bio-gas
2G Bio-diesel

Bio-based Chemicals

Bio-succinic acid
Bio-adipic acid

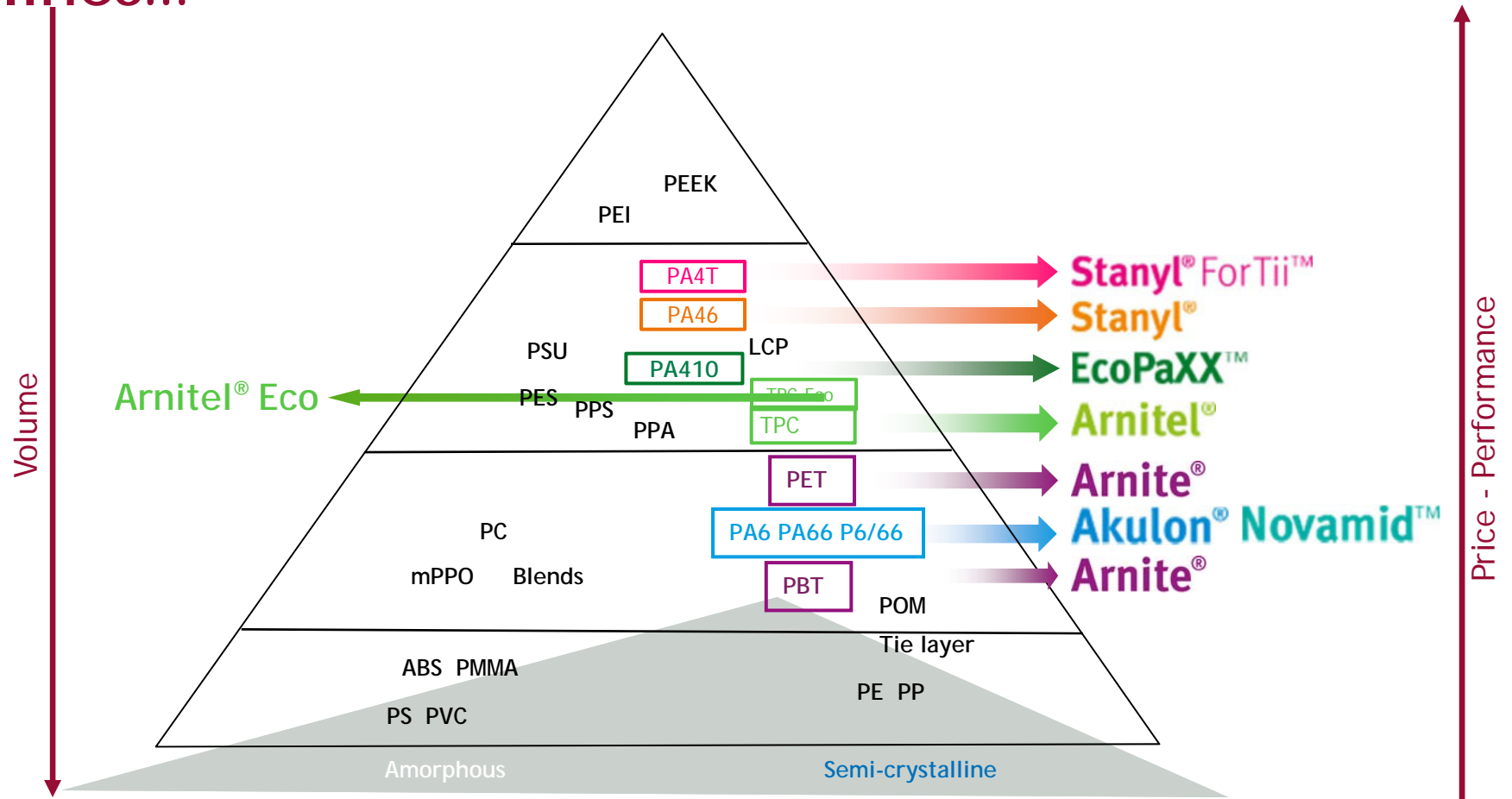
Bio-based Materials

EcoPaXX
Arnitel ECO
Palapreg ECO

Innovation Pipeline

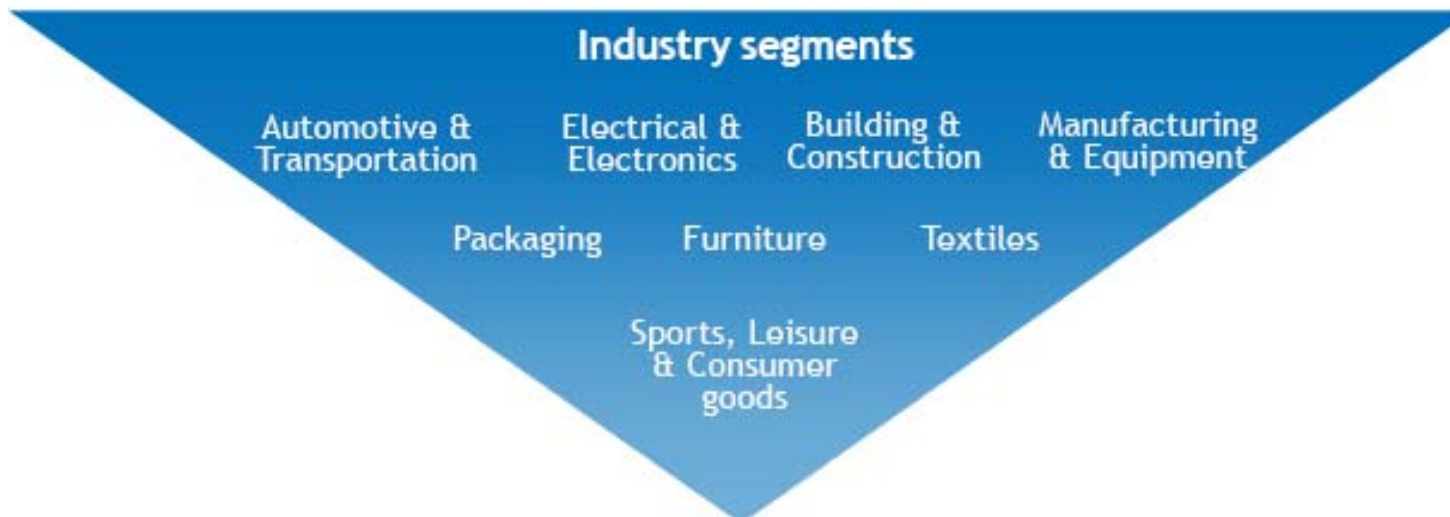
DSM Proprietary Informations

... adding to our leadership in core product lines...



