EPS Industry's Sustainability Strategy for Expanded Polystyrene (EPS) Packaging

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August 21, 2025

Snapshot of EFP

EFP began molding expanded polystyrene (EPS) over 70 years ago, building a reputation for innovative protective packaging manufacturing.

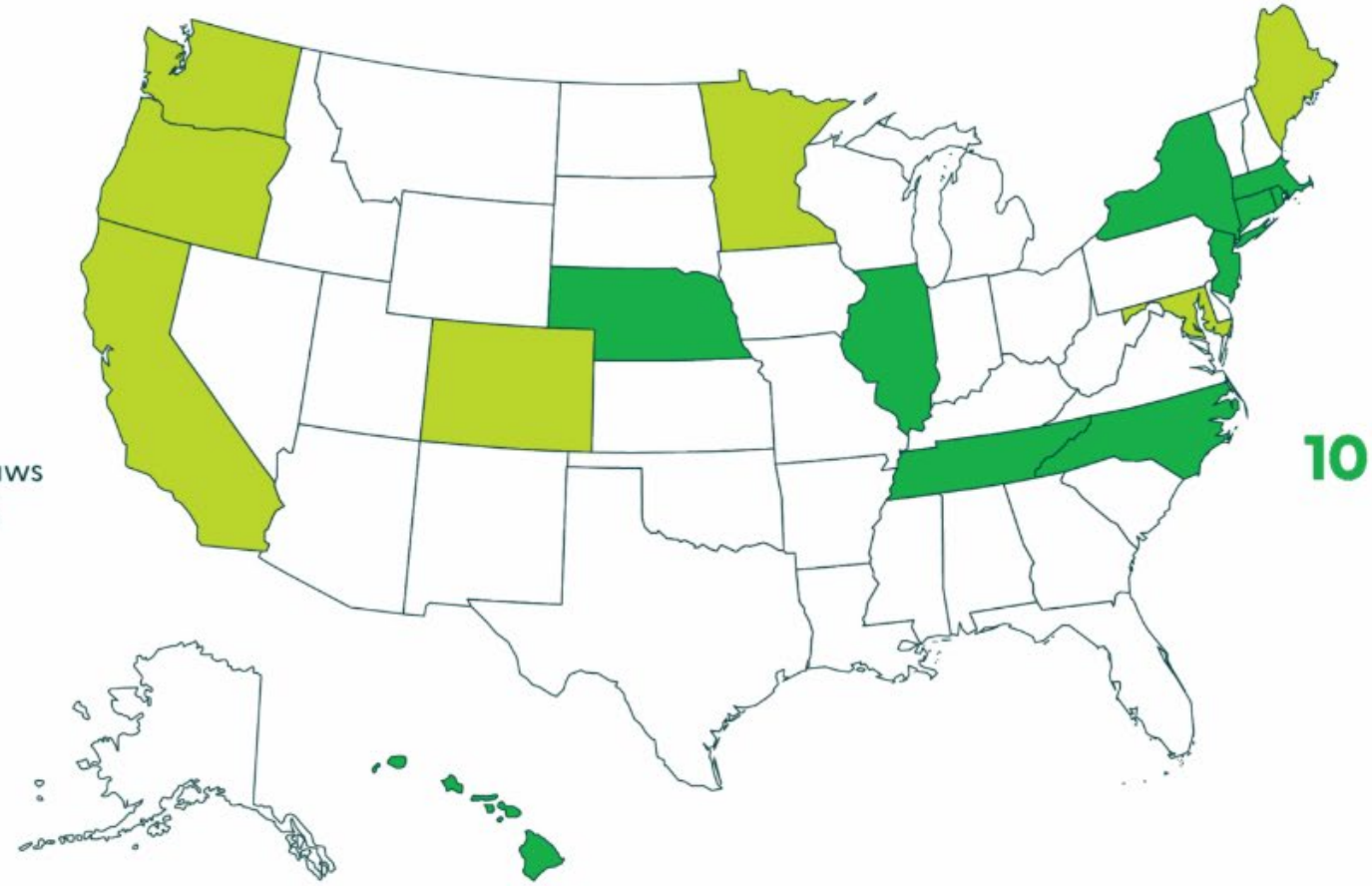
Today: 6 state-of-the-art plants in 5 states:

- Elkhart, IN
- Evansville, IN
- Decatur, AL
- La Vergne/Nashville, TN (new 2025)
- Bishopville, SC (new 2024)
- Casa Grande, AZ (new 2025)

And our investments continue . . .

