

# Unlocking the EPS Recovery Potential: Technologies Enabling Efficient Collection and Recovery



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COMMITTEE

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SPI: The Plastics Industry Trade Association  
[www.plasticsindustry.org](http://www.plasticsindustry.org)



Expanded polystyrene serves many important roles in our lives. It insulates. It protects. It has a fraction of the environmental impact in the full life cycle compared to other non-resin alternatives. The greatest challenge for this material at end-of-life is, however, also a symptom of its best feature; it is light, making collection and processing challenging. Fortunately the list of commercially-available technologies that enable efficient collection and recovery of many post-consumer (PCR) EPS streams continue to grow, as does global demand for this material.

This paper will take a cursory look at the various streams of EPS that are available for recovery today and the potential end-markets for that material. This paper also outlines the technologies that are proving key to making EPS recovery not only possible, but profitable. This paper is designed to serve as a starting point for further exploration and demonstration of the value of this material by the SPI Recycling Committee.

## EPS Collection

Because EPS serves so many practical functions, potential sources of PCR EPS are abundant. EPS can be extracted from the municipal solid waste stream in the form of food packaging and protective product packaging. In the food packaging category, EPS can commonly be found in grocery store meat trays and “to go” containers for food and beverages. EPS applications in protective packaging are even more varied including ice coolers, medical coolers, seafood coolers and molded and loose fill EPS used to protect electronics and other products during shipping. EPS is also increasingly being used in building and construction projects, again because of the material’s excellent insulating qualities.

Demonstration work has been completed that validates the technical and economic feasibility to collect these feedstreams of PCR EPS through varied collection models. Resources on collection options can be found at the following websites:

- Home for Foam offered by *Dart*  
[www.homeforfoam.com](http://www.homeforfoam.com)
- EPS MRF recovery case studies from the *Foodservice Packaging Institute*:  
[www.fpi.org/Burrtec-case-study](http://www.fpi.org/Burrtec-case-study)  
[www.fpi.org/NEPCO-Case-Study](http://www.fpi.org/NEPCO-Case-Study)
- Recycling information for Plastic Foodservice Packaging, including EPS, from the *American Chemistry Council's Plastic Foodservice Packaging Group (PFPG)*  
[plastics.americanchemistry.com/Packaging](http://plastics.americanchemistry.com/Packaging)
- Recycling resources from the *EPS Industry Alliance*  
[www.epspackaging.org/index.php?option=com\\_content&view=article&id=8&Itemid=4](http://www.epspackaging.org/index.php?option=com_content&view=article&id=8&Itemid=4)

## End Markets

Demand for recovered EPS continues to grow. Traditional end-markets include picture frames, architectural molding and other packaging. The picture frame market has led demand for EPS, and that demand continues to grow on a global scale. For example, Intco Industries (Shanghai, China) claims to be one of the world’s largest polystyrene recyclers, and makes picture frames for sale across the globe and consumes nearly 5,000 tons of EPS and extruded PS every month. The manufacturer claims that a limited PCR EPS and PS supply is a primary constraint for future business growth. To overcome this constraint, they are trying to encourage and facilitate collection by offering the low-cost densifiers for collection points.



Similar growing demand exists here in the U.S., for picture frame applications and other end-uses. Domestic consumers of recycled EPS for picture frame manufacturing include Nepco in California and Princeton Molding in New Jersey. Architectural molding, like that being made by MCS, is another end-use application that creates significant demand for PCR EPS materials. For example, this molding can be substituted for more expensive wood-based molding in building projects. Similar to the picture frames, this molding can be made in varying profiles and be painted to look just like traditional molding. Demand outside of picture frames and decorative moldings is also strong in the U.S. Repac in Tennessee makes EPS products and markets EPS resin to various manufacturers. Owens Corning is using recycled EPS for insulation board. Interest in blending PCR PS into products for durable goods is also expected to grow both in the U.S. and globally.

At this point in time, demand for PCR EPS far outweighs supply of the material. There is sentiment that the recycling industry needs to better align to support the recovery of this material at end of life. Lack of awareness and infrastructure to support the collection of EPS has been cited as a significant barrier to expanding the collection of EPS products. Having the right technology in place to support efficient collection and processing of EPS products is key to unlocking the recovery potential of these valuable materials.

