




Circular Economy for EPS Packaging

Making the Right Decision for the Environment



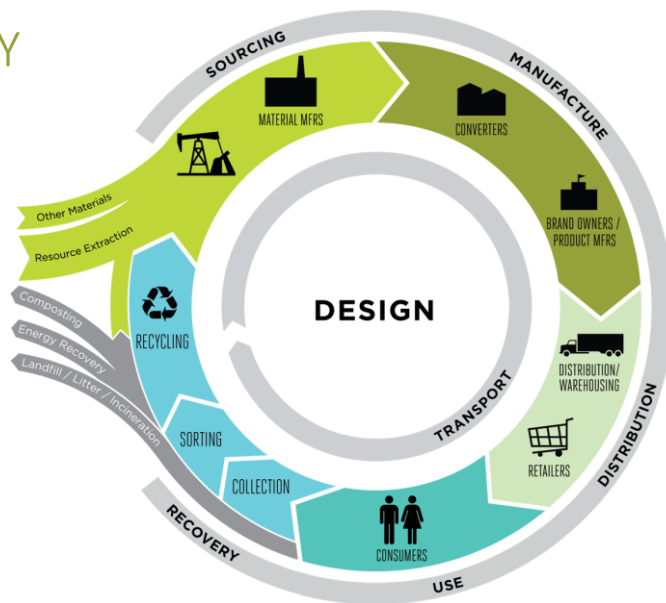
September 2023

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CIRCULAR ECONOMY REQUIRES CAREFUL CONSIDERATION

Non-Plastic Packaging Isn't The Only Sustainable Solution

- Creating sustainable packaging requires questions on sourcing, efficiency, recovery, health, and safety.
- Data and science should drive decision making.
- Risk mitigation and damage avoidance metrics are key to minimize environmental impacts.
- Packaging life cycle performance should be properly weighted in addition to end-of-life disposal.



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EPS Recycling Surpasses Global Environmental Targets

According To The EMF Decision Tree, Reusable and/or Recyclable Plastics Are Not Categorized As A Problematic Or Unnecessary Material.

The Ellen MacArthur Foundation (EMF) Recognized EPS Packaging Meets Their Definition for Global Recyclability In Practice & at Scale.



EMF Decision Tree

Is the material reusable, recyclable, or compostable?

RECYCLING NO?

Must also meet one or more criteria to be considered problematic or unnecessary

RECYCLING YES?

NOT CONSIDERED PROBLEMATIC OR UNNECESSARY

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“EPS stands out as one of the proven protective materials used worldwide. While numerous innovative alternatives are being proposed, their performance in distribution activities is yet to be fully demonstrated.”

Dr. Jay Singh

Director, Packaging Value Chain
California Polytechnic State University

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EPS CONTRIBUTES TO CIRCULAR ECONOMY SOLUTIONS

Proven Recyclability

EPS Recycling Demonstrates Consistent Growth, From 33.6 MLBS In 2008 To 145.5 MLBS In 2019

Recycled-Content & Biodegradability

EPS End-of-Life Options Range From Recycled-Content Resin to New Biodegradable Feedstocks

Clean Manufacturing

Air Emissions Abatement & Water Recycling & Other Lean Manufacturing Processes Are Widely Adopted

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EPS Provides A Unique Combination of Performance Characteristics for Packaging Logistics

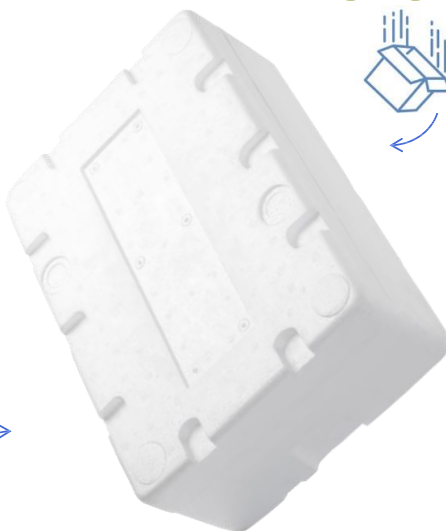
THERMAL INSULATION

Keeps your home warm, your food fresh, and your medicine properly stored



ULTRA LIGHTWEIGHT

With 95% of its volume composed of air, a little material makes a big difference in protecting goods cheaply during transport



SHOCK ABSORPTION

Protects everything from fragile high-value electronics, to large home appliances, and delicate fruits & vegetables