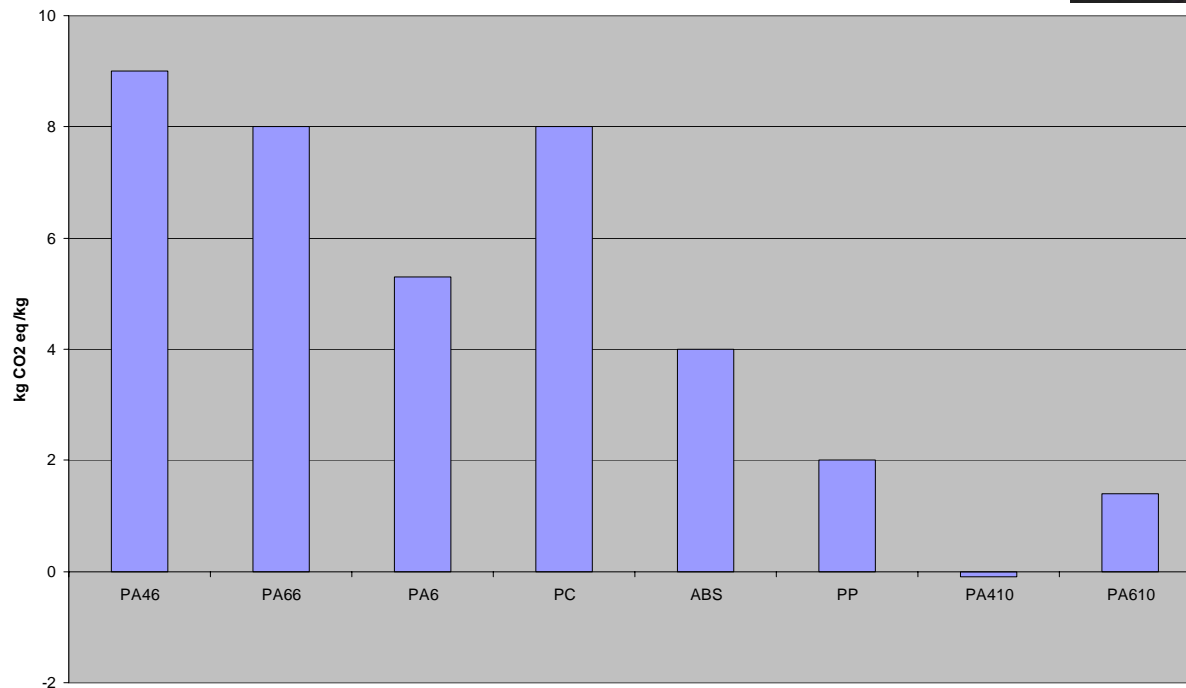
...Successes serving key segments

- Lead free products for E & E
- Elimination of hazardous brominated flame retardants
- Proactive scouting of opportunities (replace hazardous substances used by competition)
- Active involvement in various Green Screen and C2C programs with e.g. NGOs



