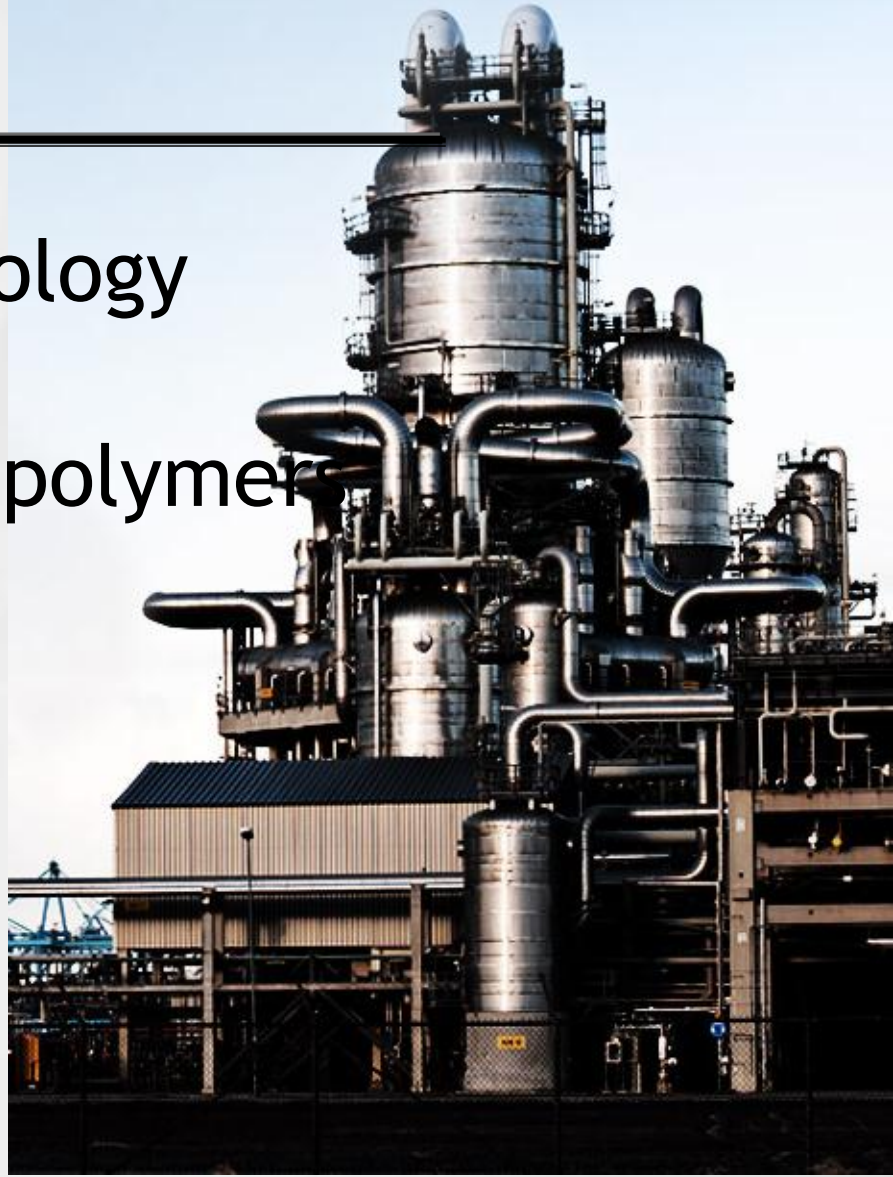
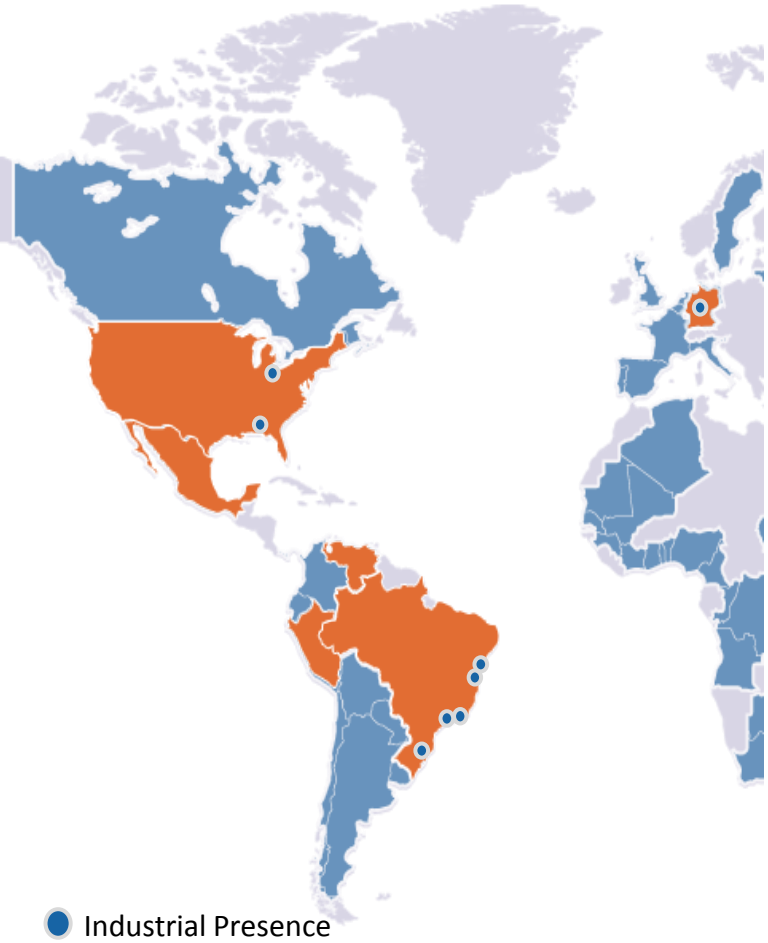

