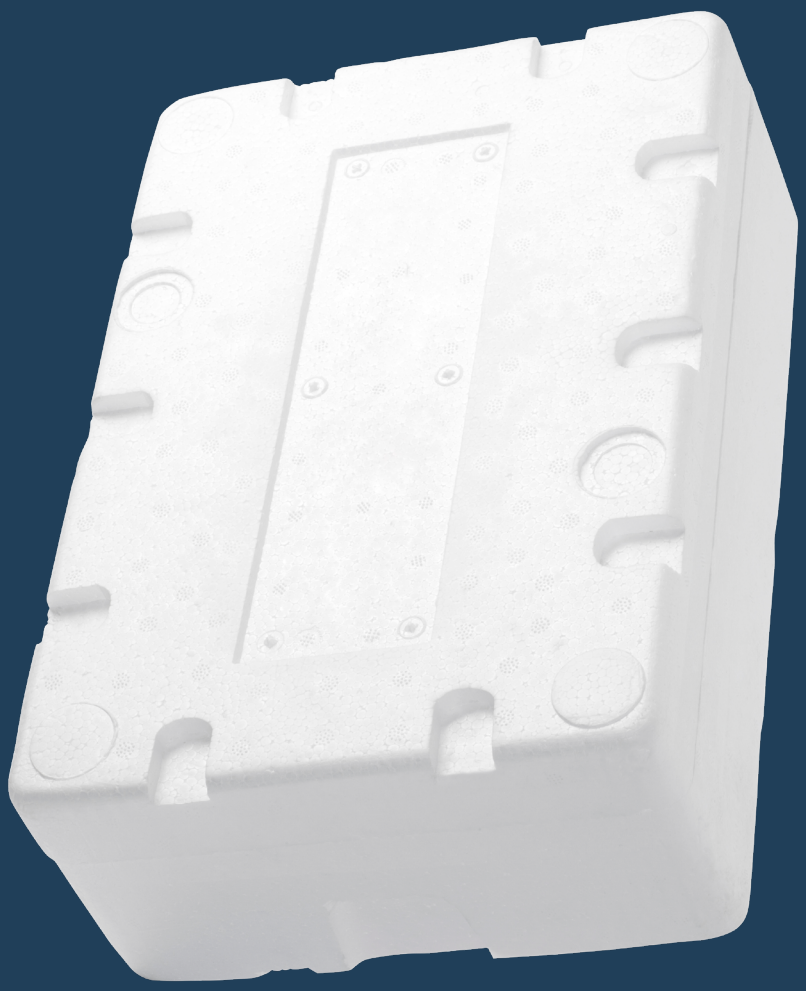
Global EPS SUSTAINABILITY Alliance

Expanded Polystyrene Environmental Profile

Policy Research & Validation
Should Start With Questions, Not Answers



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Global EPS SUSTAINABILITY Alliance

The Global EPS Sustainability Alliance (GESA) is comprised of allied associations from Europe, Asia, North America, Africa, and Australia that act as a resource for moving toward circular economy for EPS. These organizations represent the expanded polystyrene (EPS) industry for transport packaging and building insulation, sometimes referred to as foam block. Together, we want to provide information and act as a resource for member states as they chart a course to eliminate plastic pollution and to help all nations move towards achieving sustainable development goals.

The recyclability and other attributes of EPS foam block are different from polystyrene foam foodservice which can be produced using different feedstock, additives, and processes. It is also important to recognize that within the polystyrene (#6) family, there are five major subcategories, including general purpose polystyrene (GPS), high impact polystyrene (HIPS), oriented strand polystyrene (OPS), extruded polystyrene foam (XPS) and expanded polystyrene (EPS). EPS foam is used to make a multitude of products that serve a variety of functions beyond transport packaging and building insulation.

OPS

HIPS

GPPS

XPS

EPS

1.

Essential Markets & Global Distribution Network
Ensuring Safe Delivery of Vital Goods

All protective packaging, whether plastic, fiber, pulp, or aluminum, serves an essential purpose in global trade. The plastic pollution policy options under consideration will greatly impact packaging and product distribution channels. Careful consideration of nuances and subtleties will allow these objectives to be achieved while avoiding unintended outcomes.

APPLIA, the home appliance association of Europe, recently commented on a proposed EPS ban in France, stating, "The implications of this law are significant to the home appliance industry. Our sector relies heavily on expanded polystyrene (EPS) as a key component to large and other fragile household products' packaging, with a view to transporting and safely delivering such equipment to customers all across Europe. EPS buffer serves a critical role in protecting large, heavy and fragile products during production, transportation and storage, including small but fragile household appliances, as well as heating and cooling equipment." They further state the introduction of such legislation would disrupt free trade across the European continent.[1]

Packaging for cold chain distribution presents formidable challenges for product protection. With cold chain products it is vital to choose packaging that has been designed and properly tested to maintain the required temperature compliance of the shipment. EPS guarantees the quality and safety of perishable and delicate products that require strict temperature control. The pharmaceutical, medical, agricultural and fishery industries recognize EPS packaging as an instrumental component of their damage control programs.

