Introduction PolyStyreneLoop Cooperative U.A.
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Historical analogy

- March 20th, 1602 VOC was created
- Revolutionised international trade
- No longer one party paid for sailing a ship
- Kickstarted a golden age
- Unique multi-provincial cooperation

- Nov 6th, 2017 PolyStyreneLoop was created
  - Revolutionised polymer recycling
  - No longer one company recycles waste
  - Kickstarted the golden age of polystyrene
  - Uncommon multi-national cooperation
Founding Act PolyStyreneLoop Cooperatief U.A.

The PolyStyrene value-chain partners commit to the Circular Economy; realising -technical, economical and environmental sustainable recycling of Expanded PolyStyrene and Extruded PolyStyrene.

The undersigned support the deed of incorporation and pledge to further the objectives of the PolyStyreneLoop Cooperative U.A.

Signed in Amsterdam on the 6th of November 2017.

Disclaimer: this is a symbolic document and not replacing any legal agreement
6th November

Founding Act
PolyStyreneLoop Cooperative UA

The PolyStyrene value-chain partners commit to the Circular Economy; realising technical, economic and environmental sustainable recycling of Expanded PolyStyrene and Expanded Polystyrene.

The undersigned support the proposed articles of association and pledge to further the objectives of the PolyStyreneLoop Cooperative UA.

Signed in Amsterdam on the 6th of November 2017

WWW.POLYSTYRENELOOP.EU
PolyStyreneLoop
A unique recycling solution suitable for HBCD containing polystyrene (PS) foam waste
**Objective**

“to enable the recycling of construction waste EPS and XPS and at same time destructing the HBCD, while recovering the bromine in line with the new POP regulations by demonstrating an innovative recycling process of 3000 tons recycled PS/year and organizing the EPS/XPS value chain by means of a collaborative model which will trigger further replication throughout Europe”
The Cooperative PSLoop

Context, solution and objective

Technology

Current status
The cooperative – who we are

**Coop and B.V.**
**Organisation:** founded by Synbra Technology and ICL

**Focus:** demonstrating that PS foam can contribute to a Circular Economy

**Members& Supporters:** industry representatives of the whole PS foam value chain

**Goal:** building and operation of a demoplant, further implementation of process all over Europe
The cooperative – who we are
(partners, members and supporters)

56 entities from 13 countries
Know how providers - FR producers - EPS bead & XPS producers - EPS converters - Industry sectors & associations - System applicators - Styrene recyclers - Waste collectors - Machinery suppliers
The cooperative PolyStyreneLoop

Context, solution and objective
  The PolyStyreneLoop project
  Contribution to the Circular Economy

Technology

Current status
Context

PS Foam
Flame retardant (HBCD) required for fire safety of buildings
1960’s

POP
Because of its persistency in the environment, HBCD is considered a pollutant
2016

Incineration
is the only treatment to ensure the pollutant is destructed, but is not a desired option
2017

PolyStyreneLoop
has a solution
2018
The PolyStyreneLoop project

Offers a solution...

► with an innovative process to turn PS foam waste into new high quality material, based on the CreaSolv® Technology

Supported by authorities

► included in the UNEP Basel Convention as best available technology to handle HBCD containing waste

► considered as an iconic project within the LIFE programme (the EU’s funding instrument for the environment and climate action)

*CreaSolv® is a registered trademark of CreaCycle GmbH
Contribution to Circular Economy

With a safe and environmental friendly closed-loop recycling process we can now turn PS foams into a PS recylcate of high quality, to be used as raw material for new foams.

In parallel, this process safely removes the flame retardant HBCD, which is then destroyed in a high temperature waste incinerator. The facility also ensures the safe recovery of the valuable bromine component.
Recovery of PS insulation foam waste containing HBCD in the past

Production (4-6 weeks)

Used for insulation of houses (~50 years)

Disposal in advanced solid waste incineration / hazardous waste incineration / cement kilns*

*according to Basel Convention, Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with hexabromocyclododecane, 2015
The future: closing the loop

Production (4-6 weeks)

Usage for insulation of houses (~50 years)

Polystyrene and bromine recyclate

Recovery with PolyStyreneLoop
The Cooperative PolyStyreneLoop

Context, solution and objective

Technology
- The CreaSolv® Process
- Waste collection and pre-treatment

Current status
The technology

*The CreaSolv® Solvent-based Recycling ... when other technologies fail*

- Suitable for expanded polystyrene
- Safe, specific and effective solvents
- Separation of impurities
- Free of foreign polymers
- Free of impurities
- Properties of virgin plastics

PS Foam Waste ➔ Dissolution ➔ Purification ➔ Precipitation ➔ PS Drying ➔ PS Product

Inert Impurities

Solvent Recovery

Impurities including HBCD ➔ HBCD destruction + Bromine Recovery

CreaSolv is a registered trademark of CreaCycle GmbH

WWW.POLYSTYRENELOOP.EU
The technology

The **CreaSolv® Process**

- Technical feasibility approved by Fraunhofer IVV
- Plant concept developed by Fraunhofer IVV and EPC Engineering & Technologies
Collection of PS waste streams

**Phase 1**
- Identify relevant waste streams (specification)
- Establish pre-treatment facility and organize transport to demoplant in Terneuzen (transport logistic enterprises and polystyrene suppliers)

**Phase 2**
- Test feasibility of decentralised pre-treatment and PSLoop plants in DE
- Organize transport of HBCD slurry to Terneuzen NL

- Assure legal compliance for transport & pre-treatment
- Monitor quality of input streams
Collection and Pre-treatment (300kg/m³)

- Collection of PS foam waste containing HBCD (construction & packaging sector)
- Foam waste collection point: separation of EPS and remaining components
  - e.g. metal
  - e.g. plastics
- Unusable components like coat and impurities
- Compaction
- Shredding
- CreaSolv® Process
- Incineration/Landfill
- Landfill
- Recovery
- Incineration
- Landfill

Specification of basic material at the construction or collection side influences costs for collection & pre-treatment
Pre-treatment
Separation of polystyrene and remaining components

Example: EPS Building & Construction waste from ETICS

Prior size reduction by rehandling excavator → Impact crashing → Sieving → Separation by magnetic drum → Air classifier → Comp Action

Output stream: EPS with 1-10% impurity in CreaSolv

Output stream: unusable components like plaster and adhesives

Output stream: metals with impurities

Source: figure based on treatment scenario for EPS waste from ETICS, FH Münster 2017
Current status

- establishment PolyStyreneLoop Coop U.A. and B.V.: a unique way of organizing the value chain to cooperate on sustainability
- raising € 2,1 million from the 54 members and supporters plus approval loan from the RABO bank (€ 4,5 million)

- Life Grant received from the EU commission € 2,7 million for the period 2017-2021
- Presentation of the PolyStyreneLoop project to the European Commission with the feedback: a „bulls eye“ project!
Milestones

- Presenting and positioning PolyStyreneLoop at national and international level including the EU commission as part of the Circular Economy
- Inauguration and open general assembly Nov. 2017

- Preparing - collection of PS foam
- Permit / engineering and building of demo plant
- Communications and workshops / conferences

Start demo plant

2017 2018 Ultimo 2018
Conclusions / key features

- A tangible way to demonstrate an effective contribution to a Circular Economy
- A unique way of organising the value chain out of many small fishes becoming one big fish
- Demonstrates the PS value chain as a leading initiative that is positively uncommon in the polymer industry
- A long term commitment and runs for 100 years
- Roll out is foreseen to locations all over Europe once more PS foam waste becomes available