Braskem
Novas formas de ver o mundo
Danish Parliament Committee
Feb, 2013

Agenda

- BRASKEM overview
- Innovation and Technology
- Green chemicals and polymers



BRASKEM OVERVIEW



35 Industrial sites

Bahia
- 1 Naphtha Cracker
- 4 PE
- 1 PP
- 1 PVC
- 1 Chlorine Soda

Alagoas
- 1 PVC
- 1 Chlorine Soda

Rio de Janeiro
- 1 Gas Cracker
- 1 PP
- 1 PE

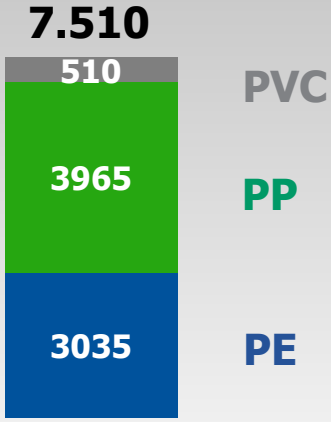
São Paulo
- 1 Naphtha Cracker
- 2 PP
- 3 PE

Rio Grande do Sul
- 1 Naphta Cracker
- 5 PE
- 2 PP
- 1 Green Ethylene

United States of America
- 5 PP

Germany
- 2 PP

CAPACITY (kt/p.a.)



2011 Net Earnings
US$ 19.9 billion

2011 EBITDA
US$ 2.2 billion

Fonte: Braskem

STRATEGY BASED ON 3 DRIVERS OF GROWTH

Key differentiators

Brazil

- Adding value to the current streams
- Strategically positioned to capture the future feedstock availability (pre-salt exploration: Comperj)
- Committed to the competitiveness of the domestic plastic chain

International Expansion

- Expanding presence in countries with feedstock advantage
- Preferred partner to develop the industry in Latin America
- Ongoing project: Mexico Ethylene XXI

Sustainable Chemicals

- Largest biopolymer player in the world
- Well positioned to capture ethanol advantage
- Technological breakthrough in green: PE, PP and other streams (under analysis)

Innovation & Technology

2020 Vision

To be the global leader in sustainable chemicals, innovating to better serve people

BRASKEM BASES FOR GROWTH

Brazil

Consolidated Project Pipeline

2012
- PVC Expansion (+ 200 kton/y)

2013 - 2015
- Butadiene (100 kton/y)

PROJECTS UNDER EVALUATION
- Brownfield/Greenfield expansion projects in Brazil: PE and PP assets
- Comperj - integrated complex in Rio de Janeiro (southeast Brazil)
- Portfolio Expansion

- **Resin Capacity CAGR for 2010-2015: +4.3% p.y.**
- **Diversification of raw materials and world-class assets**
- **Fiscal discipline and excellent track record of projects execution**

Source: Braskem

BRASKEM BASES FOR GROWTH

Internationalization - Americas

2015

Ethylene XXI - Mexico

- 1,000 kton/y ethylene and PE
- JV between Braskem (65%) and the Mexican group IDESA (35%) for the purchase of ethane from PEMEX
- Strategic partnership with Ineos and Lyondell Basell for PE plants technologies

Future projects over evaluation

Peru

- 600 to 1,000 kton/y ethylene and PE

Venezuela

- Under revaluation

USA

- Shale gas opportunity, under evaluation

BRASKEM BASES FOR GROWTH

Sustainable Chemicals

Braskem: a global leader in biopolymers

I'm green™ Plastic
Renewable source
Carbon reduction
Braskem

Green PE
started up 4Q2010

- Successful track record for implementing projects: term and costs
- Capture of 2.5t CO2/t PE
- Partnership with Customers

Green PP

- Innovation in bioplastic market
- Production integrated with green propylene
- Capture of 2.3t CO2/t PP

Development

- Partnerships for the development of competitive technologies

GRACE
novozymes Rethink Tomorrow
LNBio

- Development of other cracks streams to sustainable chemicals
- PE integrated project study
- New biobased chemical products studies

