Knowledge Hub

OCEAN WISE — Reducing EPS marine litter in the North East Atlantic

Expanded and Extruded Polystyrene Current Solutions to Recycle and Repurpose

Report | Summary

Executive Summary

Expanded and Extruded Polystyrene (EPS and XPS) are single -component materials which are already 100% recyclable. To reduce the frequency of these item appearing in marine litter, the focus is on:

A) Eliminating their use where there is a viable alternative, for example, a deposit scheme for a reusable container which can be returned.

B) Improving the existing collection and recycling infrastructure, leading to more of these materials being captured, compacted, and recycled, so that they are less likely to enter the marine environment.

In 2016, the European Association of Plastics stated[1] that they estimate consumption of EPS in Europe to be 335,000 tonnes in 2015, of which 290,000 tonnes were produced in Europe, with a further 45,000 tonnes imported from outside the EU. European Association of Plastics Recyclers (EPRO) estimated that 27 % (90,450 tonnes) was recycled, 40 % (134,000 tonnes) was recovered, and 33 % (110,550 tonnes) was sent to landfill.

Objectives:

- To develop a state of the art catalogue that provides information on the current solutions to recycle, reuse, and repurpose EPS and XPS.
- To support the completion of circularity assessments for EPS and XPS products.

1. European Association of Plastics Recyclers, available at: http://www.epro-plasticsrecycling.org/_assets/downloads/epro_seminar_on_eps_recycling_28_04_2016_presentations_420.pdf Accessed several times 2018,2019

Find the full report and database:

www.oceanwise-project.eu

Figure 1: Map of countries participating in the OceanWise project

The OceanWise project covers the Atlantic area which is shown in blue above, but it is important to consider the movement of EPS and XPS for this action, therefore other EU countries were included .

Interreg Atlantic Area — European Regional Development Fund — EUROPEAN UNION

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Current Recycling:

EPS can be recycled either by:

1) Reground and added back into the manufacturing process to produce EPS.

2) Compacted and then subjected to a chemical process making the resulting material suitable for production into Polystyrene items.

XPS can also be recycled using compacting and recycling machines for post-industrial XPS.

In 2017, a report[2] by Wageningen University suggests that EPS makes up 1 % of the overall waste stream in the Netherlands. In 2019, EPS is reported to account for 1 % of all household waste in Norway[3].

In the 2018 Household Waste Characterisation Campaign Report[4], of all materials incorrectly placed in the mixed recycling bin, 29 % comprised of packaging, of which EPS accounted for 2.3 % of this figure. This equates to less than 1 % of the overall waste that was incorrectly disposed of.

Research indicated that the primary XPS reuse and recycling is undertaken in-house by XPS manufacturers, or XPS production waste and material received from customer take-back schemes. There were no specific XPS recycling companies found in any of the focus countries (Belgium, Denmark, France, Germany, Iceland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom (UK)).

There are a number of case studies of successful EPS collection and recycling programmes and systems in place. These studies demonstrate that is possible to arrange EPS recycling systems that can cover costs and generate a profit.

Knowledge Gaps

- There is no data specifically available on XPS recycling.
- EPS recycling rates are unlikely to include all of the in-house recycling activities undertaken by manufactures.
- EPS and XPS Production estimate data is only available for five of the focus countries.
- The general public are mainly unaware of the difference between EPS and XPS and are unable to make a destination between the two.