EPS BAN REVERSED

In 2022, Australia's National Plastics Plan included a ban on EPS transport packaging. However, the Australian government quickly reversed the ban and declared EPS used to ship home appliances and other key applications that rely on EPS, including medical and agriculture products, is essential and outside of the ban's scope.

EPS cold chain packaging keeps seafood products and agricultural produce fresh for extended periods and prevents deterioration. Any break in the cold chain can increase the risk of bacteria development, disease, and decay. In particular, fishery products are a global cold chain that crosses nearly every ocean and touches almost every principal land mass. Spoilage cannot be stopped in fresh fish, but it can be controlled by maintaining the core temperature from catch until delivery, this ensures optimum safety, freshness and quality and reduces post-harvest losses. Likewise, the table grape industry specifies EPS packaging to retain peak condition and prevent cargo damage during distribution to international markets.

Patient safety is paramount to the pharmaceutical and medical industry, that is why they rely on EPS packaging to maintain product integrity and efficacy. EPS packaging is irreplaceable for a wide range of medical applications, such as organ transport and lifesaving medicine and vaccines. In 2020, the EPS industry was instrumental in producing strictly specified, extreme low temperature-controlled shipping containers that allowed for the quick and safe distribution of COVID-19 vaccines around the world.

The FedEx Shipping Guides[2], which are based on test procedure requirements, recommend EPS packaging for essential products due to its ability to reduce the weight of containers, and provide maximum inner protection during shipment. Electrolux[3] has reported EPS packaging is essential to protect their products; they found replacing EPS with paper-based materials increased environmental impacts for heavy and fragile products.

EPS transport packaging is used to ship hundreds of thousands of product units internationally, many of which are subject to existing regulations under various governing bodies covering:

- Food contact and food safety regulations,
- Transportation, including railway, trucking, sea freight and aviation,
- Pharmaceutical integrity and,
- Chemical compliance (e.g.: TSCA, REACH, RoHS)

2.

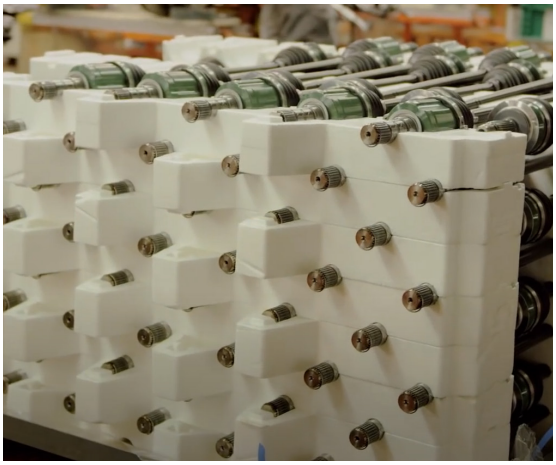
Source Reduction & Reuse
Conserving Resources

Source reduction measures are constantly being incorporated as part of the packaging design process, resulting in less material use over time. Another method of source reduction that is unique to the EPS industry is the use of regrind as recycled content feedstock. EPS can be ground into bead sized particles and reincorporated into the manufacturing process, minimizing the use of virgin feedstock. And, the development of new, recycled content resin will further reduce the use of virgin EPS resin. EPS recycled content can be achieved at levels ranging from 10-30% depending on the applications. Higher levels are achievable pending further developments with material collection and market acceptance.

Through careful design and testing by knowledgeable packaging engineers, EPS packaging is specified to meet stringent delivery requirements, particularly in remote delivery areas, by using the least amount of material necessary. This is achieved by using void space, fluted wall design, and the latest packaging science such as CAD design to improve prototyping. This ensures the packaging is right sized and there is no material waste. In addition to the safety, health and legal factors that go into packaging design, packaging engineers must also consider efficient use of materials, production capacity, energy conservation and cost reduction.

EPS source reduction opportunities continue to evolve as the industry establishes innovative ways to boost recyclability and levels of recycled content while maintaining product performance.

ICECATCH EPS REUSE SYSTEM



SUBARU EPS REUSE SHIPPING CONTAINER

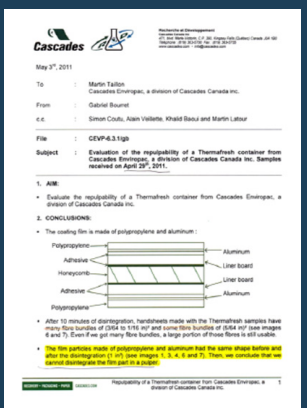
3.