BRASKEM GREEN POLYETHYLENE: A RUNNING BUSINESS

- Startup **Sept 24, 2010**
- Capacity **200 kty**
- Investment **US$ 290 MM**

Braskem is the leading global supplier of biopolymers

GREEN POLYETHYLENE CYCLE

FROM CRADLE TO CRADLE

Sugarcane

The sugarcane crop metabolizes the CO_2 to produce sucrose

Ethanol CH3-CH2OH

At the distillery, the sugar juice is fermented and distillated to produce ethanol

Ethylene CH2=CH2

Through the dehydration, the ethanol is transformed in ethylene

Very Favorable Ecoprofile*

Captures and Fixes 2,5 t CO_2/t PE

Braskem

Green PE [CH2=CH2]

The ethylene is polymerized in polyethylene production unities

Carbon capture

The green polyethylene is transformed in final products in the same unities already existents

Recycling

The green polyethylene is 100% recyclable (Mechanical / Incineration)

* Preliminary Ecoeficiency Analysis (From cradle to Braskem gate)– Fundação Espaço Eco 2007/2008

GREEN POLYETHYLENE

Green PE/PP has the same technical and recyclability properties than petrochemical PE/PP.

Oil

Fully identical properties

Sugarcane

- Green PE/PP **can be recycled in the same stream already** established for the petrochemical PE/PP
- Green PE/PP regrind can also be **incorporated in the converter's production systems**

Petrochemical PE/PP

Green PE/PP

GREEN POLYETHYLENE

Partnerships with Leading Global Companies reinforce sustainability strategy

Coca-Cola

DANONE

P&G

Johnson & Johnson

L'OCCITANE
EN PROVENCE

Nestlé

Good Food, Good Life

PROTECTS WHAT'S GOOD™
Tetra Pak

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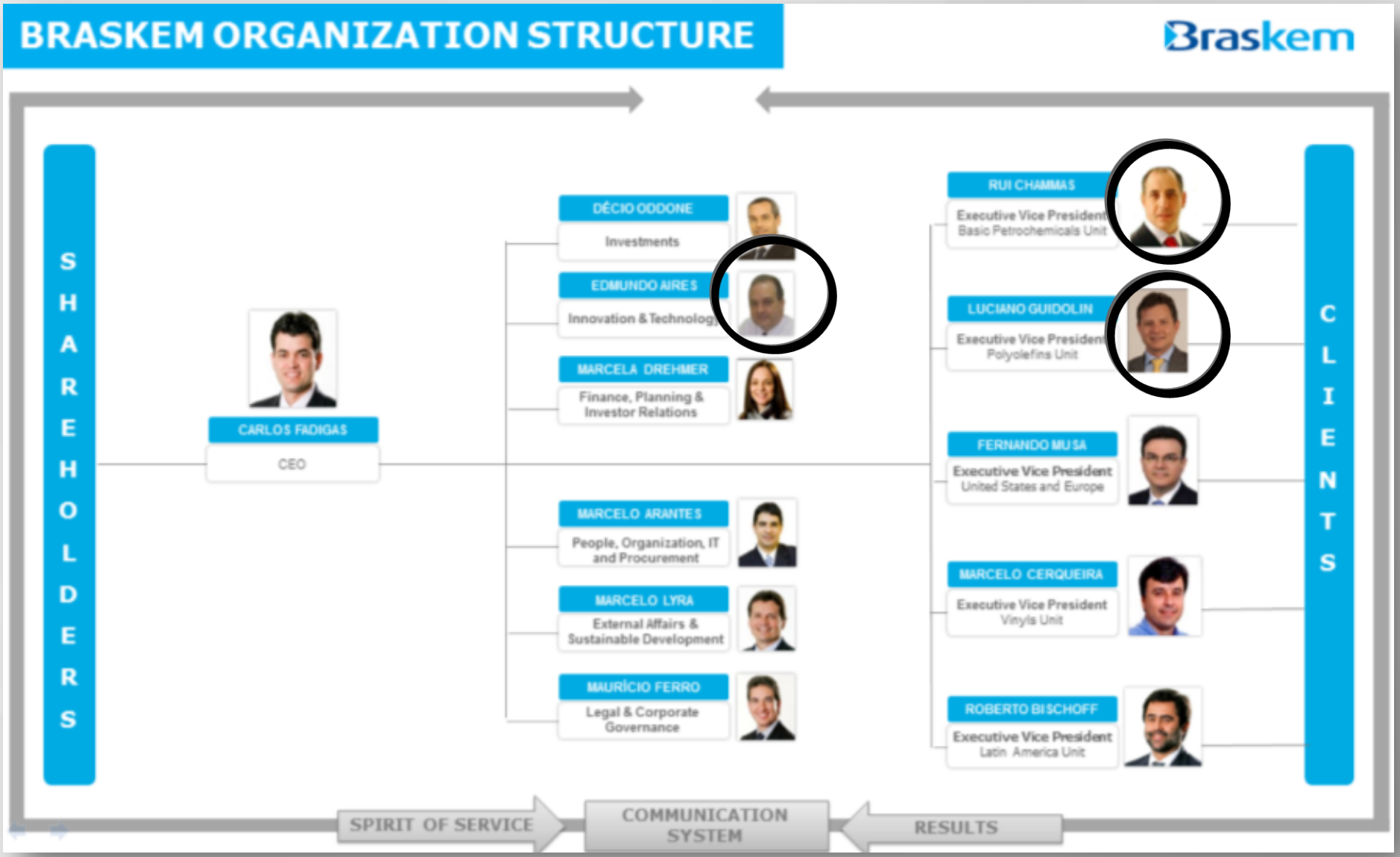
MANAGING INNOVATION

R&D Structure



INNOVATION AND TECHNOLOGY

EXPENDITURES, TEAM LEVEL, INFRASTRUCTURE,...

