

100% recycling of Polystyrene insulation soon to be demonstrated - wide spread industry support for "PolyStyrene Loop".

Late 2015 a representative group from various sectors of the European Expanded PolyStyrene (EPS) industry and authorities was hosted by ICL-IP in Terneuzen, and it was decided to take a proactive stance for the entire value chain by supporting the creation of a demo plant for recycling polystyrene (PS) building and construction waste, using the "CreaSolv® process" concept. This to be ready for closing the loop and to offer an industry concept that can deal with the growing volumes of construction waste, that will finally originate from the demolition of buildings in the coming decades. The purpose of the foundation is to prepare the ground work for a demo plant. The demo plant will be operated by a separately funded entity.

The original core team that constituted representatives from Sunpor, Unipol, Synbra, ICL-IP and EUMEPS, has now been extended into a project management core team with representatives from the entire value chain. It has received support from the Flame retardant producers (EFRA), the EPS bead producers (Plastics Europe-EPS/MC), XPS board producers (EXIBA), EPS converters (IVH, Stybenex and EUMEPS) and system applicators (Fachverband WDVS and EAE). Also EPS recyclers (KRAS, ECOFILL, De Vries) are now actively involved. More companies are invited to participate.

The proprietary solvent-based polymer recycling process, known as the "CreaSolv® Process", dissolves PS coming from EPS and XPS waste while maintaining the polymer chain. It offers a closed loop recycling for polystyrene foams within the newly emerging sustainable circular economy. It was agreed to pursue the "CreaSolv® technique" specialized and advanced by Fraunhofer IVV to recycle End of Life (EoL) PS foam into Polystyrene. The demo plant will only recycle PS foam from building and construction waste from old buildings into Polystyrene. At the same time a full bromine recovery will be realised in the existing Bromine recovery installation (BRU) at ICL-IP in Terneuzen, where the bromine that originated from the now restricted Persistent Organic Pollutant (POP) flame retardants HBCDD, will be re-used to make the new polymeric flame retardant.

At the IVH Environment Committee in Heidelberg at March 10th, Roman Eberstaller of Sunpor Kunststoff GmbH, showed the result of the recent pilot carried out by Fraunhofer IVV using the CreaSolv® process, where 100% EPS construction waste with up to 1,5 wt% HBCDD was processed into solid polystyrene bead (with all HBCDD removed below 100 ppm), which at its turn was converted by Sunpor into new prime Lambdapor EPS, now with the polymeric FR agent added as flame retardant, and subsequently moulded into EPS, meeting all specifications for application in e.g. ETICS applications.

It was demonstrated that the removal efficiency of HBCDD in the CreaSolv® process was higher than 99,7%. In the BRU of ICL IP in Terneuzen a destruction efficiency higher than 99,999% for the HBCDD, is realised, bringing the outcome of the overall destruction efficiency, totally in line with the strict requirements of the BASEL-POP guidelines. Additionally a new PS recycle containing residual HBCDD below 100 ppm is obtained.

As described, the CreaSolv® process involves a chain of steps. The first one is the dissolution of the polymer followed by the removal of the additives incl. HBCDD/wastes. This initial step should be characterised as D9 (Physicochemical treatment), as provided for Annex IV A of the Basel Convention. After this first step, there are two material streams: the bromine containing stream and the polystyrene stream. Each stream undergoes a second treatment. The bromine containing stream is fed to the hazardous waste incinerator, leading to destruction of HBCDD followed by recovery of bromine. These steps should be classified as D10 (Incineration on land) followed by R5 (Reclamation of other inorganic materials). The polystyrene stream is recycled in the production of new PS foam. This step would classify as R3 (Recycling of organic substances not used as solvents). It must be emphasised here that polystyrene and elemental bromine are recovered from the waste EPS stream, whereas HBCDD is not recycled but irreversibly transformed to the levels noted above.

In June in Nairobi the OEWG will decide on the work on the General Technical Guidelines on the Environmentally Sound Management of POP containing waste, needed to prepare this guideline for adoption at the next Conference of the Parties, May 2017 in Geneva. The incorporation of the D9-D10/R5 treatment in the main body text of the General Guidelines will allow the factory in Terneuzen to operate within an agreed legal framework that is essential to secure the full scale funding.

Basic engineering for the demo plant, that is earmarked to be built at the premises of ICL IP in Terneuzen, the Netherlands, now been commissioned and will be carried out by engineering company EPC Engineering Consulting GmbH in Alzenau, Germany and the proprietary solvents will be supplied by CreaCycle® GmbH in Grevenbroich, Germany under license from Fraunhofer- IVV.

The successful and well established conventional recycling of packaging EPS waste is not impacted as this does not contain flame retardants. Also recycling of left overs and cut offs from the building site of new EPS which all contain EPS with the new polymeric flame retardant, is not affected.

This process can be seen as the most sustainable form of raw material feedstock recycling contributing and stimulating to a more circular economy. It is targeted to roll out this recycling concept to other EU member states, whenever the EoL EPS is coming available, fully embracing the circular economy.

There are five different working groups active to build the information data base in order to progress this project further. These working groups cover: Waste handling legal frame work, Business case including logistic cost, Basic engineering work for the CreaSolv® based demo plant, Funding and advocacy.