- EFP has the most up-to-date suite of EPS molding infrastructure in the industry.

Extended Producer Responsibility Laws (EPR) Packaging EPR Spreading Quickly



7 packaging EPR laws passed in the U.S.

- California
- Colorado
- Maine
- Maryland
- Minnesota
- Oregon
- Washington

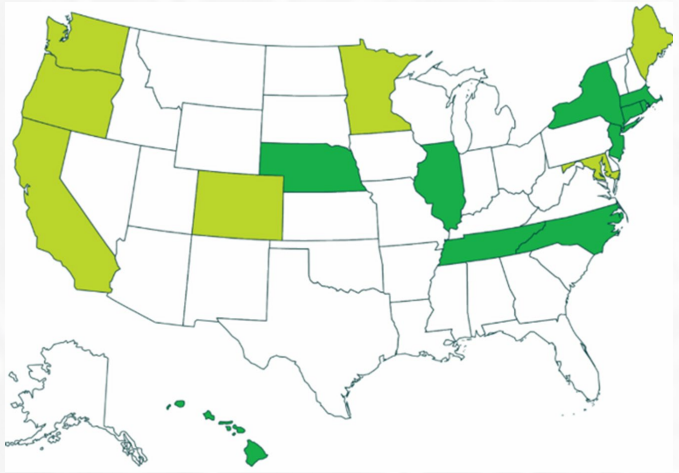
10 states introduced packaging EPR legislation in 2025.

- Connecticut
- Hawaii
- Illinois
- Massachusetts
- Nebraska
- New Jersey
- New York
- North Carolina
- Rhode Island
- Tennessee

Increasing Regulatory Pressure, BUT . . .
NO bans on EPS Transport Packaging!!

https://brookandwhittle.com/extended-producer-responsibility-epr-laws/

California's SB 54: Most Extensive EPR Legislation in US



Legislation moving forward in 17 states

Oregon, Colorado, California, Maine farthest along

- ***Does Not* Ban Plastic Packaging, BUT . . .**
- Sets dates when minimum recycling rates must be achieved for plastic packaging and single-use products
  - 30% by Jan 1, 2028
  - 40% by Jan 1, 2030
  - 65% by Jan 1, 2032
- 2032: 100% of single-use packaging must be recyclable or compostable
- ***Good News: EPS already shows 26-32% recycling rate in California. High confidence in meeting the 2028 deadline.***

EPS Industry Alliance

2022 RECYCLING REPORT

EXPANDED POLYSTYRENE FOAM PACKAGING

In 2022, 168.6 million pounds (76,488 metric tons) of expanded polystyrene (EPS) was diverted from the landfill in North America, including 61.6 million pounds (27,940 metric tons) of post-consumer EPS. Recycled EPS packaging is used in numerous end-markets like safety helmets, furniture, new packaging, and automotive applications among others. Stable market value, increasing investment in collection infrastructure, recycling technology innovations and collaborative community programs are driving growth in EPS recycling.

The EPS industry is prepared to meet recycled content demand. Collectively, the industry has invested $185 million in technology innovation to develop recycled content EPS resin. Approximately 79 million pounds of capacity are already operational, with an additional 150 million planned for the future.

The United Nations Environment Program's Plastic Pollution Science Report acknowledges that EPS transport packaging is recyclable in-practice & at-scale in certain global regions.