SAFE TO USE

BPA and Phthalate free, mildew resistant, FDA-approved for medical & food-grade applications, and safer for handling

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RECYCLABLE

U.S. EPS Recycling 2010-2019*

136.8 MILLION POUNDS RECYCLED IN 2019

RECYCLED CONTENT

56% Average amount of post-use EPS used as recycled content in new packaging

EPS TRANSPORT PACKAGING CIRCULAR ECONOMY

EPS Industry Alliance

BIODEGRADABLE

REUSE

SUBARU

MOLDED EPS PALLETS FOR CAR PARTS

USED UP TO **24** TIMES

THERMOCON

REUSABLE TEMPERATURE CONTROLLED SHIPPER

www.epsindustry.org

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EPS Is More Sustainable Than Most People Imagine

EPS foam is of **98% air**, which results in lower energy consumption.

Life cycle analyses show that EPS has far less impact on the environment than other competitive materials for the same use; in particular paper.

Material Substitutions Are Risky

Recent studies show that heavier alternatives to lightweight plastics can significantly increase raw material requirements, energy consumption & landfill volume.

On a global scale, environmental costing indicates that plastics alternatives may cost \$400 to \$500 billion more **(4 to 5 times more)**.

Meat, fish & produce shipped in EPS have a longer shelf life, leading to less food waste.

EPS is Recyclable

Historically, EPS recycling averages **~18%** over a **25-year** trendline.

EPS recycling is most successful in commercial waste streams with large volume sources of EPS waste.

Consumer access to EPS recycling sometimes requires extra effort, but with proper equipment & handling, it is successful in many communities.

OMAHA STEAKS | Whirlpool

WILLIAMS-SONOMA

Creative problem solving for challenging recycling scenarios means Walmart, NutriSystems, Williams Sonoma, Whirlpool, Best Buy, Omaha Steaks are committed to long term EPS recycling.

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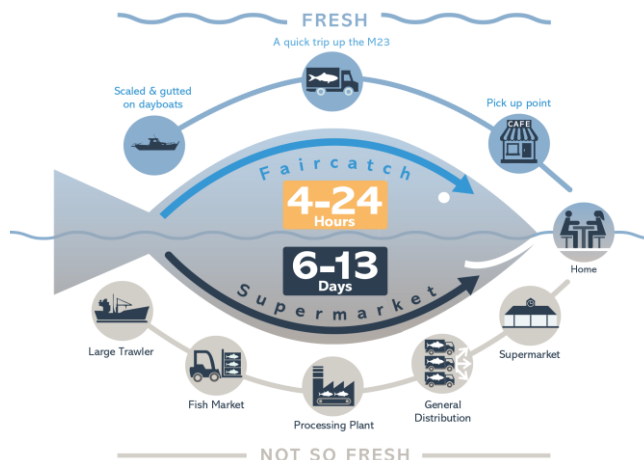
EPS Is The Gold Standard for Cold-Chain Packaging

Fish Spoilage 101

- Begins at Catch, Continues Throughout Shelf Life
- Tipping Point is at Core Temperature (~40°F)
- Occurs More Rapidly at Higher Temperatures
- Results in Post-Harvest Losses, Decreased Shelf Life & Food Safety Risks
- Maintaining Core Temperature From Catch is Essential

Infallibility Factors

- Multiple Transfer Points
- Reliability of Refrigeration Equipment
- Point of Sale Display



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“EPS IS SIMPLY A BETTER PRODUCT”

Here in Puerto Montt, fishing is a way of life, and salmon is king. During the summer, we can sometimes spend weeks out at sea, and once we make a catch, the clock starts running. Fish must arrive as fresh as possible in places as far as the USA, and every penny we spend getting it there matters to us and our families.

Fortunately, cheap & lightweight EPS boxes are a great way to keep fish fresh without affecting taste or smell during the journey. Pretty much everyone I know uses EPS boxes many times over before having to recycle them.

Lucas Meyer

Fisherman for over 30 years
Puerto Montt, Chile

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Delete?

Ellen MacArthur Elimination Criteria

ASSESSMENT OF PLASTIC PACKAGING IN THE GLOBAL ENVIRONMENT
Problematic & Unnecessary Plastic Packaging

1. It is not reusable, recyclable or compostable (per EMF definitions).
2. It contains, or its manufacturing requires hazardous chemicals that pose a significant risk to human health or the environment (using precautionary principal).
3. It can be avoided (or replaced by a reuse model) while maintaining utility.
4. It hinders or disrupts the recyclability or compostability of other items.
5. It has a high likelihood of being littered or ending up in the natural environment.