I&T Expenditure: 2011 – 93 MM USD; 2010 – 40 MM USD; 2009 – 30 MM USD.

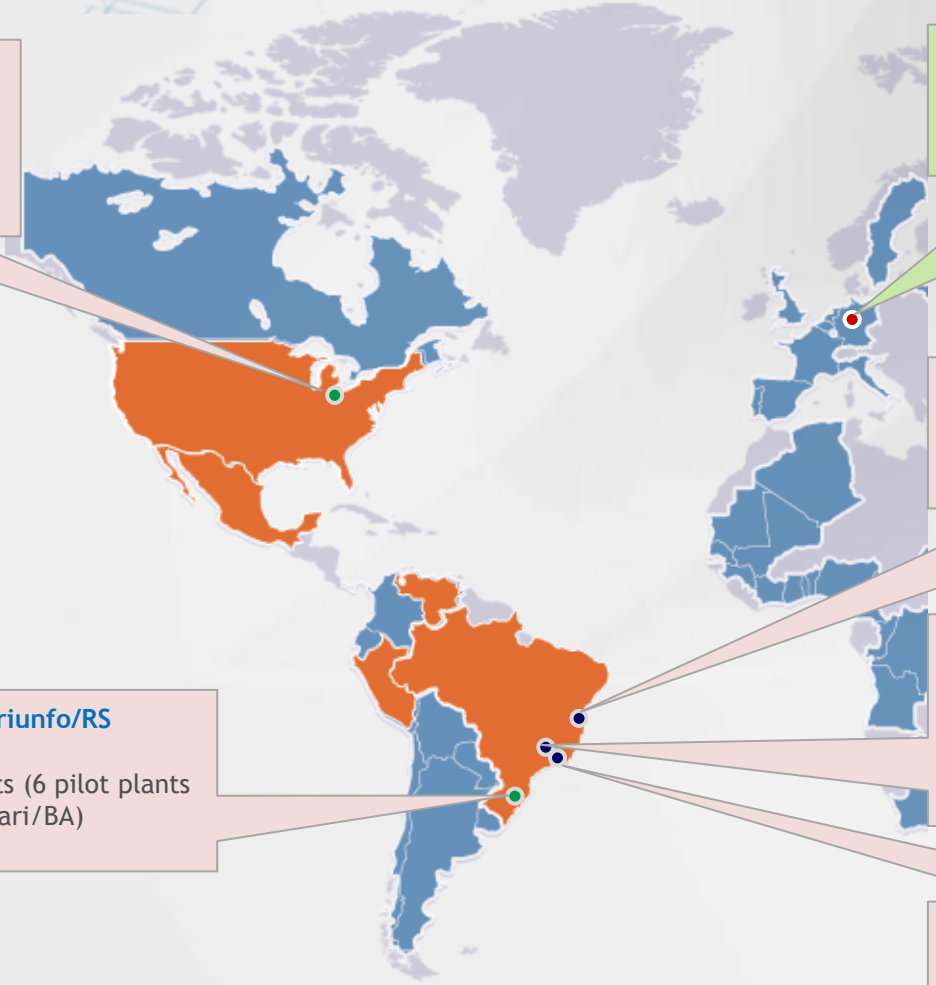
298 People; Areas of Qualification: Chemical and Materials Engineering, Chemistry, Biochemistry and Biology; 16% of PhDs, 30% of researchers MSc and Post – Graduate.

Over US$ 200 million in R&D assets: 2 Tech Centers, 8 pilot plants, 24 labs.

445 patents filed until 2011

Joint technology programs; Partnership with universities and R&D centers in Brazil and USA

TECHNOLOGY CENTERS AND LABORATORIES



TECHNOLOGY CENTER
Pittsburgh in United States
Polymer development
3 laboratories
37 qualified staff

EUROPE LABORATORY - Wesseling in Germany
Polymer development

HMPE LABORATORY - Camaçari/BA
HMPE Fiber development
1 pilot plant
14 qualified staff

BIOTECNOLOGY LABORATORY
Campinas/SP
Biopolymers development: Partnership with LNBio
2 Laboratory
31 qualified staff

TECHNOLOGY CENTER - Triunfo/RS
Polymer development
17 laboratories + 7 pilot plants (6 pilot plants in Triunfo/RS and 1 in Camaçari/BA)
158 qualified staff