61.6 Million lb

(27,940 METRIC TONS)
POST-CONSUMER EPS
RECYCLED

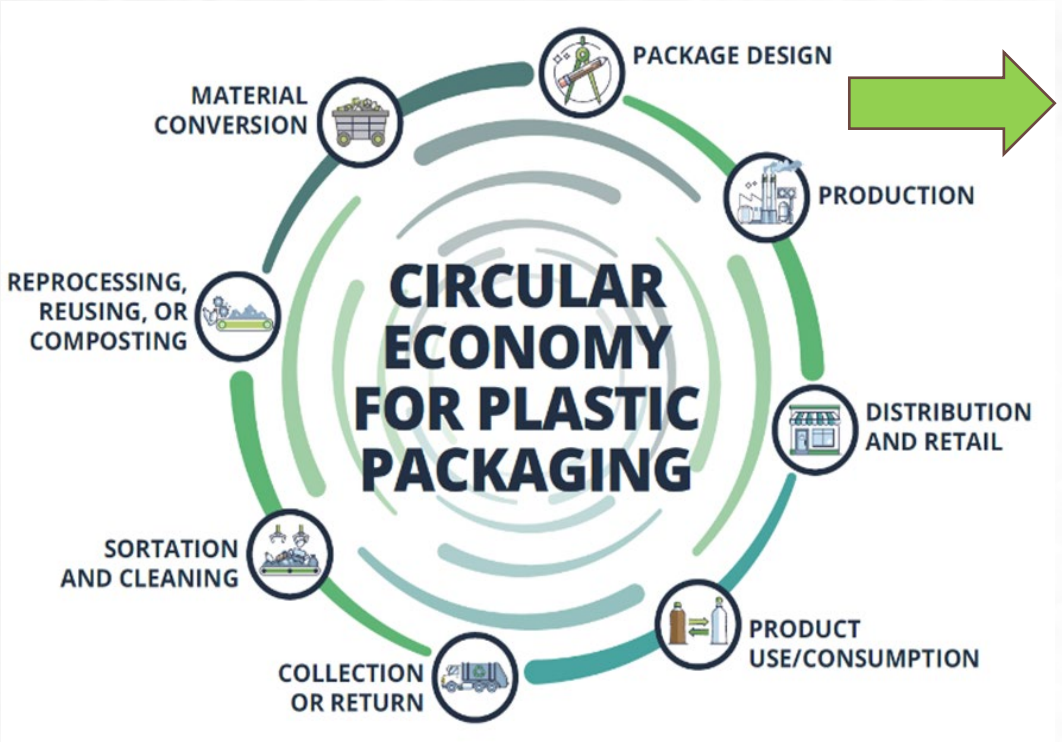
31% RECYCLING RATE

EPS Industry's Sustainability Strategy

Making EPS Packaging Circular

1. Manufacturing with Circularity in Mind
   - Designing packaging to minimizing weight
   - Using advanced materials available today:
     - EPS with accelerated biodegradability
     - EPS with 30% to 50% recycled content
2. Expanding Collection, Recycling & Reuse
   - Goal: Used EPS packaging => New EPS resin
3. Investigating Real-World Uses => Data
4. Educating & Collaborating

EPS Industry's Sustainability Strategy



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Manufacturing with Circularity in Mind

Designing packaging to minimizing weight & keeping component materials pure

- Design Support From EPS Molder (ex. Experienced-based design support, 3D CAD)
- ISTA-certified Testing Facility (ex. Center of Excellence at EFP)
- Life Cycle Analysis (ex. Compass LCA tool)

Using advanced materials *available today*

- **EPS with accelerated biodegradability**
  - Modifies the exterior surface of the EPS bead
  - Biodegrades 94% in 4 years vs less than 6% for standard EPS
  - Zero degradation in physical or thermal performance

- **EPS with up to 30% to 50% recycled content**
  - Huge opportunity to move the sustainability needle!