EPS Transport Packaging Does Not Meet the Elimination Criteria

Not All Polystyrene Is the Same

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EPS Transport Packaging Is Widely Recycled, Frequently Used In Innovative Reuse Applications & Has Biodegradable Feedstock Options



THERMOCON PROTECT
System Packaging



reuse



Subaru Re-Use
Solutions



reuse



EVRgreen™
Biodegradable EPS Resin



REfoam
EPS Using an Additive to
Catalyze Degradation



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EPS LIFE CYCLE

EPS IS RECYCLABLE




19,850 TONS
OF EXPANDED POLYSTYRENE (EPS)
WAS RECYCLED IN 2018

THAT'S EQUAL TO
THE WASTE GENERATED BY
13,233
U.S. HOUSEHOLDS





surfboards



picture frames



recycled content eps



coat hangers

POLYSTYRENE BANS AREN'T THE ANSWER.



www.epsindustry.org

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EPS Recycling Solutions

Mechanical Recycling	Clean EPS Waste Holds Its Value In Recycling Markets
Advanced Recycling	Employs Reverse Engineering To Incorporate Recycled Polystyrene Into Existing Applications
Recycled-Content Resin	Eco-Six™ Resin Uses 80%+ Recycled EPS Since 2012

Consumer Access

Curbside	50 U.S. Cities Serving 24 Million
Drop-Off	Over 230 Drop-Off Locations
Collection Events	100's of Community Recycling Drives
Mail-Back Program	Accepted by 30 EPS Manufacturers

TAKE A LOOK AT EPS RECYCLING

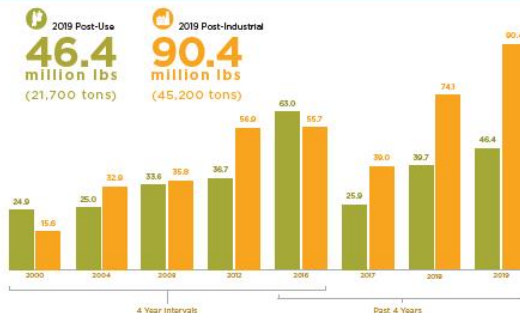
2019 U.S. EPS RECYCLING REPORT





COLLECTION OPTIONS & RESOURCES

Not everything can be recycled all the time. In order for materials to be recycled, you need stable markets and a demand for end products. Each community has its own guidelines for which plastics are accepted, and these can vary widely. To find out if EPS recycling is available in your area, visit www.epsindustry.org. For consumers that do not have access to a local drop-off center, the EPS IA sponsors a Mail-Back Program intended for smaller quantities of EPS which can be mailed via USPS or UPS to more than 30 locations nationwide. Full instructions and a list of Mail-Back locations are available on the EPS IA website.



EPS-IA has been committed to expanded polystyrene foam recycling advancements for over three decades. In 2010, EPS recycling trended upward as a result of expanded collection programs and major advancements in reprocessing technologies. This includes pyrolysis, a recycling process that can convert EPS waste into new polystyrene applications via reverse engineering to meet existing market demands. Another is radio frequency fusion technology, a new manufacturing process that can produce a variety of EPS applications with a minimum of 70% recycled content.

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EPS Recycling Innovations

Polystyrene Waste – Including EPS Packaging – Is a Major Driver in Advanced Recycling

CBS THIS MORNING **BILL COOPER**
AGILTY CHIEF FINANCIAL OFFICER

Chemical Recycling: "A Game Changer"

CBS News visited our Tigard plant to speak with Bill Cooper, Chief Financial Officer, about our solution for hard-to-recycle plastics.

THE FUTURE OF RECYCLING

The Future of Recycling

John Desmarteau, Director of Business Development, talked to KPTV Oregon about our process to keep polystyrene out of landfills.

Turning Everyday Plastics Into A Renewable Resource

Forbes featured Regenyx, our new joint venture with AmSty, dedicated to recycling post-consumer polystyrene products.

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“RECYCLING IS NOT A PREDICTOR OF ENVIRONMENTAL IMPACT”

“Simply knowing that an item is recyclable or compostable tells us surprisingly little about the actual impact on human health and the environment or the trade-off between different materials.