EPS Recycling
In Practice & At Scale

EPS packaging is globally recycled at scale and in practice with statistical data being reported in more than 38 countries. In 2019, 66 thousand metric tons, more than 30%, of EPS was diverted from the landfill in North America. In Europe, the average recycling rate for EPS packaging is 40% while Japan, China, and South Korea have recycling rates above 50%. These statistics reflect recycling calculation rates as specified in ISO 14021-16 Environmental Labels & Declarations - Self-Declared Environmental Claims (Type II Environmental Labelling).

EPS transport packaging is considered a difficult-to-recycle material in consumer waste streams, when not separately collected due to cross contamination, disproportionate weight to volume ratios and, as it only represents less than 1% of the total solid waste stream, insufficient quantities to interest waste management companies. However, in commercial waste streams, there are much higher volumes that are concentrated in various industry sectors that justify an investment in densifying equipment. This creates a cost-efficient scenario for recycled EPS feedstocks to be transported for reprocessing.

Many global companies, such as Walmart, Whirlpool and Best Buy[4], internally recycle EPS. Recycled EPS packaging is used in numerous end-markets such as building and construction, safety helmets, furniture, packaging, and automotive applications among others. Stable end-markets and resale value, increasing investment in collection infrastructure, recycling technology innovations and collaborative community programs are driving growth in EPS recycling.


Cascades

May 3rd, 2011

To : Martin Taillon
Cascades Enviropac, a division of Cascades Canada inc.

From : Gabriel Bourret

c.c. : Simon Coutu, Alain Veillette, Khalid Baoui and Martin Latour

File : CEVP-6.3.1gb

Subject : Evaluation of the repulpability of a Thermafresh container from Cascades Enviropac, a division of Cascades Canada Inc. Samples received on April 29th, 2011.

1. AIM:

- Evaluate the repulpability of a Thermafresh container from Cascades Enviropac, a division of Cascades Canada Inc.

2. CONCLUSIONS:

- The coating film is made of polypropylene and aluminum :

Polypropylene
Adhesive
Honeycomb
Adhesive
Polypropylene
Aluminum
Liner board
Liner board
Aluminum

- After 10 minutes of disintegration, handsheets made with the Thermafresh samples have many fibre bundles of (3/64 to 1/16 in)² and some fibre bundles of (6/64 in)² (see images 6 and 7). Even if we get many fibre bundles, a large portion of those fibres is still usable.
- The film particles made of polypropylene and aluminum had the same shape before and after the disintegration (1 in²) (see images 1, 3, 4, 6 and 7). Then, we conclude that we cannot disintegrate the film part in a pulper.

Repulpability of a Thermafresh container from Cascades Enviropac, a division of Cascades Canada Inc. 1

There is an incorrect assumption that paper and cardboard (OCC) are always recyclable. For example, Cascades ThermaFresh OCC packaging's recyclability is limited to within the Cascades collection system. Further limitations are indicated in the internal Cascades report "Evaluation of the repulpability of a ThermaFresh container" (2011). This report says that even when using the Cascades repulping process , "the adhesive used to laminate the honeycomb with the liner is insoluble; and the film itself cannot be disintegrated in a pulper and can only be incorporated at a 5% rate because: it is a polymer coated material."

These results are echoed in other life cycle studies comparing cardboard versus expanded polystyrene foam packaging.