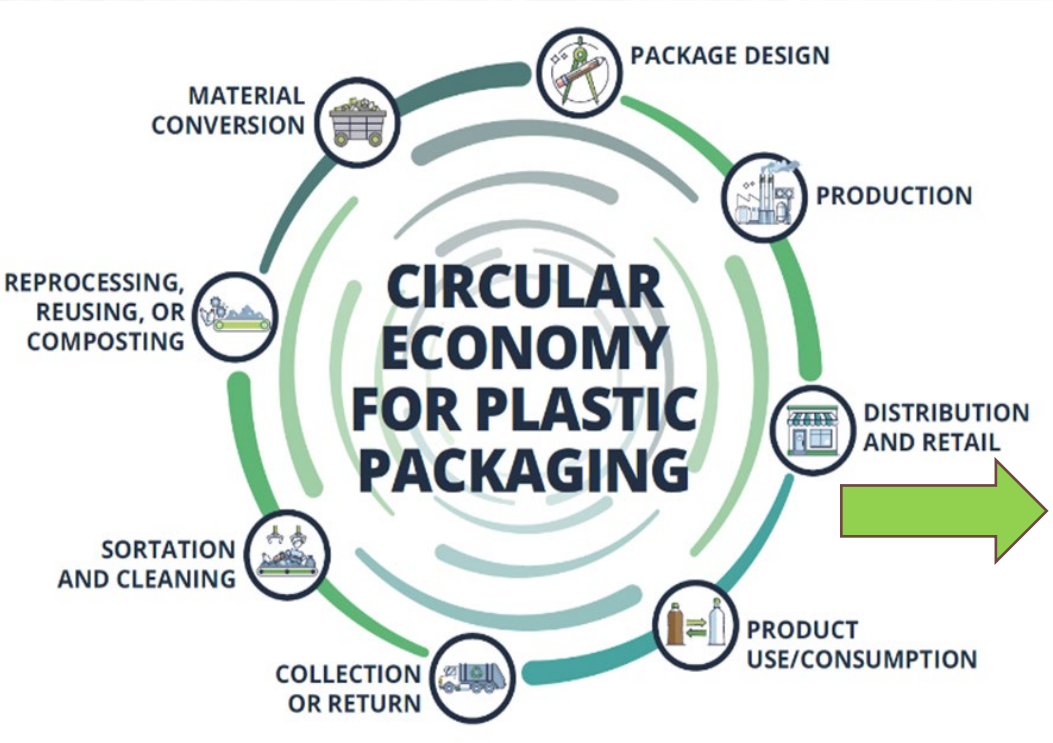
Manufacturing with Circularity in Mind

NexEco from NexKemia

- **EPS with 30% recycled content**
  - 1KG of recycled resin saves 4KG of GHG
  - Significantly lowers waste stream footprints
    - 1 ton of recycled resin saves 34 tons of landfill space
  - 100% Recyclable
  - Produced using 100% renewable energy

- **Ideal choice for Transport Packaging products**
  - Processes like virgin bead in our molding plants
  - Resulting parts have same protection properties as virgin EPS
    - Compression, Tensile Strength (flex), Density
    - Drop test, Shock test, etc

EPS Industry's Sustainability Strategy



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EPS Collection & Densification

EPS provides unrivaled performance for Transport Packaging

And technically, EPS is very straightforward to recycle

However . . .

EPS's operational strength is the same as its recycling challenge

- ***Excellent*** protective packaging performance with very little material (1.25 lb/cuft)
  - 200 lb washer protected by 0.4 lbs of EPS
- **BUT . . .** That low density make for challenges in EPS collection and transportation
- **AND . . .** Relatively low collection and recycling rate through municipal programs.

The Solution:

- Building an alternate EPS collection, densification and recycling ecosystem
- Both for Businesses and Consumers

EPS Collection & Densification

Industry Action: Increasing Access to EPS Collection and Densification

- EPS Producers like EFP
- Big Box Stores and Other Retailers
  - Expanding collection and recycle after appliance & furniture delivery
- Industry Organizations
  - Polystyrene Recycling Alliance
  - EPS Industry Alliance
- Communities & Organizations
  - Goodwill Industries

Working Together, We Can Change Public Perception and Overcome Regulatory Pressure

EPS Collection & Densification

Example: Actions at EFP

Addressing the collection & transportation challenge

- Grinding and compressing EPS packaging into logs (50:1)
- Logs are palletized and transported to resin producer
- ***Drop off at EFP plants, both business & consumer***

EFP Plant Location	Number of Densifiers
Nashville, TN	2
Evansville, IN	1
Bishopville, SC	1
Casa Grande, AZ	1
Decatur, AL	1
Elkhart, IN	1

Customer Collaboration Example

- EPS Pallets used by appliance manufacturer for incoming parts
- EFP is collecting and densifying the pallets at nearby plant
- Selling and transporting the densified EPS for re-use in manufacturing new Post-Consumer Recycled EPS bead
- **~181,000 cu ft of landfill avoidance annually (1-2 trailer loads per week)**