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# EPS Recycling Technology Information Appendix A

Equipment Type	Technology Manufactory	Model	Capacity	Website
Blending systems	<b>Hirsch Servo</b>	Star Mix		<a href="http://www.hirsch-gruppe.com/homepage/com/geschaeftsfelder/maschinen_anlagenbau/produkte/recycling/starmix.php">www.hirsch-gruppe.com/homepage/com/geschaeftsfelder/maschinen_anlagenbau/produkte/recycling/starmix.php</a>
Blending systems	<b>Hirsch Servo</b>	Screw Mix		<a href="http://www.hirsch-gruppe.com/homepage/com/geschaeftsfelder/maschinen_anlagenbau/produkte/recycling/screwmix.php">www.hirsch-gruppe.com/homepage/com/geschaeftsfelder/maschinen_anlagenbau/produkte/recycling/screwmix.php</a>
Densifyer - melt	<b>Avangard Innovative</b>	(FD Series) FD-12	150 lb/h Compacted Ratio: 90:1	<a href="http://www.avaicg.com/products/fd-series-foam-densifiers">www.avaicg.com/products/fd-series-foam-densifiers</a>
Densifyer - melt	<b>Avangard Innovative</b>	(FD Series) FD-10	50 lb/h Compacted Ratio 90:1	<a href="http://www.avaicg.com/products/fd-series-foam-densifiers">www.avaicg.com/products/fd-series-foam-densifiers</a>
Densifyer - melt	<b>Avangard Innovative</b>	(FD Series) FD-15	225 lb/h Compacted Ratio 90:1	<a href="http://www.avaicg.com/products/fd-series-foam-densifiers">www.avaicg.com/products/fd-series-foam-densifiers</a>
Densifyer - melt	<b>Avangard Innovative</b>	(FD Series) FD-20	150 lb/h Compacted Ratio 90:1	<a href="http://www.avaicg.com/products/fd-series-foam-densifiers">www.avaicg.com/products/fd-series-foam-densifiers</a>
Densifyer - melt	<b>Avangard Innovative</b>	(FD Series) FD-25	300 lb/h Compacted Ratio 90:1	<a href="http://www.avaicg.com/products/fd-series-foam-densifiers">www.avaicg.com/products/fd-series-foam-densifiers</a>
Densifyer - melt	<b>Avangard Innovative</b>	(FD Series) FD-35	1000 lb/h Compacted Ratio 90:1	<a href="http://www.avaicg.com/products/fd-series-foam-densifiers">www.avaicg.com/products/fd-series-foam-densifiers</a>
Densifyer - melt	<b>Avangard Innovative</b>	(FB Series) FB-285	450 lb/h Compacted Ratio 90:1	<a href="http://www.avaicg.com/products/fb-series-foam-densifiers">www.avaicg.com/products/fb-series-foam-densifiers</a>
Densifyer - melt	<b>Avangard Innovative</b>	(FB Series) FB-585	550 lb/h Compacted Ratio 90:1	<a href="http://www.avaicg.com/products/fb-series-foam-densifiers">www.avaicg.com/products/fb-series-foam-densifiers</a>
Densifyer - melt	<b>Avangard Innovative</b>	(FB Series) FB-205	350 lb/h Compacted Ratio 90:1	<a href="http://www.avaicg.com/products/fb-series-foam-densifiers">www.avaicg.com/products/fb-series-foam-densifiers</a>
Densifyer - Cold Compression	<b>Hasswell</b>	CP370	150-200 kg/h Reduction Vol.: 50:1	<a href="http://www.hasswell.com/category/eps-compactor">www.hasswell.com/category/eps-compactor</a>
Densifyer - Cold Compression	<b>Seabright</b>	Bright Technologies PBX2 EPS Pre-Breaker: D30	300 lbs/h	<a href="http://www.sebrightproducts.com/products/bright-technologies/densifiers">www.sebrightproducts.com/products/bright-technologies/densifiers</a>
Densifyer - Cold Compression	<b>Seabright</b>	Bright Technologies PBX2 EPS Pre-Breaker: D120	800- 1200 lbs/h	<a href="http://www.sebrightproducts.com/products/bright-technologies/densifiers">www.sebrightproducts.com/products/bright-technologies/densifiers</a>
Densifyer - Cold Compression	<b>Runi</b>	SK120 Screw Compactor	18-20 kg/h Compacted Ratio: 50:1 Energy Consumption: 1.5 kw	<a href="http://www.runi.eu/machines/runi-sk120">www.runi.eu/machines/runi-sk120</a>
Densifyer - Cold Compression	<b>Recycle Tec</b>	XT 70	50 lbs/h	<a href="http://www.recycletechno.com/products/xt70.html">www.recycletechno.com/products/xt70.html</a>
Densifyer - Cold Compression	<b>Recycle Tec</b>	XT 200	200 lbs/h	<a href="http://www.recycletechno.com/products/xt200.html">www.recycletechno.com/products/xt200.html</a>
Densifyer - Cold Compression	<b>Recycle Tec</b>	XT 400	400 lbs/h	<a href="http://www.recycletechno.com/products/xt400.html">www.recycletechno.com/products/xt400.html</a>
Densifyer - Cold Compression	<b>Recycle Tec</b>	XT 500	500 lbs/h	<a href="http://www.recycletechno.com/products/xt500.html">www.recycletechno.com/products/xt500.html</a>
Densifyer - Cold Compression	<b>Recycle Tec</b>	XT 700	700 lbs/h	<a href="http://www.recycletechno.com/products/xt700.html">www.recycletechno.com/products/xt700.html</a>