NEW MOBILE TECHNOLOGY HELPS EPS WASTE PICKERS

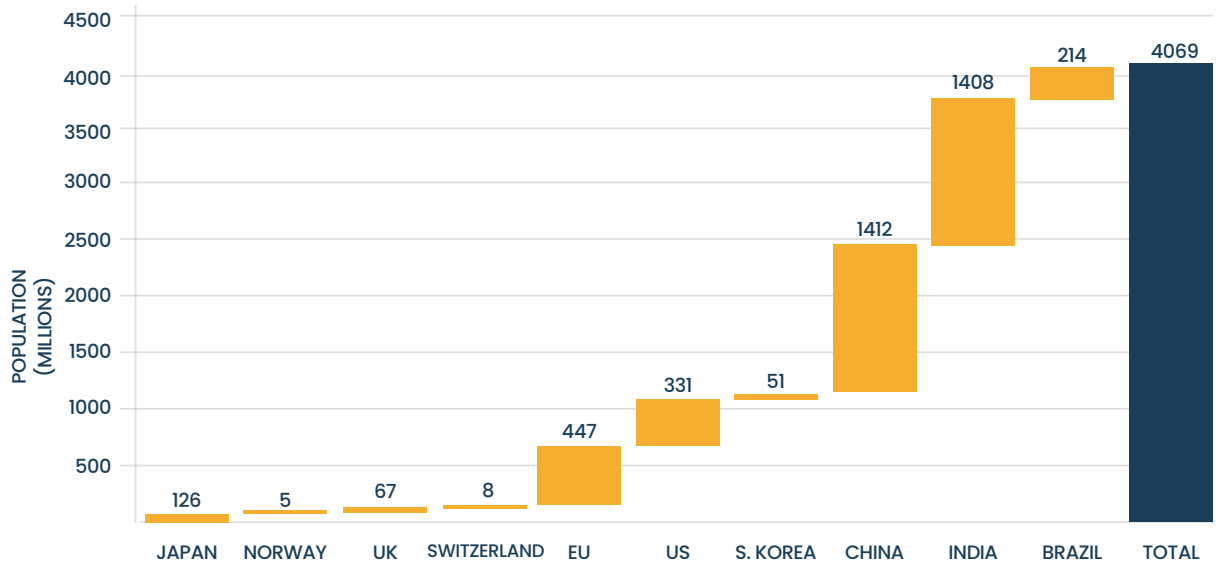
In Africa, Nigeria, Rwanda, Uganda and Zambia actively recycle EPS. Recycling companies are pioneering low-cost waste management infrastructure using mobile technology and cargo bikes and providing incentives for people to embrace recycling. Innovative applications for recycled EPS in Africa include plastic pavers, benches and desks. EPS is also used by refuse-derived fuel (RDF) manufacturing plants to generate bio-fuel. These new projects not only promote recycling and reduction, they power social change and help create employment for waste collectors.

Consumer access to EPS recycling is growing within municipal recycling facilities (MRF) in North America. Additionally, the EPS industry established over 450 drop-off locations in the US and Canada. With over 30 U.S. locations using FoamCycle's turn-key recycling solution, more than 12 million residents have access to EPS recycling.[5] Consumer collection points are available across the majority of European countries.

The Indian Centre for Plastics in the Environment (ICPE) established a number of community programs to recycle EPS. Beginning in 2019, ICPE identified recyclers and worked with Indian appliance retailers to collaborate on an EPS take back collection program. EPS recycling operations began across five different metro cities in India with local municipalities also collecting EPS for recycling. In 2022, a mobile EPS compacter was developed to expand the operation process across the southern part of India. The program recycles approximately 1,000,000 kg of EPS per month. It has fostered behavioral change among citizens regarding proper disposal of plastic waste and raised awareness about the importance of recycling, particularly among children – a Plastics Recycling Premier League cricket tournament for children under 14 was held to promote recycling and inspire young individuals to become advocates for a greener future.

As part of the Australian EPS industry product stewardship commitments, the industry leveraged the infrastructure from existing recycling practices and provided a waste recovery service to local communities. By establishing collection facilities at EPS manufacturing points, local councils and other businesses throughout Australia, EPS is collected and reused to create products for sustainable building applications. This closed-loop system in reuse and recovery diverts EPS waste from landfills in the most efficient way.

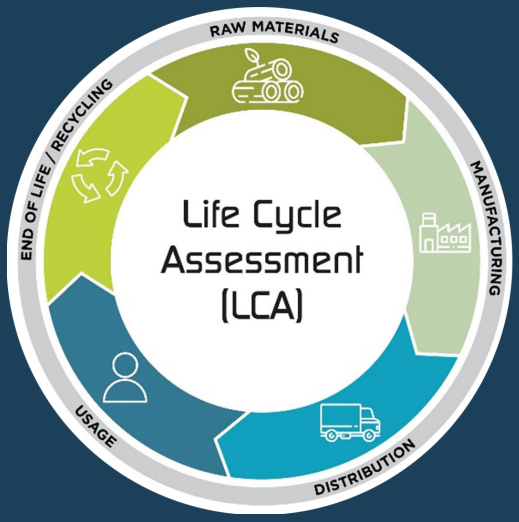
GLOBAL POPULATION WITH ACCESS TO EPS POST-CONSUMER PACKAGING AT SCALE AND IN PRACTICE AS DEFINED BY ISO 14021



SOURCE: EPS BRANCHEN

4.

Life Cycle Impacts
Quantifying Environmental Performance



Life cycle analysis (LCA), also known as life cycle assessment, is a primary tool used to support decision-making for sustainable development. It evaluates environmental performance indicators throughout the product life cycle, focusing on scientific data sets backed up by vigorous, credible third-party review. Key life cycle impact metrics that should be taken into account when making material comparisons are:

- global warming
- water consumption
- acidification
- eutrophication
- smog
- ozone depletion
- solid waste production

An Environmental Product Declaration, or EPD, is a living document that uses LCA data to transparently communicate the environmental performance or impact of a product or material over its lifetime. Utilized by many industries, EPDs are based on ISO standards and guidelines outlined in a product category rule (PCR), which allows for review and comparison of different environmental attributes among similar products in a defined category. Because they allow for comparative third-party analysis, EPDs help policy makers formulate tactical sustainability decisions and minimize opportunities for unintended consequences.