PETROCHEMICAL PROCESS LABORATORY ABC/SP
3 qualified staff

- Laboratory
- Technology Center
- Future Laboratory

Fonte: Braskem

INNOVATION AND TECHNOLOGY

TECHNOLOGY CENTERS AND LABORATORIES

BRASKEM TECHNOLOGY CENTER – PITTSBURGH (EUA)

BRASKEM TECHNOLOGY CENTER – TRIUNFO/RS (BRAZIL)

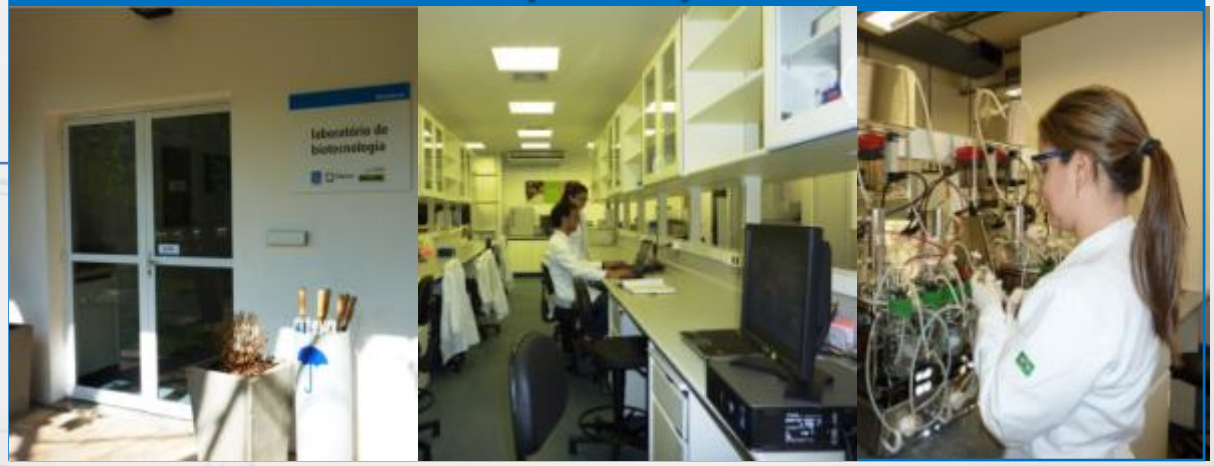
Source: Braskem

INNOVATION AND TECHNOLOGY

TECHNOLOGY CENTERS AND LABORATORIES

HPME FIBER LABORATORY BRASKEM– CAMAÇARI/BAHIA (BRAZIL)

BIOTECNOLOGY LABORATORY BRASKEM – CAMPINAS/SP (BRAZIL)

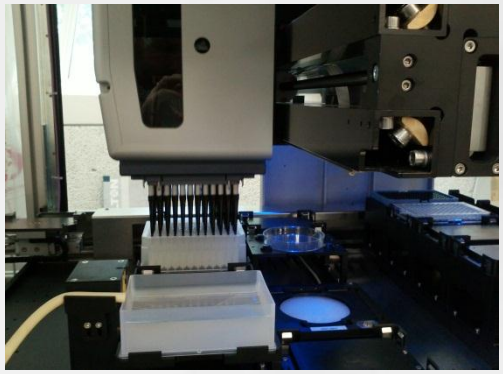


Source: Braskem

BRASKEM BIOTECHNOLOGY LABORATORY

Available resources

Laboratório de biotecnologia BRASKEM



HTS

shakers

bioinformática

Fermentadores

biofreezer

Sistema de geração de imagens molecuares

Cromatógrafos

BRASKEM´s OPEN INNOVATION VIEW

partnerships with universities and research centers

BRASKEM´s OPEN INNOVATION VIEW

PARTNERSHIP TO TURN SUGAR INTO PLASTIC

December 2009

Braskem and Novozymes established a new partnership based on Novozymes' fermentation technology and Braskem's expertise in chemical technology and thermoplastics to develop a green alternative to polypropylene derived from oil.

BRASKEM IS AWARDED BY FINEP

FINEP – "Financier of Studies and Projects"

Braskem wins FINEP 2011 Innovation Award in the Large Business category;

Braskem wins FINEP 2012 award on Sustainable Innovation cathegory for Green PE case;

http://www.braskem.com.br/site.aspx/Releases-Details-USA/Braskem-wins-FINEP-Innovation-Award-in-the-Large-Business-category/
FINEP website

POLYMERS

Innovation throughout the production chain

POLYPROPYLENE (PP) Washing Machines

Partners: Electrolux and Colormaq
Replace steel and PET in parts of the washing machine, reducing the cost and weight.

POLYPROPYLENE (PP) automotive

Partners: Lyondell-Basell Brazil
High-performance plastics in automotive items

POLYETHYLENE (PE) Water tanks

Partners: Fortlev
Replacement fiberglass.

POLYETHYLENE (PE) Bags of Grain

Partners: Pacifil
Flexible silos for grain storage, facilitating installation and reducing costs.

PVC frames

Partners: Claris, First Line, Veka and Weiku
Increased use of PVC in building.

PVC tiles

Partners: Precon Industrial
Replacement of cement and tile.