A lot of consumers are making their choices based on whether or not something is easy to recycle and that is not a meaningful predictor. It's pretty random, it's about as useful as tossing a coin or consulting a Ouija board.

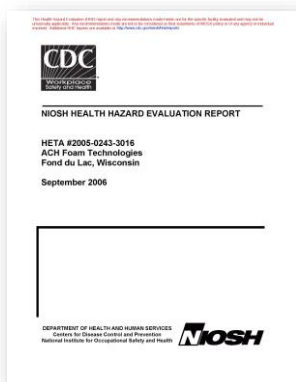
Popular is not always wise.”

David Allaway

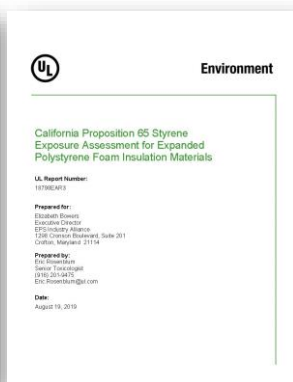
Senior Analyst
Oregon Department of Environmental Quality

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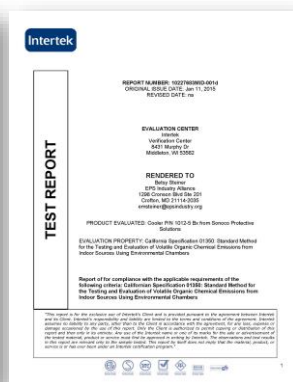
Science Shows EPS Chemical Composition Is Below Established Risk Levels



Independent Govt Investigation



Styrene Risk Assessment



VOC Emissions
CA Specification 01350





Life Cycle Assessment
Eco-Toxicity

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Styrene Used In EPS Is Approved By U.S. Food & Drug Administration For Use In Food-Contact

EPS AND STYRENE ARE COMPLETELY DIFFERENT SUBSTANCES WHAT'S THE DIFFERENCE?

Styrene  *EPS* 

These two unique substances have a very different chemical makeup. Styrene, a **clear liquid**, is the monomer that becomes EPS, a **white solid**.

STYRENE IS A NATURAL ORGANIC COMPOUND FOUND IN EVERYDAY FOODS:



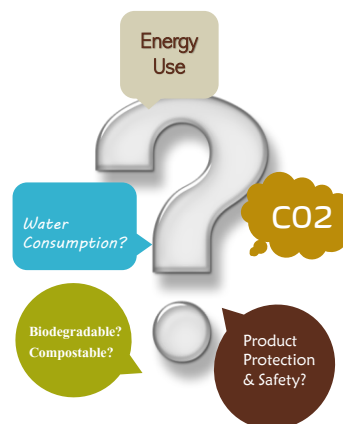
1.6 – 6.4 ppb 0.37 – 3.1 ppb 170 – 39,000 ppb 10-200 ppb 1 – 2.2 ppb

Styrene is a naturally occurring organic compound found in many kinds of plants, as well as a variety of foods such as fruits, vegetables, nuts, beverages and meats.

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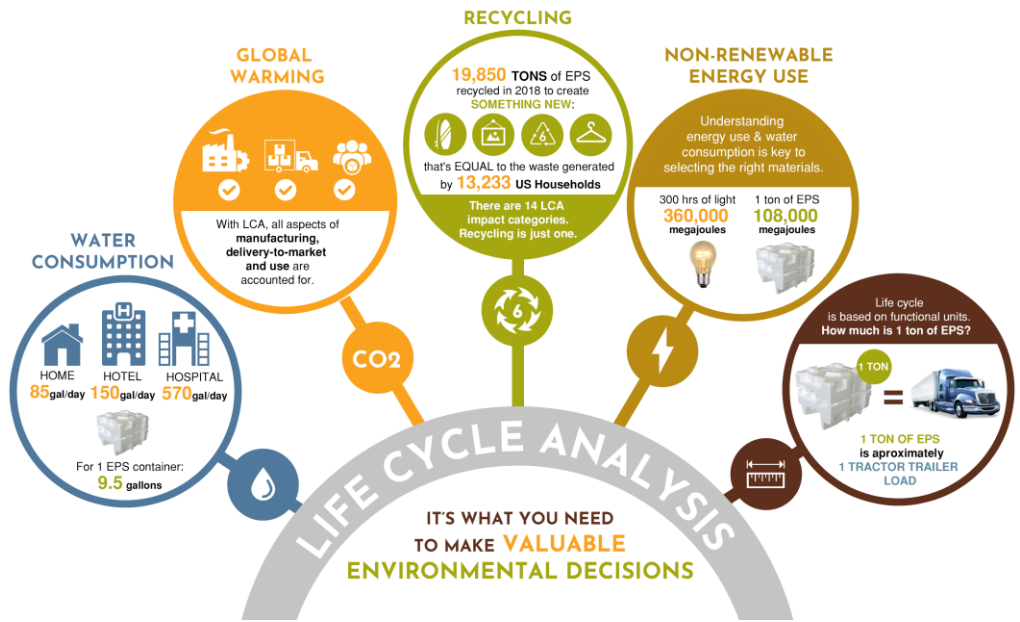
EPS Outperforms Alternative Materials To Minimize Damage-In-Transit