The environmental emissions for expanded polystyrene transport packaging are quantified below. The cradle-to-grave carbon footprint, or global warming, of 1 ton of EPS packaging product is 5,360 kg CO_2. Production inputs have the lowest environmental impacts in all stages of the LCA, followed by transport.[6]

Cradle-to-Grave LCIA Result for 1 Ton of EPS Packaging Product		
CATEGORY	**PARAMETER**	**VALUE**
GLOBAL WARMING	CO_2 (carbon dioxide)	5,360 kg
OZONE DEPLETION	CFC-11 (Chlorofluorocarbon)	0.00003 kg
ACIDIFICATION	SO_2 (sulfur dioxide)	18.4 kg
EUTROPHICATION	N (nitrogen)	2.59 kg
WATER CONSUMPTION	H_2O (water)	749 m^3
SMOG	O_3 (ozone)	391 kg

Peer-reviewed as well as third-party EPS industry life cycle assessments have found that replacing plastics, including EPS, with paper-based packaging will lead to increased greenhouse gas emissions (GHG). Experts from McKinsey found plastics offered a lower GHG contribution compared to alternative options in 13 of the 14 cases examined, including both direct and indirect value-chain emissions. In some cases, plastic creates up to 90% lower GHG emissions when considering both product lifecycle and impact of use.[7]

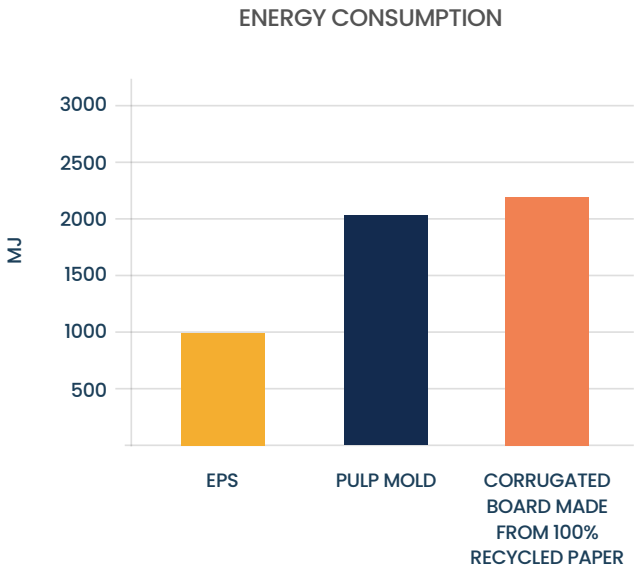
A group of academics from Heriot-Watt University say plastics bans could result in much greater environmental damage. Their estimates show that replacing plastics with currently available materials would lead to a doubling of global energy consumption and a tripling of greenhouse gas emissions.[8] While academia supports the need to prevent potentially harmful environmental effects of plastics, they say many of the current arguments surrounding a reduction or ban are often shortsighted and not based on facts, and do not consider the broader industrial, societal and ecologic impacts.

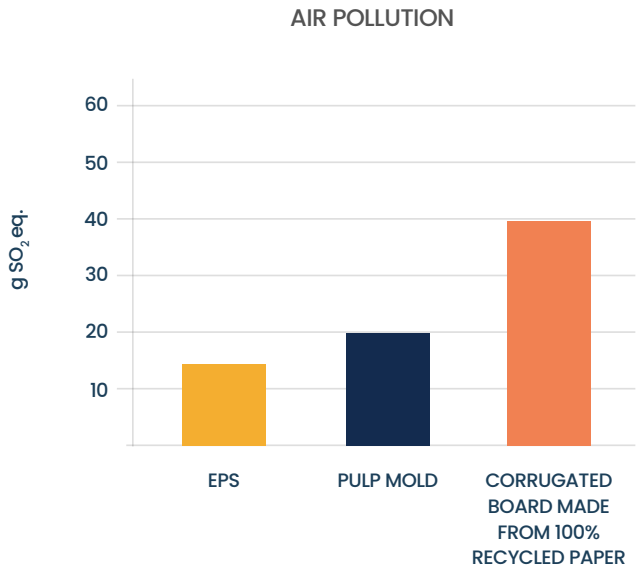
Plastics' role in enhancing use efficiencies, such as decreasing food spoilage and reducing greenhouse gas emissions, is often overlooked. These findings can inform important decisions when assessing the full effects of the supply chain and provide a more balanced, science-based perspective on plastics versus alternative materials.