A French recycling company[5] states that 3 million cubic metres of EPS are landfilled each year, which equates to a very large volume of recyclable material not captured. A Plastics*Europe* Conversion 2018 report for (European Manufactures of Expanded Polystyrene) EUMEPS estimated that 392,000 tonnes of post-consumer EPS waste from all applications was generated

2. M.T. Brouwer et al. Recyclebaarheid van verpakkingen op de Nederlanse markt. Report 1782. Available at: https://www.kidv.nl/7717/recyclebaarheid-van-verpakkingen-op-de-nederlandse-markt.pdf?ch=DEF Accessed 17 April 2019

3. Deloitte "Circular Plastic Packaging in Norway", published April 2019. Available from: The Norwegian Packaging Federation https://www.emballasjeforeningen.no/

4. http://www.valtri.fr/collecte-dechet/dechets-polystyrene/ Accessed 02 July 2019

5. RPS, Household Waste Characterisation Campaign, Final Report, November 2018. Available at http://www.epa.ie/pubs/reports/waste/wastecharacterisation/Household_Surveys_Final_Report1.pdf Accessed October 2019

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EPS RECYCLERS Database

A comprehensive database has been completed of EPS recycling operations in the focus countries. Completing the EPS RECYCLERS database was challenging, the different names used locally for the products made it difficult to find companies that compact/recycle EPS/XPS. A total of 154 EPS recycling companies were found across 14 focus countries.

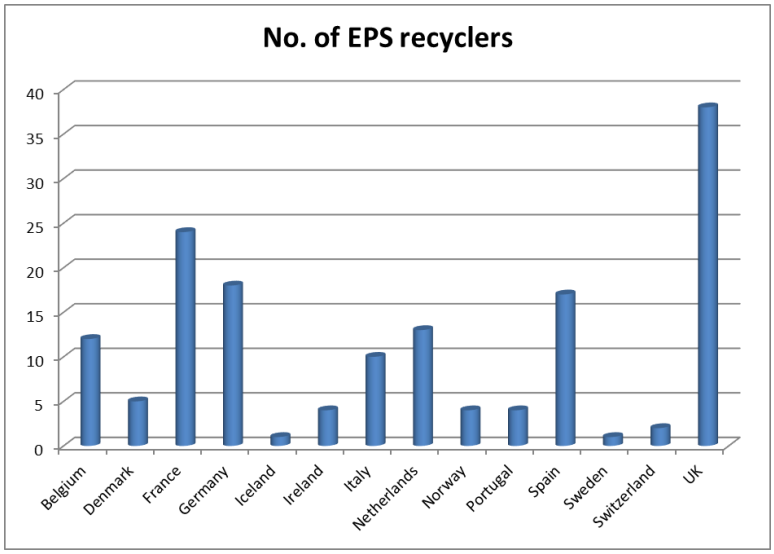

Figure 2: Number of EPS Recycling companies

Operation Clean Sweep

A scheme designed for those in the global plastics industry and operates on a voluntary basis. Its main objective is zero plastic pellet loss throughout the manufacturing and distribution processes[6].

The Association for European Manufactures of Expanded Polystyrene (EUMEPS) has submitted a Voluntary Pledge[7] to the EU Plastics Pact to reach recycling targets of EPS by 2025.

- EPS fish boxes—50 %
- EPS protective packaging—50 %
- Building deconstruction—27 %
- New build and renovation—80 %
- Civil engineering and new build and deconstruction—90 %

Recycled Product Demand

It is estimated that only 6 % of recycled material replaced virgin demand in a 2019 publication[8].

The Polymer Comply Europe Report[9] published findings on a survey on the use of Recycled plastics Materials (rPM) by plastics converters across Europe. They reported that 53 % of responses indicated that companies are purchasing compounds made using rPM.

The main reasons for not using rPM were cited as supply issues and restrictions on use.

The use of recycled EPS rather than virgin EPS can result in significant cost savings.

