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Position Paper

The PSLoop (PolyStyrene Loop) Project and the revision of the threshold value for unintentional trace contaminants (UTCs) for Hexabromocyclododecane (HBCD) in Annex I to the EU POPs Regulation

Key messages

- Reducing the current 100 mg/kg UTC value for HBCD will bring no additional environmental benefits[1].
- Lowering the current UTC could hamper the European Commission and industry's pledges to a circular economy, while no available information shows there is harm from the current level.
- A validated test method to demonstrate compliance at the 100 mg/kg level is still being developed. This means that waste handlers will not be able to recycle the material and have no choice but to send the PS foam to landfill or incineration creating a huge amount of CO_2 emissions.
- The PSLoop (PolyStyrene Loop) is a pioneering European material treatment and recovery plant funded under the EU LIFE program. An abrupt reduction in the UTC level will effectively mean a cessation of PSLoop operations; thus preventing the promotion of good practices for PS foams collection and the enablement of a viable value chain for PS foam recycling.

Introduction

This paper sets out the views of relevant industry sectors[2] and the PSLoop consortium on the revision of the threshold value for unintentional trace contaminants (UTCs) for Hexabromocyclododecane (HBCD) in Annex I to the EU POPs Regulation[3]. In particular, the paper outlines the case for a pragmatic approach to the revision of the UTC avoiding a sudden and uncontrolled reduction from the current threshold value. This is to ensure that the innovative, EU LIFE funded, PSLoop project addressing the treatment of building wastes containing HBCD is not jeopardised.

About HBCD

HBCD, flame retardant additive intended to improve the flammability performance of plastic polymers enabled them to meet fire safety standards related to their use in different applications. The main use of HBCD in the EU, accounting for about 90%, was in Polystyrene (PS) foam used in the building and construction insulation.

HBCD was listed in 2013 under Annex A of the Stockholm Convention, where parties must take measures to eliminate their production and use (from 2014) with a possibility for time limited exemption for use in insulation in buildings. In the EU, HBCD was used in EPS and XPS in construction until 2015 (XPS) and 2017 (EPS) in typical functional concentrations of 1.5% and 0.7%, respectively. Since then, there is no more production, trade or use

[1]Life Cycle Assessment of ETICS End of Life Treatment of Expandable Polystyrene, https://polystyreneloop.eu/wp-content/uploads/2020/04/Life-Cycle-Assessment-of-ETICS-PSLoop_final-results.pdf

[2]BSEF: International Bromine Council (BSEF) which is an international bromine production organisation promoting the benefits of bromine and bromine technologies for society and economy.
HBCD Industry Group: gathers former producers of HBCD (BSEF) and producers of polystyrene insulation foam (PlasticsEurope and Exiba).
PSLoop: a pioneering European material treatment and recovery plant funded under the EU LIFE program.
Plastics Recyclers Europe (PRE): an organization representing the voice of the European plastics recyclers.
EUMEPS: the association for European Manufacturers of Expanded Polystyrene (EUMEPS) is the voice of the Expanded Polystyrene (EPS) industry.

[3]Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants

of HBCD in the EU. Unintentional traces of the substance below 100 mg/kg are allowed under Annex I of the POPs Regulation.

The EU POPs Regulation and HBCD

Annex 1 of the EU POP Regulation, EU/ 2019/1021, substances listed under the Stockholm Convention, currently formulates the UTC value for HBCD as: "equal to or below 100 mg/kg (0,01 % by weight) where it is present in substances, mixtures, articles or as constituents of the flame-retarded articles, subject to review by the Commission by 22 March 2019".

About PSLoop

PSLoop is a pioneering European material treatment and recovery plant funded under the EU LIFE program. The treatment process, which is a recognised pre-treatment step for the environmental sound management of POPs waste under the Basel Convention[4], has been designed to treat in an environmentally sound manner end of life PS foams containing HBCD. The process has a number of steps designed to separate the HBCD POP from the parent resin (polystyrene). The HBCD residue subsequently is destroyed, thus complying with the Basel Convention and the EU POP Regulation. The recovered bromine can then be used in the production of other molecules used for other applications in addition to the polymeric flame retardant used to replace HBCD in PS foams (i.e. a circular process).

