

A package deal— Recycle-friendly and brand-enhancing shrink labels

Minimize waste. Maximize RPET yield.



See inside . . .

- Review of recycling challenges for traditional shrink labels
- Recycling advantages with deseaming technology
- Review of deseaming benefits throughout the value chain
- Gatorade®—a shrink label success story

Executive summary

Eye-catching shrink labels with 360° graphics provide brands with a hard-to-resist marketing punch—it's their last opportunity to influence the consumer's buying decision. At the same time, they need a recycle-friendly shrink label that enables PET recyclers to increase their recycled PET (RPET) yield.

Now brand owners can have both the superior performance benefits they've come to expect with Eastman Embrace™ LV copolyester and a recycle-friendly full-body shrink label. Brands can experience both with only a change in the label's seaming adhesive.

Eastman and Sun Chemical introduce SunLam™ Deseaming Technology—a deseamable adhesive that helps increase the recyclability of shrink-labeled containers. This technology has received the Responsible Innovation Acknowledgement from the Association of Plastics Recyclers (APR).

The appeal: brand owners prefer shrink film labels.

It's been proven that full-body shrink sleeve labels, when combined with uniquely shaped containers, will draw consumers to products on the shelf. The extra space provided by full-body shrink sleeves allows colorful and eye-catching designs and provides a larger canvas for brand owners to communicate with prospective customers. Shrink sleeves sell product.

By allowing 360° graphics on highly contoured bottles, shrink labels make a powerful impression and add value because they:

- Grab attention
- Communicate product information
- Encourage consumer trial
- Enhance brand presence
- Build brand loyalty

Many brands have experienced this for themselves by making the switch to shrink labels. Extending the Gatorade product line with shrink labels made of Eastman Embrace™ LV copolyester

may have helped increase the brand's market leadership. At the end of this report, see the *Gatorade success story* on their experience growing market share in a historically flat market segment and their packaging change utilizing Embrace LV.

Sustainability is good business.

Shrink labels have been proven to entice buyers, and we also know that environmental concerns influence consumer buying decisions. Sustainability is no longer just a buzz word. It has become an important factor for businesses to consider when designing new products and packaging. It is now included in many corporate long-term strategic objectives.

Brand owners may hear that shrink-sleeve labels can cause packaging to be nonrecyclable. This may bring up questions about the recycling process.

The recyclability of packaging can impact the success of a brand. Over the past 10 years, the shrink-sleeve label market has grown significantly and the recycling community has become vocal about the issues they face with shrink sleeves. Brand and marketing managers need a solution that enhances the recyclability of their packaging and will continue to drive growth of their products.

So what solutions are available to the brand owner? How will those solutions impact the recyclability of packaging and improve the yield for recyclers?

Brands can enjoy the advantages of shrink film labels while supporting higher RPET volume.



What attracts consumer attention?

Eye-catching colors and shapes drive more purchase decisions.

Source: Chandon, et al. *Journal of Retail Analytics*, 2009.



The story: PET recycling challenges

Five years ago, recyclers brought to everyone's attention problems they were experiencing with shrink labels. Recyclers were experiencing a steadily rising volume of shrink-labeled PET containers which were not recyclable—estimated at 5% of PET bale volume. As a result, the shrink-labeled bottles were being removed from the RPET stream, a sizable loss in yield.

In 2012, the National Association of PET Container Resources (NAPCOR) and the Association of Plastic Recyclers (APR) broadly requested that brands stop using shrink labels or change to floatable labels.

North American recycling communities reported the following challenges:

- Shrink labels do not come off in the PET recycling process unless delabeling equipment is installed, which is a capital investment.
- The quality and value of RPET flake is reduced if it is contaminated with labels.
- Shrink film labels in the recycle stream can block identification of clear PET bottles, causing them to be removed and not recycled.
- RPET yield can be reduced by 5% as shrink-labeled PET bottles are removed from the recycling process.

The fact is, shrink labels aren't going away—they help brands sell product. Shrink labels were a big issue in 2012, but since then, there has been much effort towards improvement, technology has evolved, and there are now options available.