Many nuances must be considered in plastic substitutes, from their recyclability and global warming potential (GWP) to their versatility and suitability for applications. The shifts to alternative materials have emerged as a knee-jerk reaction to consumer anti-plastic sentiment, but these abrupt alterations are not as environmentally-sound as they might first appear.



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PACKAGING LIFE CYCLE - YOU NEED THIS!



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LIFE CYCLE ANALYSIS SUPPORTS EPS PACKAGING

Comparisons of life-cycle impact of the uses of three different packaging materials shows that EPS compares favorably with polypropylene (PP) & cardboard packaging because of its energy-efficient production & light weight.

* Comparative Results of Three Packaging Solutions in an Average 6kg European Situation, Pricewaterhouse Coopers, November 2011.

Environmental Impact	EPS	PP	Cardboard
	6 kg		
Non- Renewable Primary Energy (MJ)	1	1.3	1
Depletion of Non-Renewable Resources (kg eq 5b)	1	1.3	1
Greenhouse Gas Emissions (kg CO ₂ eq 100 years)	1	1	1.3
Air Acidification (g SO ₂ eq)	1	1.2	1.9
Photochemical Oxidants Formation (g eq ethylene)	1	0.3	0.2
Water Consumption (m ³)	1	0.8	3.5
Water Eutrophication (in g eq PO ₄₃)	1	1.2	5.1
Total Waste Production (kg)	1	2.3	5.2

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“EDUCATING TOWARD SMARTER CHOICES”

As a professor, there is one skill I strive to ensure all my students develop in class. That skill is critical thinking. Avoiding snap judgements, and thoroughly thinking through the pros and cons of the decisions we face, makes us better as individuals and as a society.

Hot topic discussions always arise in class, such as how to solve the world’s growing waste problem, and I’ve been surprised by how often the narrative on this issue has changed over time.

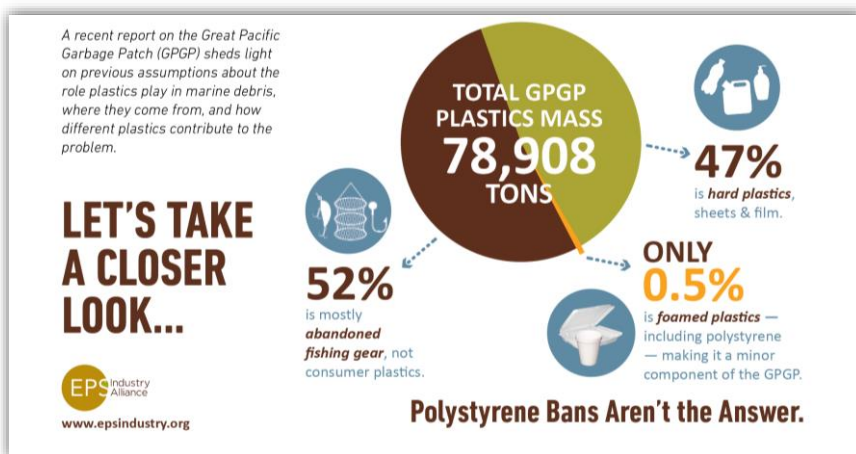
We’ve come a long way from disregarding the issue, to considering bans on problematic products, and finally embracing a model of circularity with proper waste disposal, as the issue has been better understood.

EPS products have a long way to go to reach this ambitious goal, but their irreplaceability makes the journey ahead worthwhile.

Rachel Robinson
College professor
Houston, USA

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EPS Transport Packaging Is 2.7% of U.S. Litter & Less Than 0.5% of Plastic Marine Debris



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“WE SHOULD THINK ABOUT THE BIG PICTURE”

I think society has focused on solving the waste problem, and we definitely need to do that, but we shouldn't lose sight of the real problem facing our generation: climate change. Said differently, if all we do is recycle more, does that mean we are doing less harm to the environment?