BRASKEM INNOVATION AND TECHNOLOGY

Areas of interest

- Sustainability (performance improvement, post-consuption destination)
- Polymers – new molecules (PEF, PLA, PA, PPC, PPE, others)
- Catalysis (Phthalate Free for PP and PE; ionic liquid; nanocatalysis)
- Renewable Sources for chemicals and new monomers (furans, C2, C3, C4, C5 and C6)
- GMO
- Performance Materials (Composites, thermosets, PEEK, othes)
- CO2 chemistry
- UHMWPE

Source: Braskem

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Product chain based on fossil source

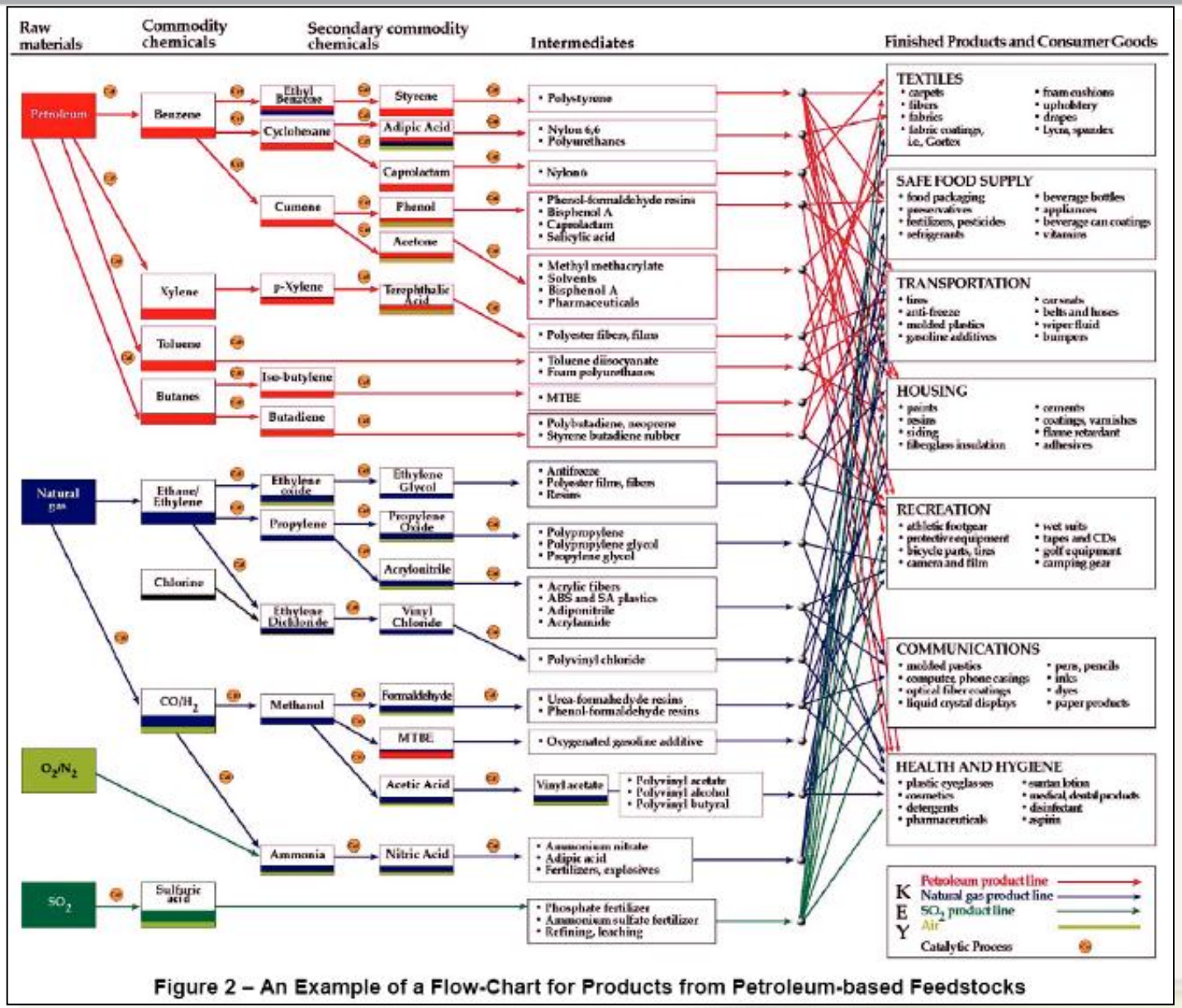


Figure 2 – An Example of a Flow-Chart for Products from Petroleum-based Feedstocks