The resulting recovered polystyrene resin is designed to have any residual HBCD at levels at or below the current UTC threshold for HBCD set out in the EU POP regulation. The technology is pioneering because it is the first solvent-based purification process capable of removing a legacy substance from the product material. It is the first plant able to apply this innovative technology. The path it takes will greatly influence the preparedness to invest in this kind of technology in the future. The involvement of the European Union in its co-financing[5] is also testament to the importance of the project for the EU in its engagement on the management and effective treatment of wastes containing legacy POP substances.

The demonstration project is operational since September 2021. It is envisaged that in its third year of operation the plant will be able to process 3,000 t/year of PS materials. While for the time being only a small part of PS foam insulation waste of the total volume available in Europe is being processed, it is a potential alternative for treating and recycling the increasing amounts of this waste that will continue to be generated well up to the year 2070 (peaking in the 2050s).

The project will run until 2023, at a time when there will be sufficient technical, economic and operational results available to determine the overall efficiency of the process in meeting the current UTC for HBCD whilst being able to envisage reducing the residual HBCD further.

Implications of reduction of the HBCD UTC below 100 mg/kg for the PSLoop Project and the treatment of demolition waste in the EU

A sudden reduction in the UTC level lower than the current 100 mg/kg will effectively mean a cessation of operations at the PSLoop project facility. The reason is that no viable process methodology exists today to ensure that a UTC for HBCD below 100 mg/kg will effectively be met. Additionally, there is no validated analytical methodology today to screen for or to measure HBCD at a < 100 mg/kg level for quality and in-process control needs in (waste) PS matrices (foams and solids).

Lowering the UTC to below 100 mg/kg will undermine the objectives and jeopardize the deliverables of the PSLoop project agreed with the European Commission which include:

[4]Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel, 5 May 1992, No. 28911
[5]LIFE-PSLOOP - LIFE16 ENV/NL/000271

- Establishment of a waste collection system able to supply the required PS foam waste quantities to the demonstration plant;
- Production of 3000 tonnes/year of PS and > 15 tonnes/year of bromine;
- Avoidance of the emission of 1500 tonnes/year of carbon dioxide, 25 tonnes/year of aromatic hydrocarbons and 10 tonnes/year of aliphatic hydrocarbons;
- Reduction by 12 000 tonnes/year of greenhouse gas emissions (78% compared to the baseline scenario; and
- Saving of 150 000 GJ of energy.

Should the PSLoop plant have to shut down due to the inability to reach a lower UTC, other ambitious plastics waste treatment initiatives (some funded under the EU Horizon Programme) based on the same technology being trialed by the PSLoop project will not come to fruition, thus limiting the ability of the EU to meet its Circular Economy and Plastics Strategy goals. Plastics which are unable to contribute to a circular economy would likely face phase-out by EU. The phase out of PS (as the most efficient insulation material) would have a very negative impact on the EU commitment to climate neutrality and ability to improve energy efficiency.

This would also prevent any other recycling technology of PS foam waste, including mechanical recycling of EPS packaging waste, as a contamination with HBCD traces, due to imperfect separation and sorting processes, cannot always be avoided.

Waste sorting facilities often use bromine measurements by means of XRF (X-ray fluorescence spectroscopy) to identify and separate plastic waste with bromine-containing flame retardants. In the case of EPS, a distinction is made between waste containing bromine (HBCD in Building & Construction) and bromine-free plastic waste (EPS packaging). However, despite the effort, they cannot fully guarantee that a recyclable waste mixture will always be supplied, which ensures compliance with a reduced UTC. This would severely restrict the recycling of PS foams in general and that of packaging in particular, if not even make it impossible.

The only alternative to PSLoop for PS foam waste will be increased diversion of the waste stream from demolition waste towards incineration with the attendant increase in CO_2 and GHG emissions, contrary to EU climate goals.

Suggested way forward
Apply "Better regulation principles" and maintain the current UTC at 100 mg/kg for a period of three years to be followed by a scientific and technical assessment of the threshold value in 2024, including a full stakeholder consultation**.** The Commission may take the results obtained from the operation of the PSLoop Plant into account in the establishment of any new UTC proposal.

If the UTC remains at the present level, it will allow the PSLoop demonstration plant to move forward with innovative technology that recovers PS and destroys a legacy additive POP in an economical sound way. **This creates a solid basis of technical information on the performance of the process in a real-world situation**. More importantly, it creates public awareness and attracts investors to move this technology forward for other POPs in different polymer materials. This is a prime reason why the European Commission is co-financing the project.

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