Polystyrene Recycling ALLIANCE

- Driving collaboration across value chain
  - Resin producers, EPS molders, Brand owners, Recyclers
- Key Goal: Expand EPS recycling access to >60% of US population
- Provide seed funding for expansion of EPS recycling infrastructure

EPS Collection & Densification

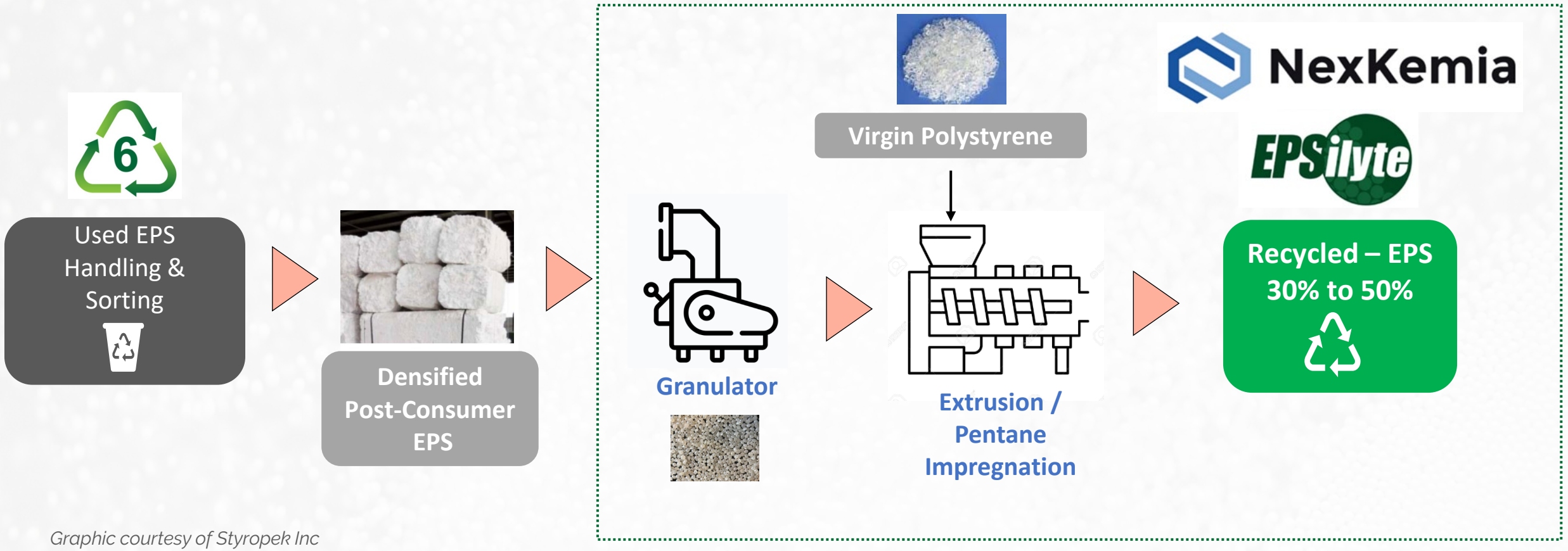
Seed Funding by Polystyrene Recycling Alliance (PSRA)

- Goodwill Industries, New England
- Circular Colorado, Colorado Statewide
  - **Questions to be answered via trials:**
    - Will people use the drop-off sites?
    - How much material is collected per month?
    - What are the revenue and costs?
    - What is the potential for regional or nation-wide rollout?

Mechanical Recycling of EPS

Electricity and Heat Only

*No chemicals other than addition of pentane expansion agent



Graphic courtesy of Styropek Inc

Paper and Corrugate Recycling:
Not as clean as one might think . . .