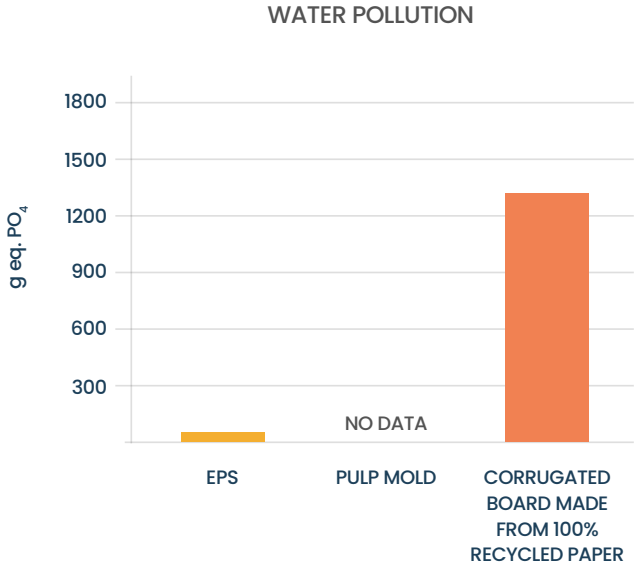
"Banning plastics is not the answer. There are important gaps in our understanding but we should not be rushing to conclusions in order to provide makeshift answers. Further research into the environmental effects must be done within the context of the relative importance other environmental issues confronted by society. Just because plastics are visible does not mean they are the most important environmental issue we are facing. Doing so will lead us down a dangerous road where already scarce resources are misdirected and we end up losing out on important opportunities to make a real difference for the environment."

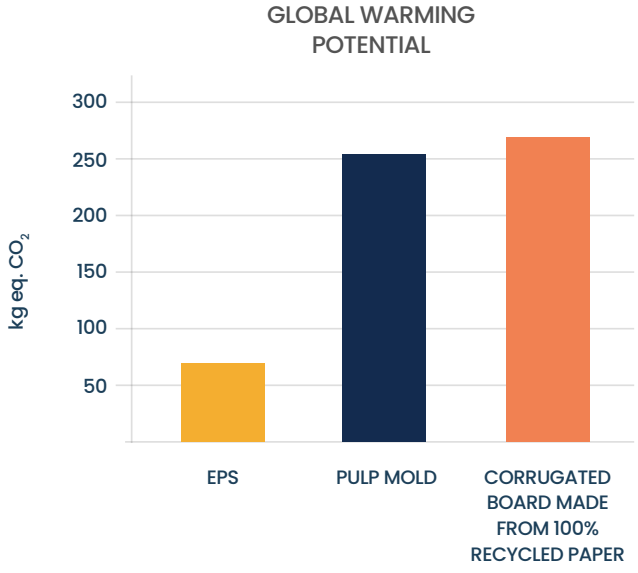
– Professor Ted Henry,
Institute of Life & Earth Sciences,
School of Energy, Geoscience,
Infrastructure & Society,
Heriot-Watt University

A life cycle analysis by InFo Kunststoff e.V. compared EPS to corrugated cardboard. The study quantified the energy use, global warming potential, air pollution and water pollution associated with 1 cubic meter of EPS packaging or corrugated cardboard packaging. EPS packaging clearly has lower energy consumption and CO_2 emissions than cardboard packaging.





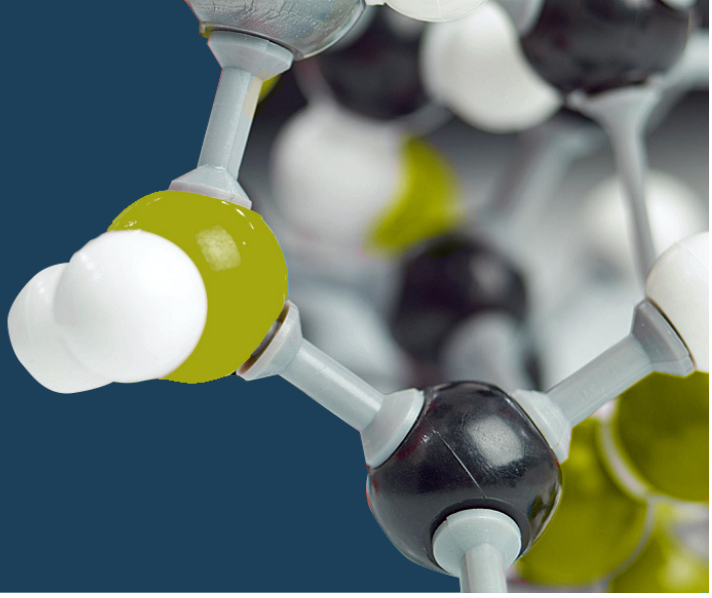




"LIFE CYCLE ASSESSMENT OF THE INDUSTRIAL USE OF EXPANDED POLYSTYRENE PACKAGING IN EUROPE CASE STUDY: COMPARISON OF THREE FISHBOX SOLUTIONS", PRICEWATERHOUSE COOPERS AND ECOBILAN, NOVEMBER 2011

5.