Source: US DOE – Top Value Added Chemicals from Biomass – Volume I - 2004

Possible product chain based on renewable source

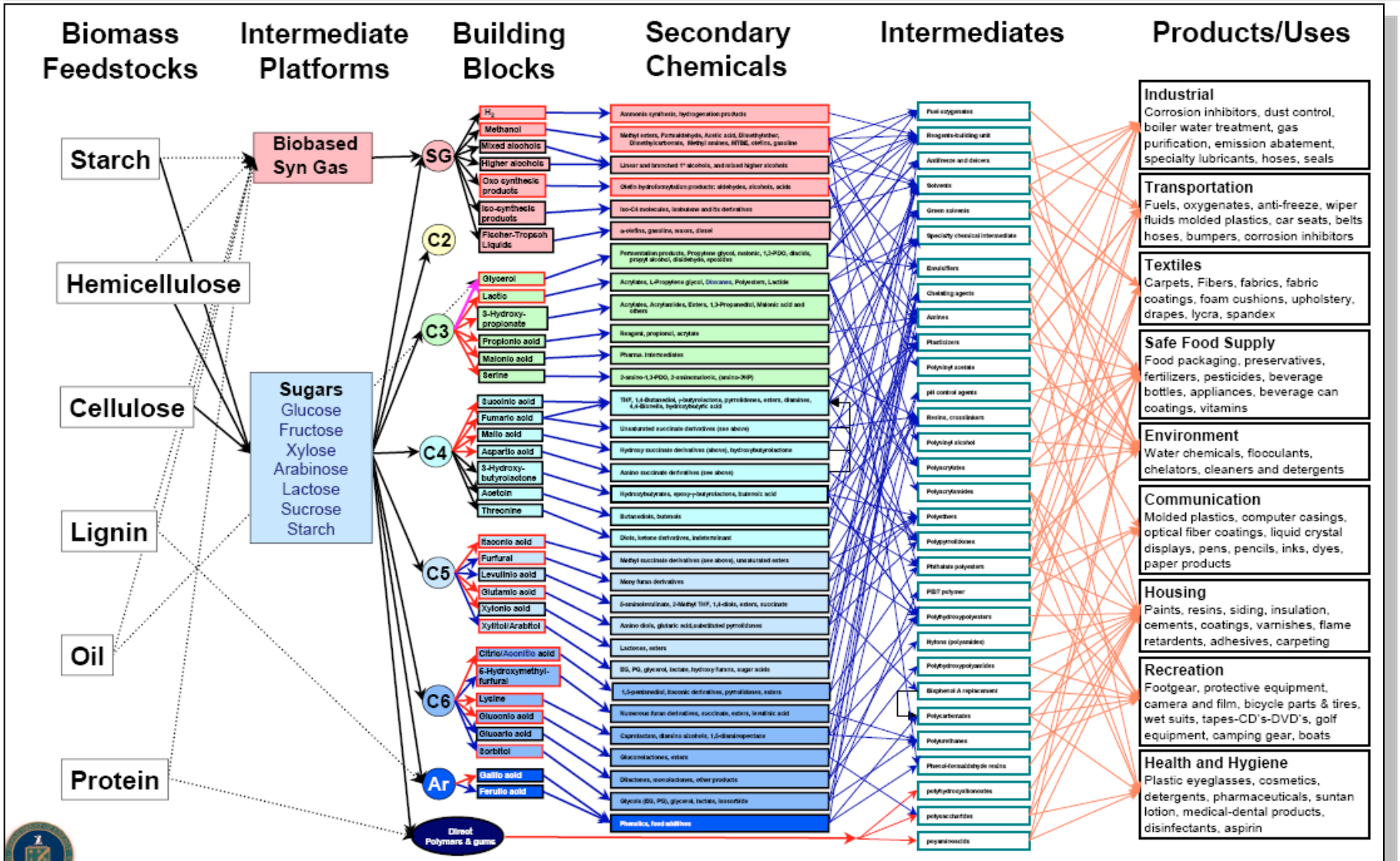
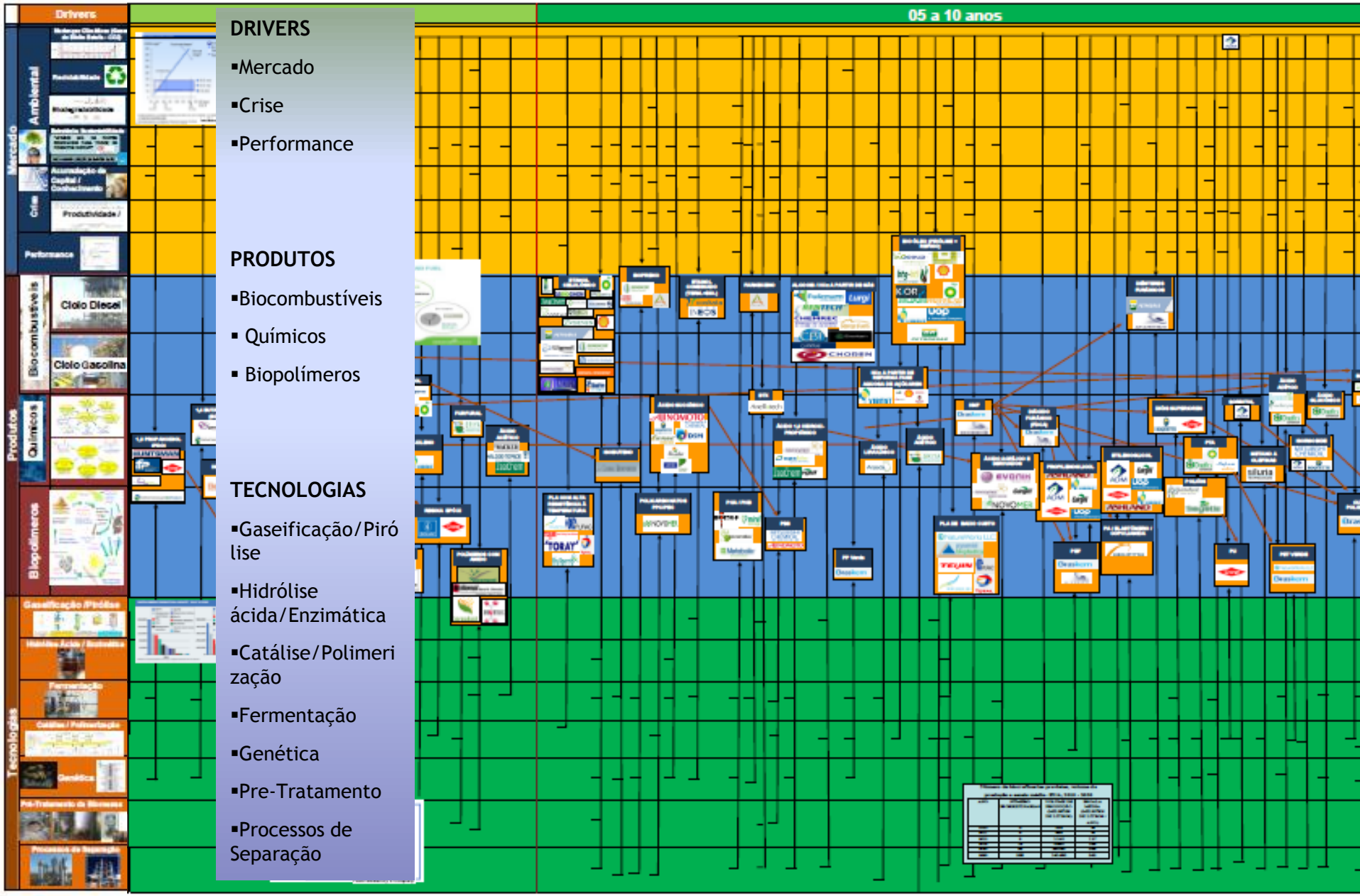