Having secured wide spread industry support, the objective is to have the “CreaSolv® technique” incorporated in the Basel Convention Technical Guidelines for HBCDD containing polystyrene foam as an additional End of Life option besides incineration, and to have a demo plant available by 2018.



Caption: Roman Eberstaller and Jan Noordegraaf present the current status of the CreaSolv® project to the IVH Environment Committee. From left to right: Matthias Hofbauer (WKI Isoliertechnik GmbH), Hartmut Schönell (IVH), Jan Noordegraaf (Synbra Technology bv) and Roman Eberstaller (Sunpor Kunststoff GmbH).

About :

The **Industrieverband Hartschaum e.V.** (IVH) in Heidelberg is the umbrella association of manufacturers of EPS foam/Styropor insulation products in Germany. Founded in November 1973, its 15 full members today represent around 80 per cent of the German EPS market for the construction sector. Its responsibilities primarily encompass the areas of “Research and Application Systems”, “Quality Assurance”, “Environmental Protection and Sustainability” as well as close collaboration with partners in the market.

Stybenex is the Dutch branch association of manufacturers of airpop (EPS) products. Stybenex represents the collective interests of its members. The main task of Stybenex is to encourage optimum use of airpop (EPS) for insulation as well as packaging Stybenex provides information and initiates and participates in studies and research Stybenex also wants to be a leading consulting partner with government agencies and organizations.

Fraunhofer IVV: Fraunhofer IVV is one out of 66 institutes and research units of the Fraunhofer Gesellschaft e.V. and focusses on process engineering and packaging. In co-operation with the CreaCycle GmbH, Grevenbroich, Fraunhofer IVV has developed a solvent based plastic recycling process (CreaSolv® process, CreaSolv® is a registered trademark of CreaCycle GmbH). It is able to treat mixed and contaminated plastic waste and - amongst other features - allows separating legacy additives from target polymers.

Sunpor Kunststoff GmbH: is the third-largest producer of EPS-raw material in Europe, with two production plants in St. Pölten/Austria and an annual production capacity of around 230,000 tonnes of EPS polymer granulate. 90 % of production goes to export. Sunpor’s main customers are in construction (insulation) and packaging industry. The company is 100% owned by the Norwegian O.N. Sunde AS group.

Unipol Holland B.V. is a leading manufacturer of EPS-raw material and produces a selected range of EPS beads in Oss (Netherlands). The products are suitable for numerous applications ranging from insulation, construction to packaging. Unipol supplies to customers throughout the whole of Europe.

ICL IP is a manufacturer of flame retardant products to enhance fire safety and to protect life and property. It is the industrial chemicals segment of Israel Chemicals Limited (ICL) and is the world's largest producer of elemental bromine, and a leader in the production, marketing of bromine and bromine compounds, supplying over 33% of global demand. It also has a leading position in the manufacturing of phosphorus based compounds for fire safety.

EUMEPS is the European association of the EPS industry. EUMEPS membership represents over 90% of the European manufacturing industry. The common interest between members is a belief that EPS is the most cost effective packaging and insulation material. For thermal insulation in construction, EPS offers long-term properties such as high insulation value, high compressive strength and moisture resistance. EPS is lightweight, versatile, easy and completely safe to work with, making it the ideal material in a wide range of applications. EPS has a key role in ensuring safe, comfortable and energy efficient buildings, whilst also contributing strongly to the mitigation of greenhouse gas emission. EPS comprises about 35 per cent of the total thermal insulation market in Europe, with over 55,000 people employed in the European EPS industry. The role of EUMEPS is to ensure that the advantages of EPS are brought to a larger audience. This is achieved by information sharing to enable an informed dialogue with stakeholders on a national and European level.

Synbra Technology bv: is the in-house polymerisation and R&D facility 'Technology & Innovation' and the centre of excellence in materials and product development in the Synbra Group in Etten-Leur, The Netherlands. Synbra has a leading position in Europe regarding Expandable Polystyrene (EPS) for Sustainable Insulation Systems and Industrial Products & Solutions for a wide diversity of markets. Synbra Holding is active in The Netherlands, Germany, Denmark and Portugal.

EAE: the European Association for External Thermal Insulation Composite Systems is the European association for ETICS, formed by 12 national ETICS associations, 6 important European components' associations and numerous supporting members, which include manufacturers as well as research and test institutes. The EAE represents about 80% of Europe's revenue from ETICS.

Fachverband WDVS: German ETICS association is one of the largest ETICS associations in Europe, founded in 1975. Fachverband WDVS represents 18 leading system holders and 42 leading suppliers of system components and accessories.

For more information please contact:

Ulrich Meier, IVH, phone: +49(0)6221 776071 email: U.Meier@ivh.de

Jan Noordegraaf, Synbra technology bv: phone: +31 168 373 373 email: j.noordegraaf@synbra-tech.nl

Edmar Meuwissen, EUMEPS, phone: +31 6 81431728 email: e.meuwissen@eumeeps.org

Roman Eberstaller, Sunpor Kunststoff GmbH, phone +43 (0)664/2340744 email: eberstaller@sunpor.at

Lein Tange, ICL- IP, phone: +31651326084, email: lein.tange@icl-group.com

[Ralf Pasker, Fachverband WDVS/EAE, phone +49 7221 3009890, info@fachverband-wdvs.de or info@ea-etics.com](mailto:Ralf.Pasker@fachverband-wdvs.de)