Pulp and Paper in US: 6th largest industrial polluter

Paper recycling process generates:

- **65% of the water pollution**
- **25% of the air pollution as virgin paper**
- **Air Pollution:**
  - CO_2, acid rain chemicals, cadmium, lead, mercury
- **Water Pollution:**
  - Solids, nutrients, lead, dioxin, manganese
- **Water Use:**
  - More water per pound of product than any other industry

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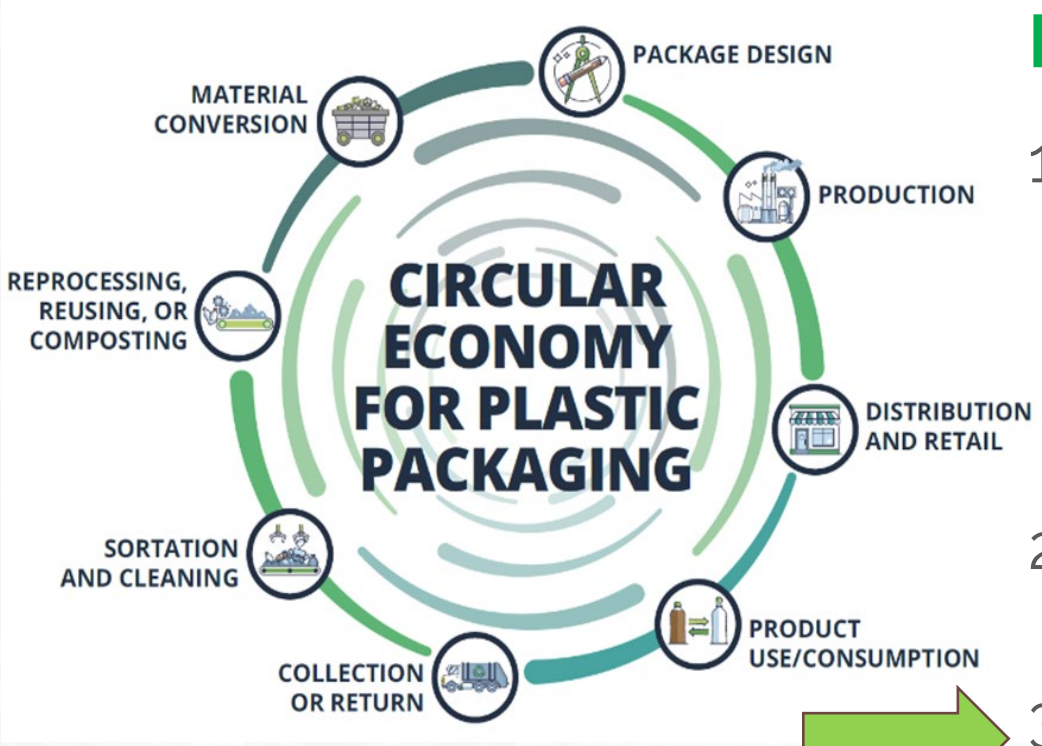

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EFP's Sustainability Focus Real World Investigations

Washing Machine Protective Packaging

Washer 1

- Almost all corrugate
  - Corrugate = 7256 gm
  - EPS = 25 gm
  - **Total weight = 7256 gm**

Washer 2

- Corrugate and EPS
  - Corrugate = 4340 gm
  - EPS = 1452 gm
  - Plastic Bag (thin) = 110 gm
  - **Total weight = 5902 gm**

Washer 3

- Almost all EPS
  - Corrugate = 882 gm
  - EPS = 867 gm
  - Plastic Shrink Wrap (thick) = 542 gm
  - **Total weight = 2231 gm**
    - **(70% less packaging weight)**

Real World Investigation at EFP

Life Cycle Analysis (LCA)