6.Operation Clean Sweep, W: https://www.opcleansweep.org/ http://www.opcleansweep.eu/ Accessed several times 2018, 2019

7. Available at: https://eumeps.org/news/eumeps-submitted-voluntary-pledge Accessed several times 2019

8. EEA Report No 2/2019 "Preventing Plastic Waste in Europe", available at: https://www.eea.europa.eu/publications/preventing-plastic-waste-in-europe Accessed July 2019

9. Polymer Comply Europe / EuPC, The Usage of Recycled Plastics Materials by Plastics Converters in Europe, A Qualitative European Industry Survey, Second Edition 2019. Downloaded from: https://www.polymercomplyeurope.eu/pce-services/eupc-surveys-use-rpm-plastics-converters

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Recycling and Repurposing Issues

HBCDD

The presence of HBCDD (hexabromocyclododecane) has been mentioned as the reason why some manufactures will only take back their own products for recycling, to be sure recyclate is free from HBCDD. Regulation[10] enforcing a ban on HBCDD was introduced in 2016, therefore, some products produced before this date still contain HBCDD. As all new and recycled products must contain a concentration of 100 pm[11] or less, manufactures will only recycle their own items to ensure compliance.

Waste-to-Energy

There is limited enthusiasm for recycling, as many stakeholders within industry view incineration/waste-to-energy as a good end of life option for EPS and XPS, particularly those items contaminated with food.

EPS and XPS has a higher calorific value (CV)[12] than most other waste, which drives up the average operating CV of incineration plants and reduces the amount of waste a plant can burn. Therefore, incineration plants do not want large volumes of EPS/XPS.

Lack of Awareness

Lack of awareness has been identified as one of the fundamental issues preventing recycling. The majority of customers are unaware that EPS and XPS are 100% recyclable, despite efforts to inform the wider public.

Differences in Approach

- Different approaches to managing waste are adopted by industries and countries.
- Differences in recycling rates quoted in various publications and by institutions leading to conflicting data sets.

Lack of Reuse Options

Most EPS and XPS packaging is designed for single-use. There is no evidence to suggest that re-use programmes are in place, and EPS specifically lacks durability following its initial purpose.

Figure 3: EPS fish –boxes repurposed to keep salads cool in food market (Credit: Noel Hillis Photography)

There are a number of ongoing research projects focusing on EPS and XPS recycling options.

10.European Commission, Brussels C (2015) 2067 Final, "Commission Delegated Directive../../EU of 31.3.2015, amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances"

11. Giraf Results for Ministry of Infrastructure and Water Management, "HBCDD concentration is EPS/XPS products and waste streams, Inventory in the Netherlands", March 2018.

12. British Plastics Federation http://www.eps.co.uk/recycling/recycling_practicalities.html Accessed 31 July 2019

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Types of recycling

Business to business

- Large volumes of waste are available
- Easy to forecast waste volumes so companies can plan and invest in necessary infrastructure
- Waste levels are known in advance (e.g. packaging levels)
- Known contamination levels
- Businesses have to comply with EU Packaging Directives and many countries have mandatory packaging compliance schemes.

Business to consumers

- Small amount of EPS/XPS waste produced by individuals
- Post consumer EPS and particularly XPS waste is often contaminated by food which can reduce the quality of the recycled end-product.
- Lack of recycling options as EPS can breakdown during transport and contaminate other recyclables.
- Consumers can find recycling symbols confusing. The PS6 symbol can be stamped on any polystyrene prod-

Conclusions

There are many schemes and systems in place to recycle EPS and XPS, though they are mainly focused on capturing post-industrial rather than post-consumer EPS.

Across the focus countries there is the provision of collection points for householders to dispose of their waste EPS and the items collected are reprocessed, though often as fuel for Waste-to-Energy plants, rather than being recycled.

Despite ongoing research projects to make recycled EPS and XPS more appealing, EPS recycling rates in these countries remain low, with only pockets of high recovery and recycling rates.

There is potential for more efforts to be made to capture these materials for recycling, both post-industrial and particularly post-consumer.

Other key findings

It is estimated that the volume of "waste" EPS by 2025 will be 560,000 tonnes and the overall targeted or pledged recycling rate is 46%
The business to business (B2B) supply of EPS and XPS generally has better infrastructure in terms of reuse and recycling/end of life management.
Each household is likely to generate around 1kg per person of EPS/XPS waste per year[1].

[1] Figure from a presentation delivered by Svein Erik Rødvik, of Grønt Punkt Norway https://www.grontpunkt.no