Densifyer - Cold Compression	<b>Heger</b>	Tiger 130 Series	22-33 lbs/h	<a href="http://www.foamequipment.com/tiger-series">www.foamequipment.com/tiger-series</a>
Densifyer - Cold Compression	<b>Heger</b>	Tiger 130-160	33-45 lbs/h	<a href="http://www.foamequipment.com/tiger-series">www.foamequipment.com/tiger-series</a>
Densifyer - Cold Compression	<b>Heger</b>	Tiger 200 T	75-110 lbs/h	<a href="http://www.foamequipment.com/tiger-series">www.foamequipment.com/tiger-series</a>
Densifyer - Cold Compression	<b>Heger</b>	Lion 130	25-35 lbs/h	<a href="http://www.foamequipment.com/lion-series">www.foamequipment.com/lion-series</a>
Densifyer - Cold Compression	<b>Heger</b>	Lion 200	100-130 lbs/h	<a href="http://www.foamequipment.com/lion-series">www.foamequipment.com/lion-series</a>
Densifyer - Cold Compression	<b>Heger</b>	Lion 300	175-265 lbs/h	<a href="http://www.foamequipment.com/lion-series">www.foamequipment.com/lion-series</a>
Densifyer - Cold Compression	<b>Heger</b>	Lion 400	330-440 lbs/h	<a href="http://www.foamequipment.com/lion-series">www.foamequipment.com/lion-series</a>
Densifyer - Cold Compression	<b>PolyMax</b>	Polymax 6500 Series	500 lbs/h	<a href="http://www.polymax5000.com/products.html">www.polymax5000.com/products.html</a>
Densifyer - Cold Compression	<b>PolyMax</b>	Polymax 550 Series	250 lbs/h	<a href="http://www.polymax5000.com/products.html">www.polymax5000.com/products.html</a>
Densifyer - Cold Compression	<b>PolyMax</b>	Polymax	150 lbs/h	<a href="http://www.polymax5000.com/products.html">www.polymax5000.com/products.html</a>
Densifyer - Cold Compression & Shredder	<b>Avangard Innovative</b>	(C Series) FD-2000	200 lb//h Compacted Ratio 60:1	<a href="http://www.avaicg.com/products/c-series-foam-densifiers">www.avaicg.com/products/c-series-foam-densifiers</a>
Densifyer - Cold Compression & Shredder	<b>Avangard Innovative</b>	(C Series) FD- 3000	500 lb/h Compacted Ratio 60:1	<a href="http://www.avaicg.com/products/c-series-foam-densifiers">www.avaicg.com/products/c-series-foam-densifiers</a>
Densifyer - Cold Compression & Shredder	<b>Harden</b>	SP130	2-6 m3/h	<a href="http://www.hardenmachinery.com/en-eps-recycling.html">www.hardenmachinery.com/en-eps-recycling.html</a>
Densifyer - Cold Compression & Shredder	<b>Harden</b>	CP180	5-12 m3/h	<a href="http://www.hardenmachinery.com/en-eps-recycling.html">www.hardenmachinery.com/en-eps-recycling.html</a>
Densifyer - Cold Compression & Shredder	<b>Harden</b>	CP250	10-20 m3/h	<a href="http://www.hardenmachinery.com/en-eps-recycling.html">www.hardenmachinery.com/en-eps-recycling.html</a>
Densifyer - Cold Compression & Shredder	<b>Harden</b>	CP370	25-35 m3/h	<a href="http://www.hardenmachinery.com/en-eps-recycling.html">www.hardenmachinery.com/en-eps-recycling.html</a>
Densifyer - Cold Compression	<b>Green Max/Intco</b>	(Apolo Series) A- Silo System	300 kg/h Compacted Ratio 50:1 Density: 200-400 kg/m3	<a href="http://www.intcorecycling.com/Polystyrene-Recycling-System-GREENMAX-APOLO-SILO-S.html">www.intcorecycling.com/Polystyrene-Recycling-System-GREENMAX-APOLO-SILO-S.html</a>
Densifyer - Cold Compression	<b>Green Max/Intco</b>	(Apolo Series) A-C200	200 kg/h Compacted Ratio 50:1 Density: 200-400 kg/m3 Total Power: 19.55 kw	<a href="http://www.intcorecycling.com/Styrofoam-Recycling-Machine-GREENMAX-APOLO-C200.html">www.intcorecycling.com/Styrofoam-Recycling-Machine-GREENMAX-APOLO-C200.html</a>
Densifyer - Cold Compression	<b>Green Max/Intco</b>	(Apolo Series) A-C100	100 kg/h Compacted Ratio 50:1 Density: 200-400 kg/m3 Total Power: 10.25 kw	<a href="http://www.intcorecycling.com/EPS-Styrofoam-Densifier-GREENMAX-APOLO-C100.html">www.intcorecycling.com/EPS-Styrofoam-Densifier-GREENMAX-APOLO-C100.html</a>
Densifyer - Cold Compression	<b>Green Max/Intco</b>	(Apolo Series) A-SWD System	300 kg/h Compacted Ratio 50:1 Density: 200-400 kg/m3	<a href="http://www.intcorecycling.com/EPS-Recycling-System-A-SWD-System.html">www.intcorecycling.com/EPS-Recycling-System-A-SWD-System.html</a>
Densifyer - Cold Compression	<b>Green Max/Intco</b>	(Zeus Series) Zeus C200-Surface Melting Technology (might not be densifyer cold)	200 kg/h Compacted Ratio 50:1 Density: 200-400 kg/m3 Total Power: 26.05 kw	<a href="http://www.intcorecycling.com/EPE-Foam-Recycling-Machine-GREENMAX-ZEUS-C200.html">www.intcorecycling.com/EPE-Foam-Recycling-Machine-GREENMAX-ZEUS-C200.html</a>
Densifyer - Cold Compression	<b>Green Max/Intco</b>	(Mars Series) Mars C200-Melter	200 kg/h Compacted Ratio 90:1 Density: 600-800 kg/m3 Total Power: 60 kw	<a href="http://www.intcorecycling.com/eps-foam-hot-melting-machine-greenmax-mars-c200.html">www.intcorecycling.com/eps-foam-hot-melting-machine-greenmax-mars-c200.html</a>

