A VIRGIN PS PRODUCER’S INITIATIVES TOWARDS CIRCULAR (E)PS

« Don’t ask what recycling can do for you, ask what you can do for recycling …! »

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TOTAL’s 3 main polymers: 6 million tons annual sales (ww)

- Polyethylene (PE): 76 Mt (57%), 4% Packaging, 4% Construction / Building, 24% Automotive, 29% Electrical / Electronics, 11% Others
- Polypropylene (PP): 52 Mt (41%), 5% Packaging, 9% Construction / Building, 13% Automotive, 40% Electrical / Electronics, 5% Others
- Polystyrene (PS): 11 Mt (28%), 28% Packaging, 3% Construction / Building, 40% Automotive, 29% Electrical / Electronics, 7% Others
THE EU CIRCULAR ECONOMY’S AIMS

• To develop a sustainable, low carbon, resource efficient economy

• To transform Europe’s economy and generate new and sustainable competitive advantages

To maintain value of products, materials and resources in the economy for as long as possible while minimising waste generation

JUST IMAGINE: A NEW POLYMER, DESIGNED FOR THE CIRCULAR ECONOMY…

**Required characteristics?**

- Very insensitive to multiple processing:
  - Recycling into multiple life cycles…

- Easy to apply dissolution processes:
  - Effective extraction of additives, colorants, contaminants…

- Easy depolymerising into high value monomer
  - Access to full range of applications, food contact

**Current state-of-the-art**

- PS
- PS
- PS
ONE MOLECULE, DIFFERENT FORMS
CHALLENGES FOR (E)PS

● Difficult waste collection and massification
  - Small waste fractions,
    • Separation packaging / construction
    • by split in different forms: PS – XPS – EPS
  - Small size packagings: not sorted, immediately in residu
  - EPS: logistic problem by very low density

● Food contact recycling process: most packaging applications of PS are food contact
  - Interesting synergy PS - EPS covering wider application field

● (Design for recycling)
3 UNIQUE ROLES FOR VIRGIN RESIN PRODUCERS

1. **Boost** recyclate with high performance virgin

2. Create and open up **markets** for (boosted) recyclate

3. New & enhanced **recycling** processes!
EXPLOITING UNIQUE PS RECYCLING OPTIONS

rPS can be thermally **depolymerised** into styrene monomer

CHEMICAL ROUTE « rPS depolymerisation »

Polymerisation of a recovered styrene monomer stream

Food Contact regulation is a driver for technico-economic evaluation of recycling options

rPS can be **dissolved** in various solvents

NON-CHEMICAL ROUTE « rPS dissolution »

rPS recovery technologies

Challenge = economy of scale required for high capex

Challenge = food contact acceptability by regulator
TOTAL PROJECT SPAIN:

EPS-SURE

EPS Sustainable Recycling

Life

LIFE16-ENV/ES/000258

EPS fish boxes waste

PS food contact packaging

Collector

EPS waste briquetting

Collector

Recycler EPS Pre-treatment

New product made of PS recycled
Food contact grade

EPS virgin+recycled
formulation

PS pellets

Project Coordinator: Cicloplast
Association EPS: Anape

TOTAL

COEXPNAN

Pilot plant
TOTAL PROJECTS IN BELGIUM & FRANCE: RECYCLING PS / XPS / EPS PACKAGING WASTE

Styrene Monomer → Polymerisation process → PS for food packaging

Fish boxes waste → Pre-treatment → Dissolution → 20...30%

PS packaging waste
JOINT DEVELOPMENT TOTAL -

- Innovative EPS collection technology: densification x10 by dissolution.
- Centralised recycling of PS by extraction from solvent.
- Food contact potential.
- Development objective = technology industrialisation & extension to all PS household waste.
● Val-i-Pac has existing project ‘Clean Site Circulair’ for separate collection of PE shrink film at construction sites + closed loop.
Polystyrene chemical recycling from household post-consumer waste by depolymerization to get virgin polystyrene that meets the standards for applications in contact with food.

R-PS from household post-consumer waste suitable for chemical and mechanical recycling.
4 European PS producers share their recycling technology to invest in large scale PS / EPS / XPS recycling

Parallel work ongoing on 2 complementary technology types
- Depolymerisation
- Dissolution

Feedstock: household packaging waste
- Identify PS-abundant waste streams
- Design optimum pre-treatment process
- Sourcing strategy

Focus on Germany, Italy, France, Spain, BNL
**CHALLENGE:**
WHERE IS ‘OUR’ PS PACKAGING WASTE?

- Even in mature EPR countries, only a fraction of the plastics arrive in the selective collection circuit – also PS
- Poor PS sorting efficiency for various reasons
- Seems to accumulate in front of incinerators?
OUTREACH TO THE STYRENICS VALUE CHAIN

- Styrenics – centered
- Cooperation of all actors of the PS / XPS / EPS circular value chain: making styrenics circularity ROBUST
  - Plastics Europe, EUMEPS, PSLOOP, EPRO …
  - Brand owners

- High effectiveness in terms of
  - material excellence
  - partner credibility / pledges

vs. society with circular economy ambition
• Early ‘stubborn’ initiative becomes locomotive

• Wealth of visibility

• Demonstration of the power of cooperation and ‘pro-activism’

• Potential use / extension to PS packaging waste?