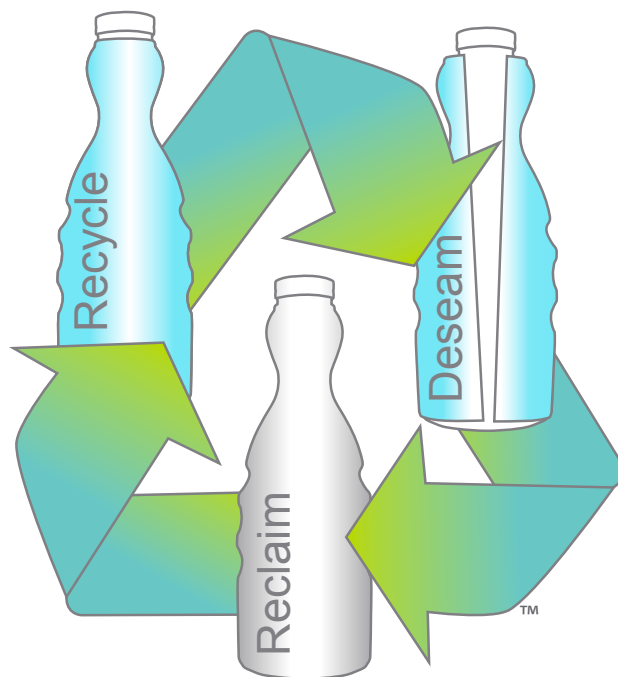
This white paper describes a simple new technology for removing full-wrap shrink labels during the recycling process without changing to floatable labels—and the benefits this can provide throughout the value chain. Cost is minimal and only requires a change in adhesive when using Embrace LV resin (PETG) for shrink label film.

Eastman finds cooperation throughout the value chain.

Looking for viable means to address recycling challenges, organizations throughout the value chain wanted to help PET recyclers minimize waste and improve RPET yield.

In 2012, Eastman organized a consortium of approximately 100 members from 50 companies, representing resin suppliers, shrink film manufacturers, recyclers, ink suppliers, print converters, brand owners, APR, and equipment suppliers.

The consortium focused on better understanding of the issues and identifying technologies that provided a win-win result for all members of the shrink label value chain. Thanks to this collaboration, technology advanced and several options have been identified and tested. While no single solution addresses all the issues of PET recyclers, options emerged to help recyclers improve yield while still allowing brand owners to enjoy the benefits of full-wrap shrink labels.



Sun Chemical SunLam™ Deseaming Technology provides an innovative, practical answer.

New SunLam™ Deseaming Technology enables shrink labels to deseam and release in the whole bottle wash—the first step in the PET wet recycling process. In the U.S., 74% of wet recyclers receive their supply from curbside collection and generate RPET flake that goes back into bottles (see flowchart).

- For good removal rate, the label temperature needs to reach 75°C with 1% caustic water, which is usually achieved with typical whole bottle wash processing conditions.
- Greater than 99% label removal is achievable with the preceding requirements, avoiding the need to separate labels from the PET flake during the sink/float step later in the recycle process.
- With labels deseamed and removed early in the recycle process, interference with optical, color, or manual sorts during recycling is no longer an issue. This helps minimize the removal of recyclable PET bottles and increase RPET yield.
- The result is higher RPET yield and quality for most PET recyclers that use wet recycling.

Brands and print converters using shrink film made from Embrace LV can help improve recyclability of PET bottles by only changing their adhesive to Sun Chemical SunLam™ Deseaming Technology. As a result:

- No design or label changes are required from currently preferred labels made with Embrace LV resins.
- Minimal changes in the current labeling process are required—avoiding capital investment.
- It runs at seaming speeds comparable to solvent bonding.
- Brands experience no compromise in label quality.



Trials demonstrate impressive results.

- Five recycling trials have been conducted at two commercial recyclers with greater than 99% label removal using typical whole bottle wash processing conditions.
- Successful seaming trials have been conducted with five print converters.
- The labels passed a distribution trial with a major U.S. beverage brand.

Benefits throughout the value chain

Shrink labels made with Eastman Embrace™ LV copolyester (PETG) and seamed with Sun Chemical SunLam™ Deseaming Technology offer opportunities and value for all stakeholders, from brand owners to print converters, recyclers, and customers.

Brand owner

- SunLam™ Deseaming Technology is an APR Responsible Innovation recipient.
- It enables brands to be compliant with Sustainable Packaging Coalition (SPC) requirements and use How2Recycle (H2R) on their labels.
- Brand owners can continue to use proven Embrace LV—no compromise in label quality.
- Brand owners can continue using the package and label consumers recognize—no package or label changes required.
- Brand owners can continue using attention-grabbing, full-body shrink labels—there's no “80% label coverage” restriction as needed for floatable shrink labels.
- Product labels look better on the shelf—labels withstand the stresses of distribution.

Print converter

- They can continue using current labeling process—no capital investment required.
- They can produce high quality shrink labels by simply changing the seaming adhesive.
- The technology has very low VOC, $\leq 5\%$, and is formulated with no HAP-listed solvent.
- It can run at seaming speeds comparable to solvent bonding.

Recycler

- Improves the recyclability of PET containers—which helps improve RPET yield.
- The technology minimizes misidentification of PET bottles (see flowchart).
- The technology works for the majority of PET recyclers.
- Avoids the need to separate labels from PET flake during the sink/float step later in the recycle process.
- Works with current wet recycling process with no capital investment.