Figure 3 – Analogous Model of a Biobased Product Flow-chart for Biomass Feedstocks

Source: US DOE – Top Value Added Chemicals from Biomass – Volume I - 2004
PEP – Advanced Biorefinaries 2005
Patrick R. Gruber, Michael Kamm, Biorefineries – Industrial Processes and Products, Vol 1, cap 1

Braskem I'm green

Roadmapping for biobased chemicals and polymers



Green Plataform development

Focus will be on "familiarity"

Complexity and risk

Existing

- Chemicals we participate in today – "Drop-in" products
- Well known applications
- Well known markets and customers
- Little to no market acceptance risk

Examples of opportunities to be evaluated (not exhausted list):

Biopolymers	Green chemicals
• PE	• Isoprene
• PP	• Benzene
• PVC	• Toluene
	• Xylene
	• Butadiene
	• Butene
	• Ethylene
	• Propylene

Aggressively pursue

Adjacent

- Chemicals we do not currently participate in today, but adjacent to our core capabilities
- Well known applications
- Needs market and customer development
- Little to no market acceptance risk

Examples of opportunities to be evaluated (not exhausted list):

Biopolymers	Green chemicals
•PET	• Acrylic Acid
• PA	• Surfactants
•PC	• Solvents
•PLA	• Acetic Acid
•Starch	• Methanol
	• DMC
	• Succinic Acid
	• Butanediol
	• PTA

Pursue

New

- Chemicals we do not participate today and far from our core capabilities OR chemicals that do not exist today
- Well known applications for existing chemicals and not well defined for new chemicals
- Need market and customer development
- Little to no market acceptance risk for existing chemicals, but large risk for new chemicals

Examples of opportunities to be evaluated (not exhausted list):

Biopolymers	Green chemicals
• PHA	• FDCA
• PEF	• 1,3 HPA
	• New Solvents

Opportunistic

SOURCE: Braskem

Green Plataform development

How to choose the best opportunity?

Polymers unit decides which product should be analysed (market driven)

Possible routes
Corporate IT + Renewable Technologies

CAPEX (FEL 1), OPEX
Corporate IT + Renewable Technologies

EVTE

Market analysis & forecasting

Price
Demand and production
Competitors
Value chain, etc

(UNIB + Corporate IT + Renewable Chemicals)

BRASKEM´s OPEN INNOVATION VIEW

How could we increase our partnership?

Current...

- Current discussion of metabolic engineering projects;

- Metabolic Engineering Course (4 days in course in Brazil - Jens Nielsen; Jochen Förster; Andreas Gombert

In discussion...

... Other opportunities ?


I'm green™
Plastic
Renewable source
Carbon reduction
Braskem