EcoPaXX™ PA410 introduction

Graph CO2 footprint of various materials



CO2 reduction potential = $1,5 * 0.7 * 5 \text{ kg CO2}$

Bio-based Arnitel Eco (TPC) - First Applications



Bio Based 20-50%,
Green House Gas
Emissions reduced
with 40%



*Adjusting
Suspension*

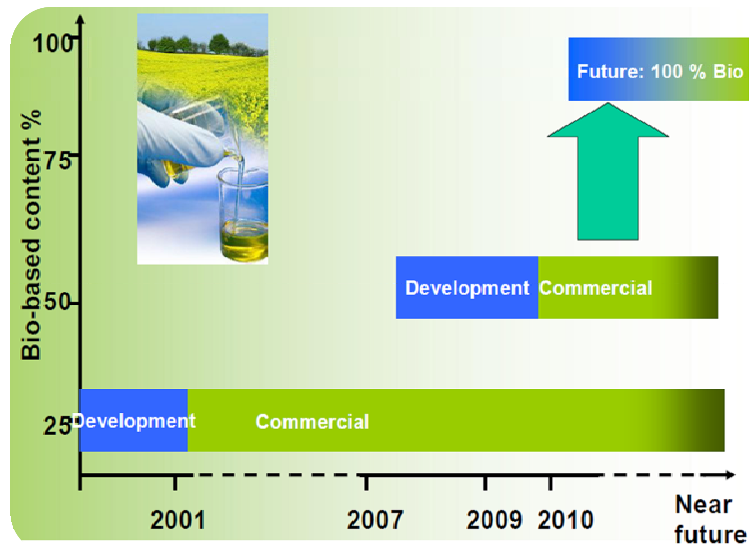


Eco Footprint Improved

DSM Proprietary Informations

Biobased Palapreg ECO (UP)

- UP Resin for SMC /BMC process
- 55% green on total
- No sacrifice in processing & performance



realized



On going



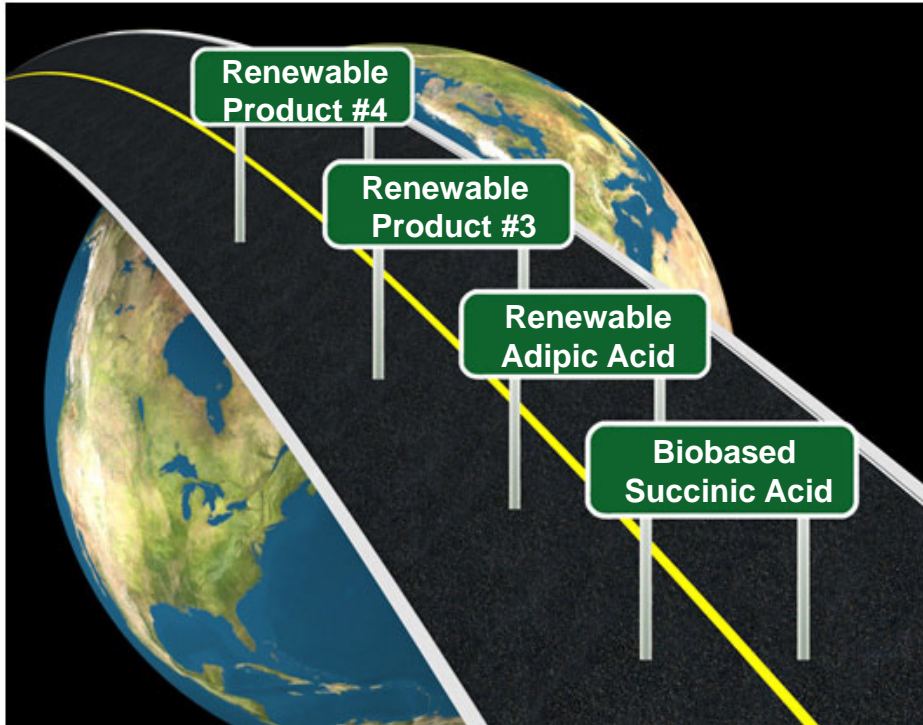
Future



Source: Renault S.A.

Use of Fossil Oil Down, Weight Down, Emissions Down

... current and future.



- BioSuccinium™ is the frontrunner - commercialized via a JV Reverdia™ (DSM + Roquette)
 - Yeast based process eliminates salt and reduces GHG emissions by >60%
- Renewable Adipic Acid - achieved feasibility on multiple routes...entering development stage
 - Introduce key renewables for polyamide 66, resins, polyurethanes and plasticizers
- Other biobased chemicals and building blocks in pipeline

Advanced Biofuels, from Corn crop residue to bio-ethanol

- POET - DSM joint venture two companies leading the transition from a petroleum-based economy to a bio-based economy.
- Current operation designed to produce more than 20 million gallons
- Replicate technology throughout POET's existing network of 27 corn ethanol plants



..lead to breakthrough innovations

BRIGHTER LIVING

- Outstanding performance in
 - Automotive
 - Electrical and electronics
 - Lighting
 - Flexible food packaging
 - General industries
- Recycle based concepts
- Bio-based concepts
- Low emission concepts
- Halogen free concepts
- Eco efficiency
- Cradle to cradle certified solutions



DSM will continue to:

Develop renewable Raw Materials.
Introduce Safer Chemicals and Polymers
Develop new bio-based Polymers