Consumer

- SunLam™ Deseaming Technology helps satisfy consumers' desire to recycle and protect the environment.
- Consumers can recognize their favorite brand—they see the same quality and recognizable brand label and bottle shape.
- Consumers don't need to tear off labels for recycling—they can simply toss them in the recycle bin.
- Consumers see a high quality, durable label that withstands the stress of distribution—and reinforces brand loyalty.

The How2Recycle labeling system

Brands that are members of How2Recycle (H2R) and using Eastman Embrace LV with Sun Chemical SunLam™ Deseaming Technology are now eligible to use the How2Recycle labels on their packaging.

H2R, a project of the Sustainable Packaging Coalition, is a voluntary, standardized labeling system that clearly communicates recycling instructions to the public.

H2R goals

- Increase the availability and quality of recycled materials
- Reduce confusion regarding the recyclability of packaging components
- Improve the reliability, completeness, and transparency of recyclability claims

Eastman is proud to join more than fifty companies now participating in H2R, the only labeling system that follows the Federal Trade Commission's Guidelines for Environmental Marketing Claims. For more information, contact your Eastman representative or visit www.howtorecycle.info.



How SunLam™ Deseaming Technology fits with the wet recycling process

The majority of recyclers receiving PET bottles use a wet recycling process. The following process diagram demonstrates how deseaming technology is designed to work in the whole bottle wash. Here are the steps in the wet-grind process the recycled PET bottles go through once they reach the recycler.

1. The PET bale is separated and sent into the whole bottle wash process. This is where the labels seamed with the SunLam™ Deseaming Technology are effective.

The whole bottle wash cleans bottles and dissolves hot-melt adhesive on traditional roll-applied labels. With deseaming technology, > 99% of the labels are deseamed and removed at this stage. This is confirmed by trials at two commercial recycle facilities with typical whole bottle wash processing conditions.

2. Next, the PET moves through the various sortation steps. Sortation technology and manual sorting cannot detect whether a traditional label is floatable, so it is removed to avoid the risk of contaminating the PET flake—reducing RPET yield.

a. Optical sortation: The equipment has a hard time seeing the clear PET bottle underneath a full-body shrink label. Therefore, bottles with shrink labels made from PVC, OPS, or PP may also be removed—reducing RPET yield.

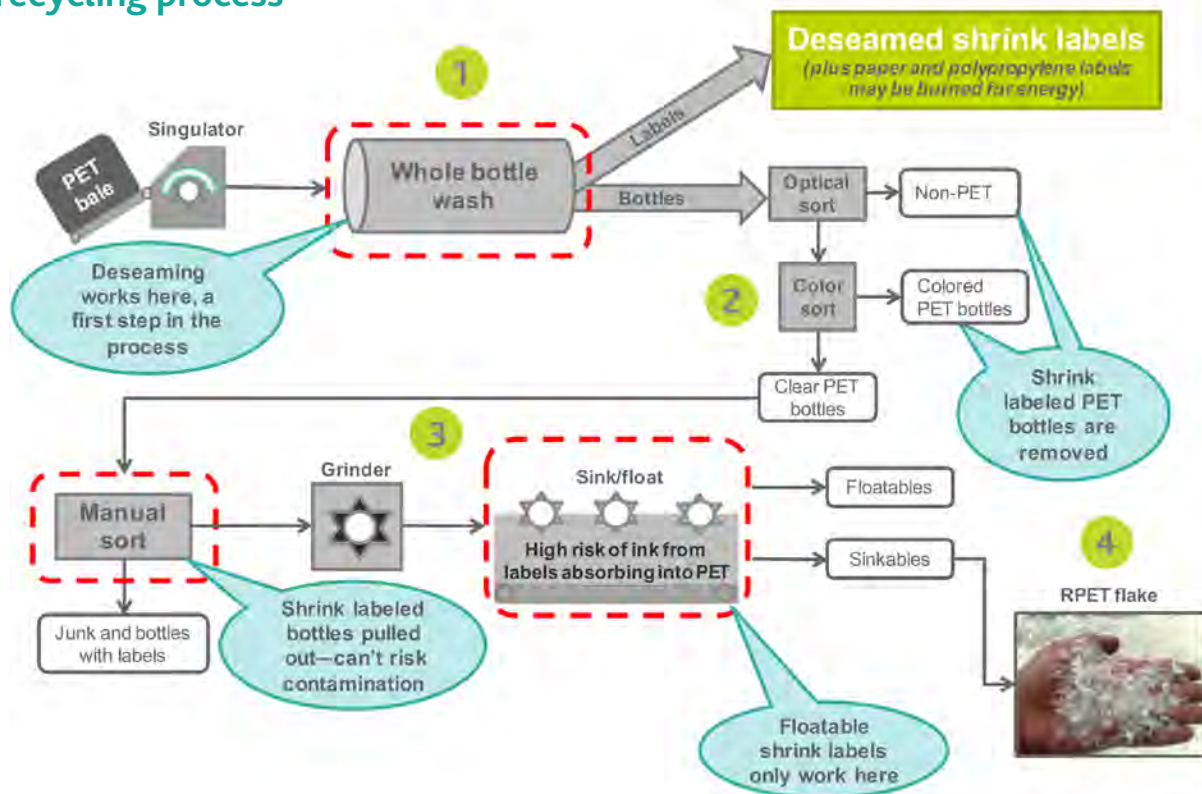
b. Color sortation: Various colored PET bottles are removed, PLUS any clear PET bottles with full-body shrink labels are also removed—reducing RPET yield.