Extruder	<b>Coperion</b>	(ZSK Series) ZSK MC18		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/zsk-mc18">www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/zsk-mc18</a>
Extruder	<b>Coperion</b>	(ZSK Series) ZSK 18 Megalab		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/zsl-megalab-laboratory-extruder">www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/zsl-megalab-laboratory-extruder</a>
Extruder	<b>Erema</b>	Intarema T und E		<a href="http://www.ereama.at/en/general_tte">www.ereama.at/en/general_tte</a>
Extruder	<b>Erema</b>	Intarema TVEplus (not EPS)		Brochure Intarema TVEplus pdf
Extruder	<b>Coperion</b>	(ZSK Series) Megacomounder		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/zsk-megacomounder">www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/zsk-megacomounder</a>
Extruder	<b>Coperion</b>	(ZSK Series) ZSK Megavolume PLUS		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/zsk-megavolume-plus">www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/zsk-megavolume-plus</a>
Extruder	<b>Coperion</b>	(ZSK Series) Kombiplast		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/kombiplast">www.coperion.com/en/compounding-extrusion/machines-systems/zsk-series/kombiplast</a>
Pelletizer	<b>Erema</b>	Intarema K		<a href="http://www.ereama.at/en/general_k">www.ereama.at/en/general_k</a>
Pelletizer	<b>Coperion</b>	Strand Pelletizer		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/strand-pelletizer">www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/strand-pelletizer</a>
Pelletizer	<b>Coperion</b>	EGR Eccentric Pelletizer		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/egr-eccentric-pelletizer">www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/egr-eccentric-pelletizer</a>
Pelletizer	<b>Coperion</b>	UG Underwater Pelletizer		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/ug-underwater-pelletizer">www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/ug-underwater-pelletizer</a>
Pelletizer	<b>Coperion</b>	WRG Waterring Pelletizer		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/wrg-waterring-pelletizer">www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/wrg-waterring-pelletizer</a>
Pelletizer	<b>Coperion</b>	ZGF Centric Pelletizer		<a href="http://www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/zgf-centric-pelletizer">www.coperion.com/en/compounding-extrusion/machines-systems/pelletizers/zgf-centric-pelletizer</a>
Pelletizer	<b>AMUT</b>	PES 300 M90 + EA 90	5% Moisture - 500 kg/h 20% Moisture - 350 kg/h	AMUT Pelletizing Wet Film Technology PDF
Pelletizer	<b>AMUT</b>	PES 600 M315 + EA 160	5% Moisture - 1200 kg/h 20% Moisture - 1000 kg/h	AMUT Pelletizing Wet Film Technology PDF
Pelletizer	<b>AMUT</b>	PES 600 M400 + EA 180	5% Moisture - 1700 kg/h 20% Moisture - 1400 kg/h	AMUT Pelletizing Wet Film Technology PDF
Pre-Crusher	<b>Seabright</b>	Pre-Crusher Compactor	2.5-7 Cubic Yard Chamber Capacity	<a href="http://www.seabrightproducts.com/products/seabright-products/precrusher-compactors">www.seabrightproducts.com/products/seabright-products/precrusher-compactors</a>
Pre-Crusher	<b>Runi</b>	Heavy Duty Pre-Crusher		<a href="http://www.runi.eu/machines/heavy-duty-pre-crusher">www.runi.eu/machines/heavy-duty-pre-crusher</a>
Pre-Crusher	<b>NEPCO</b>	NE-1200	500-580 kg/h Energy Consumption: 100 kw	<a href="http://www.environmental-expert.com/products/ne-1200-recycling-machine-308626">www.environmental-expert.com/products/ne-1200-recycling-machine-308626</a>
Pre-Crusher	<b>NEPCO</b>	NE-H4340	2000-3000 kg/h	<a href="http://www.environmental-expert.com/products/ne-h4340-horizontal-compressing-machine-308633">www.environmental-expert.com/products/ne-h4340-horizontal-compressing-machine-308633</a>
Pre-Crusher	<b>Heger</b>	Tiger 200 B Series	110-130 lbs/h	<a href="http://www.foamequipment.com/tiger-series">www.foamequipment.com/tiger-series</a>
Pre-Crusher	<b>Heger</b>	Tiger 300 B Series	180-260 lbs/h	<a href="http://www.foamequipment.com/tiger-series">www.foamequipment.com/tiger-series</a>
Pre-Crusher	<b>Heger</b>	Tiger 400 B Series	330-440 lbs/h	<a href="http://www.foamequipment.com/tiger-series">www.foamequipment.com/tiger-series</a>
Pre-Crusher	<b>Runi</b>	SkK240 Screw Compactor	75 kg/h Energy Consumption: 1.1 kw or 5.5 kw	<a href="http://www.runi.eu/machines/runi-sk240">www.runi.eu/machines/runi-sk240</a>
Pre-Crusher	<b>Runi</b>	SK370 Screw Compactor	200 kg/h Energy Consumption: 1.1 kw or 5.5 kw	<a href="http://www.runi.eu/machines/runi-sk370">www.runi.eu/machines/runi-sk370</a>