COMPASS®

Package Compare Report

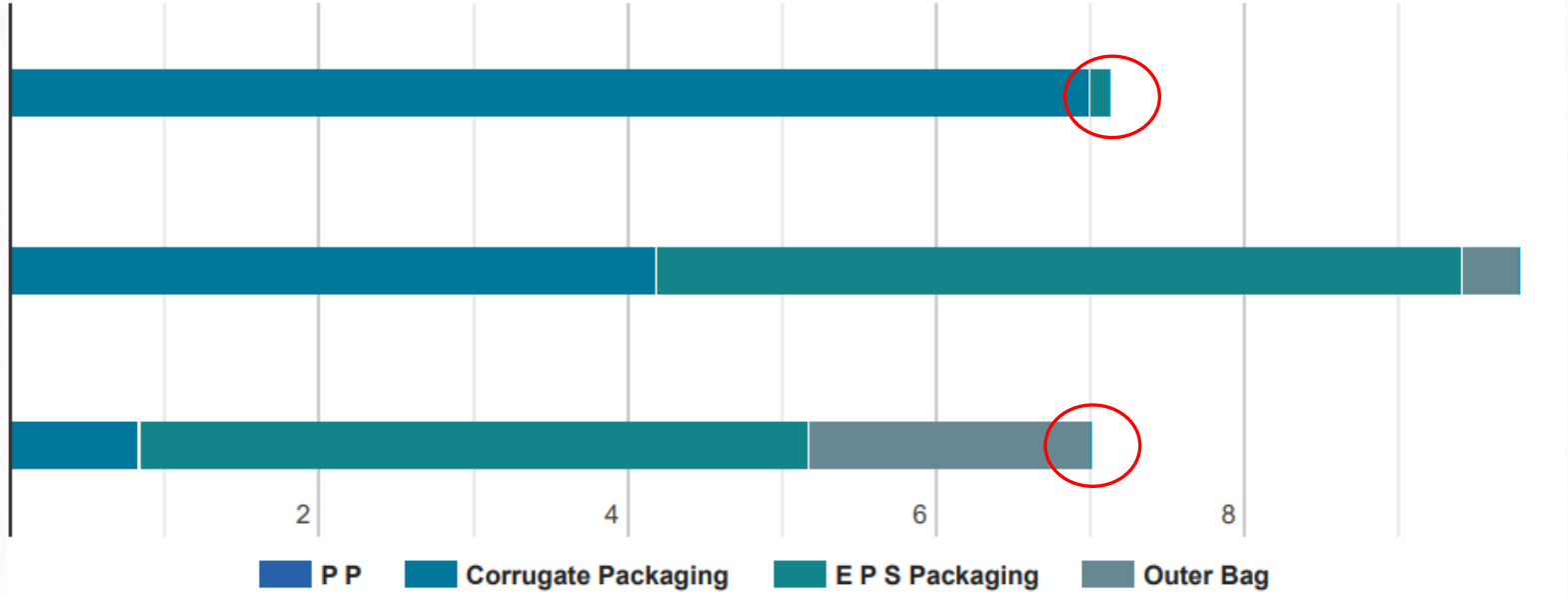
LCA by Andrew Klasek, Product Engineering Manager
EFP Center of Excellence, La Vergne, TN

Global Warming Potential (kg of CO2 equivalent) per package

Washer 1
- Packaging weight = 7256 gm

Washer 2
- Packaging weight = 5902 gm

Washer 3
- Packaging weight = 2231 gm
- 70% less packaging material by weight vs corrugate



Real World Investigation at EFP

Life Cycle Analysis (LCA)

Our LCA results are early (assumes using virgin materials) and analysis is continuing.

But it's not hard to conclude that EPS can be an environmentally responsible choice for certain packaging applications.

These fundings are consistent with those reported publicly by Electrolux Group for large appliance protective packaging (March 30, 2023).

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Education & Collaboration

Collaborating with EPS Suppliers, Recyclers and Associations

Polystyrene Recycling Alliance
(Board Member, Sustainability Chair)

EPS Industry Alliance
(Board Member)

NexKemia
(Supplier)

Association of Plastic Recyclers

EPSilyte
(Supplier)

U.S. Plastics Pact
(Activator, 4 Committees)

AmSty

The Recycling Partnership
Solving for Circularity

Sustainable Packaging Coalition

Engaging with Regulators, NGOs and other Stakeholders

CalRecycle
(SB54 Board of Advisors)

Circular Action Alliance

WWF

Ocean Conservancy

Ellen MacArthur Foundation

EFP is Working to be the Leader in the Circular Use of EPS

- Real progress is being made at EFP and the EPS Industry toward a more sustainable, circular reality.
- Minimizing the negative impact of plastic packaging on the environment will take the commitment and involvement of numerous stakeholder groups.
- All concerned stakeholders need to:
  - Get engaged. Think circular.
  - **Collaborate** broadly to develop real-world solutions
    - Brand Owners, Manufacturers, Recyclers
    - Municipalities, Regulators
    - Non-Government Organizations
  - Gather data. Innovate together.
  - **Let data and science be our common ground to drive decisions and policies**

THANK YOU

For Sustainability questions, contact Joe Grzyb.

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For more information about EFP, visit our website:

www.efppackaging.com