c. Manual sortation: All remaining contaminants, which include shrink-labeled bottles, are removed—reducing RPET yield.

3. Next, everything left is ground up and sent to the sink/float tank. This is where floatable materials (PP caps, HDPE labels, floatable shrink labels) are skimmed off and go to the PP cap and label flake stream.

4. The sinkables go into the RPET flake stream.

Wet recycling process*



*Simplified process diagram

Gatorade success story

Gatorade® finds success with a new shape and shrink label.



Previous design



New design

In 2012, Gatorade introduced a new shaped bottle with a shrink label. The previous bottle label was a traditional roll-applied OPP film. The new contoured bottle, designed to better fit the hand, features a shrink label made from Eastman Embrace™ LV copolyester. From 2012 to 2015, Gatorade experienced an impressive growth rate in sales with the line addition,¹ while the sports drink market growth has remained relatively flat.^{2,3}

¹Neither Eastman nor Nielsen makes definitive claims that labeling and bottle shape are the sole reasons for the sales trends.

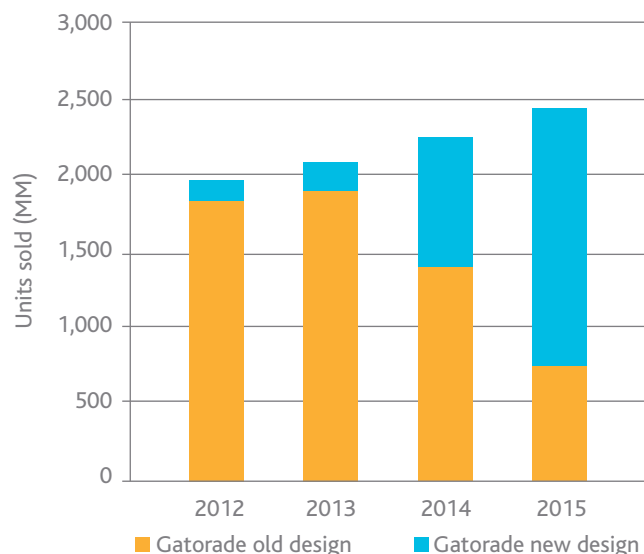
²Market Realist, *Nonalcoholic Beverages: How Have US Consumers' Tastes Changed*. <http://marketrealist.com/2016/03/insight-transition-us-nonalcoholic-beverage-choices/>

³Bevnet, March-April 2017, *Channel Check: What's hot and what's not*

Gatorade bottle and label redesign

Roll-applied OPP label changed to Embrace LV (PETG)

Gatorade sales growth



Source: AC Nielsen's research, which tracks the sales history of sports drink bottles



For more information, visit www.LinkToShrink.com.



About Sun Chemical

Sun Chemical, a member of the DIC group, is a leading producer of printing inks, coatings and supplies, pigments, polymers, liquid compounds, solid compounds, and application materials.



Eastman Corporate Headquarters

P.O. Box 431
Kingsport, TN 37662-5280 U.S.A.

U.S.A. and Canada, 800-EASTMAN (800-327-8626)
Other Locations, +(1) 423-229-2000

www.eastman.com/locations

Although the information and recommendations set forth herein are presented in good faith, Eastman Chemical Company ("Eastman") and its subsidiaries make no representations or warranties as to the completeness or accuracy thereof. You must make your own determination of its suitability and completeness for your own use, for the protection of the environment, and for the health and safety of your employees and purchasers of your products. Nothing contained herein is to be construed as a recommendation to use any product, process, equipment, or formulation in conflict with any patent, and we make no representations or warranties, express or implied, that the use thereof will not infringe any patent. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS AND NOTHING HEREIN WAIVES ANY OF THE SELLER'S CONDITIONS OF SALE.

Safety Data Sheets providing safety precautions that should be observed when handling and storing our products are available online or by request. You should obtain and review available material safety information before handling our products. If any materials mentioned are not our products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

© 2017 Eastman. Eastman brands referenced herein are trademarks of Eastman or one of its subsidiaries or are being used under license. The ® symbol denotes registered trademark status in the U.S.; marks may also be registered internationally. Non-Eastman brands referenced herein are trademarks of their respective owners.