Chemical Transparency
The Importance of Sound Science



Expanded polystyrene protective packaging does not present an inherent health and safety risk and is widely approved for direct food contact by the most rigorous food safety regulatory authorities. Chemical regulatory bodies set exposure limits through scientific risk assessments to determine a safe threshold for various chemicals found in everyday products. When there is the potential to be exposed to a chemical below those thresholds, there is no hazard.

Styrene is a liquid building block chemical used in the production of paper products and in a number of plastic polymers, including ABS, which is used in kitchen appliances and toys, and in the production of reinforced fiber plastics for windmills. The residual styrene that can be found in finished EPS foam products is very low.[9]

PAPER INCLUDES STYRENE

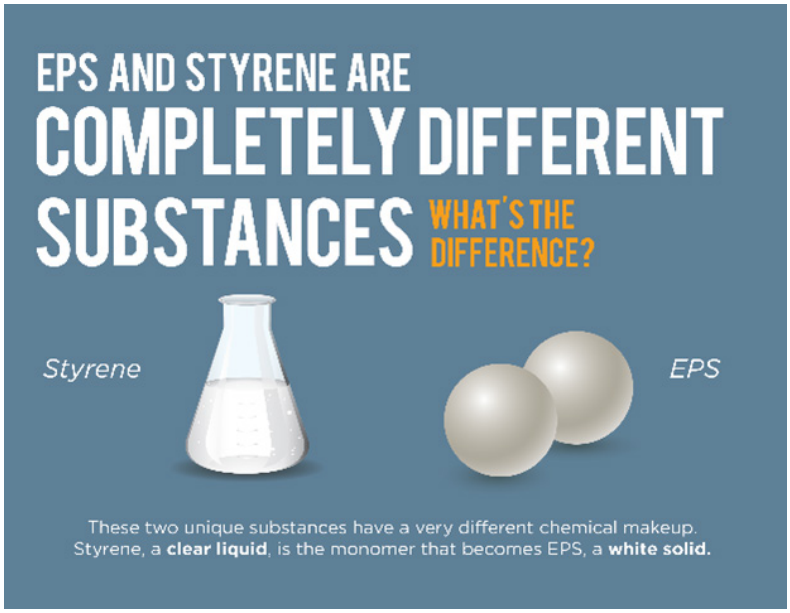
"Disposable Paper Based Food Packaging – The False Solution to the Packaging Waste Crisis" which lists chemicals of concern used in paper and board, specifically names styrene among others.

Profundo Research & Advice, 9/12/23

Studies Affirm Potential Exposures for EPS Foam Fall Below Applicable Limits

Organization	Report	Results
Dept. of Health & Human Services, Center for Disease Control, National Institute for Occupational Safety & Health (NIOSH)	NIOSH Health Hazard Evaluation Report 2005-0243-3016, 2006	EPS manufacturing plant employees were not exposed over applicable occupational exposure limits to carbon monoxide, pentane, styrene, acetophenone, ethylbenzene, xylene or respirable dust.
Aarhus University	Limited Evidence That Styrene Causes Cancer in Humans, 2017	A study of more than 72,000 employees exposed to styrene has not found an increase incidence of a wide range of cancer types.
U.S. Food and Drug Administration (FDA) Food Additive Master File (FAMF)	The Safety of Styrene-Based Polymers for Food Contact Use, 2013	The calculated estimate daily intake (6.6 µg/person/day) is more than four orders of magnitude less than the acceptable daily intake.

Note: No Significant Risk Level (NSRL) is the risk level of less than 1 case of cancer in 100,000 people over a 70-yr lifetime of exposure



After listing styrene as a chemical of concern subject to labeling requirements that it may cause cancer, the California Environmental Protection Agency Office of Environmental Health Hazard Assessment (OEHHA) issued a 39-page report acknowledging styrene is not the same as polystyrene. OEHHA also published a no significant risk level (NSRL) of 27 µg/d for styrene. In a test report by Underwriters Laboratory (UL), the potential inhalation and dermal exposures for EPS foam resulting from residual styrene are well below the NSRL published by OEHHA.

Other U.S. agencies, including the National Institute of Health and the National Institute of Environmental Health Services made similar statements clarifying EPS foam does not pose a threat to human health and safety.

HUMAN EXPOSURE & RISK VS HAZARD

Regulatory agencies set exposure limits through scientific risk assessments to determine a safe threshold for various chemicals found in everyday products. When exposed to a chemical below those thresholds, there is no hazard.