More and more people are doing their part, choosing fully recyclable materials, putting garbage in the right place, and starting action in their communities, but I think that we should also start questioning corporations about everything that happens before and after we as consumers get to make a choice. Fixing the amount of carbon emissions needed to heat my home, or get an Amazon package delivered to me, now that's big picture stuff.

Olivia Turella
College Student, São Paulo, Brazil

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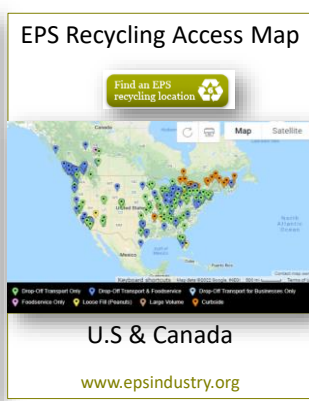


EPS PACKAGING PERFORMANCE & ENVIRONMENTAL CHARACTERISTICS ARE HARD TO BEAT

When Evaluating Alternative Materials:

- ✓ Is It Recyclable At Scale & Profitable?
- ✓ Are Life Cycle Impact Trade-Offs Net Zero?
- ✓ Are Material Costs Equivalent or Less?
- ✓ Are Optimized Shipping Loads Maintained or Improved?
- ✓ Does It Achieve Equal Damage Avoidance?
- ✓ Does It Comply With U.S. FDA, DOT & FAA Guidance?

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Additional EPS Sustainability Resources

The EPS Industry Alliance is the North American trade association representing the expanded polystyrene manufacturing supply chain. EPS-IA members produce innovative packaging solutions following best practices for environmental stewardship throughout the EPS product life cycle.



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 Crofton, MD 21114 USA
 (800)607-3772
 www.epsindustry.org

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SEE POLYSTYRENE RECYCLING IN ACTION



EPS Industry Alliance
Foam Recycling With Manufacturers
 (1:00) — 2019

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WHAT IS EPS?

Expanded Polystyrene (EPS) is a sustainable solution that can be used to keep us warm, safe, and healthy while remaining cost-effective and recyclable. This video offers insights into the world of EPS, highlighting the positive contributions EPS makes in our lives.

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Environmental Impacts of EPS Packaging Systems

Environmental Emissions - Total Pollutants*

Category	Parameter	Inventory Value (lb Per 1,000 Units)	Primary Source (Fuel or Process-Related)	% Reduction 10% Open-Loop Recycling	% Reduction 10% Closed-Loop Recycling	% Reduction 20% Closed-Loop Recycling
GLOBAL WARMING	CO2 (Carbon Dioxide)	1867	99% Fuel-Related	2%	4%	9%
	N2O (Nitrous Oxide)	N/A	N/A	N/A	N/A	N/A
	CH4 (Methane)	0.029	100% Fuel-Related	0%	3%	6%
ACIDIFICATION	SOx (Sulphur Oxides)	7.33	83% Fuel-Related	2%	4%	8%
	NOx (Nitrogen Oxides)	5.85	90% Fuel-Related	2%	6%	9%
	NH3 (Ammonia)	0.02	99% Process-Related	5%	10%	20%
EUTROPHICATION	NOx (Nitrogen Oxides)	5.85	90% Fuel-Related	2%	6%	9%
	N2O (Nitrous Oxide)	N/A	N/A	N/A	N/A	N/A
	NH3 (Ammonia)	0.02	99% Process-Related	5%	10%	20%
PHOTOCHEMICAL	CSH12 (Pentane)	15.7	100% Process-Related	0%	0%	0%
	CO (Carbon Monoxide)	2.5	98% Fuel-Related	2%	4%	8%
	Other Organics	0.53	100% Fuel-Related	2%	4%	8%
	CH4 (Methane)	0.029	100% Fuel-Related	0%	3%	6%
	HC's (Hydrocarbons)	19.7	65% Fuel-Related	4%	7%	14%

1,000 Units of EPS for Vacuum Cleaner Packaging

*Does not reflect all impact categories in Resource & Environmental Profile Analysis of EPS Packaging Products report.

'Resource and Environmental Profile Analysis of EPS Packaging Products', Franklin Associates, Ltd., 1997

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Questions?

Please Contact Us...

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