Pre-Crusher	<b>Runi</b>	Fully Automatic System with Silo Buffer	1000 kg/h Compacted Ratio: 50:1	<a href="http://www.runi.eu/machines/silo-systems">www.runi.eu/machines/silo-systems</a>  <a href="http://www.runi.eu/wp-content/uploads/2011/01/1230564052_SILO-SYSTEMS_EPS_UK.pdf">www.runi.eu/wp-content/uploads/2011/01/1230564052_SILO-SYSTEMS_EPS_UK.pdf</a>
Shredder & Extruder	<b>Erema</b>	Coax		<a href="http://www.erima.at/en/general_coax">www.erima.at/en/general_coax</a>
Shredder	<b>Hasswell</b>	FS180	40-60 kg/h	<a href="http://www.foam-compactor.com/eps-foam-shredder">www.foam-compactor.com/eps-foam-shredder</a>
Shredder	<b>Hasswell</b>	FS250	60-100 kg/h	<a href="http://www.foam-compactor.com/eps-foam-shredder">www.foam-compactor.com/eps-foam-shredder</a>
Shredder	<b>Hasswell</b>	FS370	100-130 kg/h	<a href="http://www.foam-compactor.com/eps-foam-shredder">www.foam-compactor.com/eps-foam-shredder</a>







To learn more or to get involved,  
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