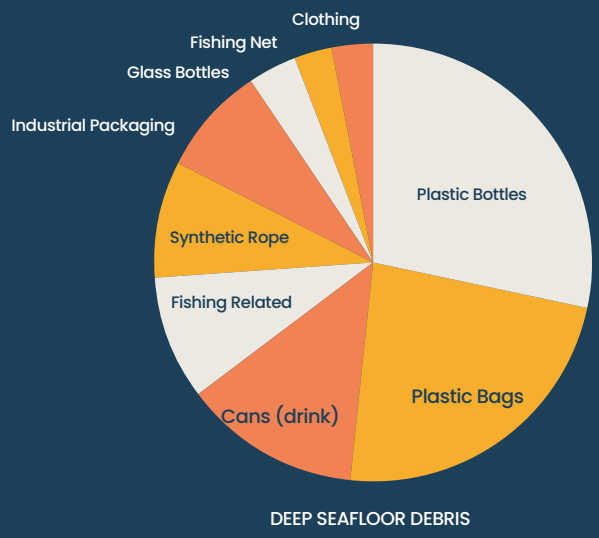
Although trace amounts of styrene are found in EPS foam products, reports published by the FDA and the U.S. Department of Health and Human Services (HHS), indicate the minute amount of styrene found in polystyrene – including EPS – is not a concern.

> *"We clearly stated that polystyrene is not the subject of a proposed listing under Proposition 65, The Safe Drinking Water and Toxic Enforcement."*
>
> **Sam Delson, Deputy Director for External & Legislative Affairs, Office of Environmental Health Hazard Assessment** [10]

6.

Litter

EPS Protective Packaging is a Small Percentage of Litter



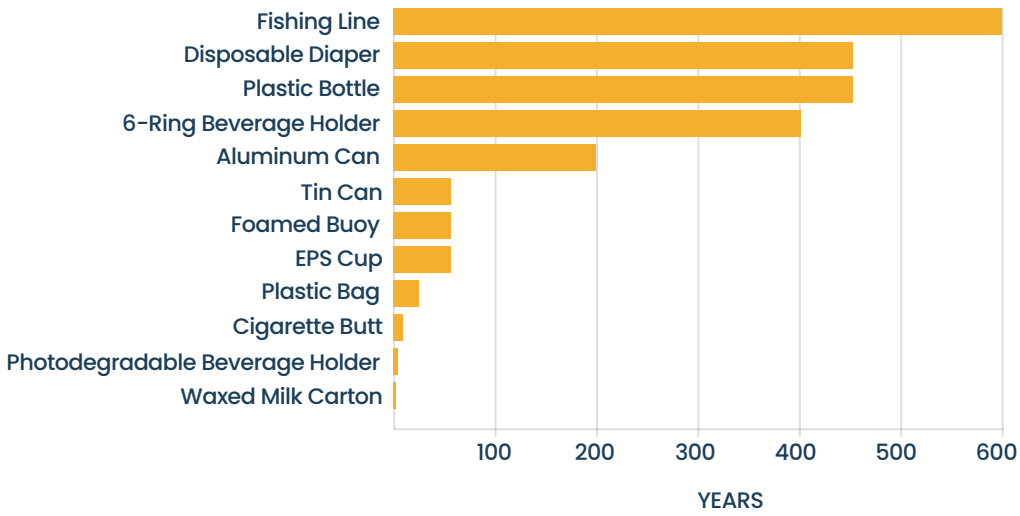
There are many exaggerated claims about the prevalence of expanded polystyrene litter. The astronomical numbers being reported by many NGOs are grossly inflated by citing research data points that cover cigarette butts and other foam plastics under a broad category that is inaccurately labeled as EPS.

Numerous litter studies indicate expanded polystyrene foam, including foodservice packaging, is 0.05-3.0%. This coincides with data in a 2018 Great Pacific Garbage Patch Report that concludes that **all** foamed plastics, is only 0.5% of the GPGP plastic load.[11] Similarly, less than 1% of all litter items found on EU beaches have been clearly identified as polystyrene.[12] EPS transport packaging is only a small subset of these findings.

Data dispels the notion that EPS bans will alleviate the measurable improvements in marine plastic debris. Rather, focusing on litter reduction for plastic bottles and bags, which make up 41% of debris on the ocean floor in addition to floating debris, would be more impactful.

Effective litter solutions should be based on multi-stakeholder partnerships and consumer education. Litter is a behavioral problem further amplified by waste mismanagement. Product bans are not a viable litter abatement tool and will only result in different materials being littered instead.

DECOMPOSITION RATES OF MARINE DEBRIS



SOURCE: US NATIONAL PARK SERVICE; MOTE MARINE LAB; NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION MARINE DEBRIS PROGRAM

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Global EPS SUSTAINABILITY Alliance

EPS Industry Alliance · eumeps · eWASA e-Waste Association of South Africa · EPSbranchen · expanded polystyrene australia · AMEPS Asian Manufacturers of EPS

ADDENDUM A

Global EPS SUSTAINABILITY Alliance

Decision tree on problematic and avoidable plastics applications