

AD CleanFlake™ Technical Guide

Labeling HDPE Containers

About AD CleanFlake™ Technology

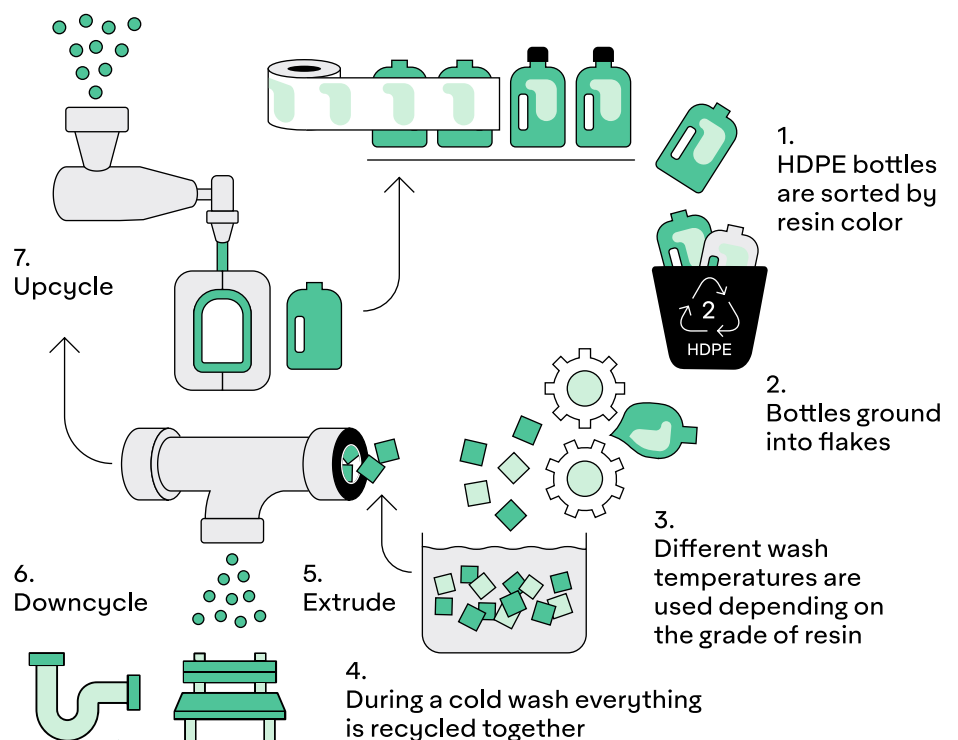
Recycled HDPE (rHDPE) is a valuable and sustainable material which can be recycled multiple times into new packaging. However, the challenge lies in eliminating contamination from the recycling stream. The new AD CleanFlake™ Portfolio of labeling solutions significantly improves the rHDPE yield in the recycling process while maintaining the shelf appeal for which pressure-sensitive labels are known for. AD CleanFlake™ technology allows for labels to stay with the HDPE containers during the recycling process without impacting rHDPE performance. AD CleanFlake™ is available globally and meets the highest standards of compliance in each region.

Recycling Pigmented HDPE with AD CleanFlake™ Technology

HDPE bottles can be recycled by reclaimers to create washed recycled HDPE flake or pellets, known as rHDPE. In order to be recycled, HDPE bottles must first be sorted by resin color (natural vs pigmented). AD CleanFlake technology is designed to work with the pigmented stream.

HDPE has the second highest recycling rate among plastics, but still less than 30% is collected for recycling in the United States.

The process used to recycle HDPE can be broken down into the following steps:



In the second step, HDPE bottles and containers are sorted and washed to help reduce contamination.

For HDPE recycling to work, there are a few main requirements the decoration or label must follow:

Multi-Colored (Commercial) Stream:

- Decoration allows for the HDPE bottle to be detected (<50 or 70% of the surface)
- Overall Density less than 1.00 g/cm³ (label+ink)
- Wash temperatures 20° C with no caustic
- Filmic label + inks stay on container and become part of the recycling stream

Converting AD CleanFlake™ Adhesive Technology

Converting

AD CleanFlake™ exhibits low ooze/bleeding resulting in little to no adhesive build up within the press or die cavities. When evaluating die cutting performance on a PET liner, a faint impression of each die cavity should be observed, which ensures appropriate die cutting through the adhesive to the liner. AD CleanFlake™ Adhesive technology offers good converting performance at speeds in excess of 500+ FPM or 150m/min. Note: Inconsistent die cutting in conjunction with too much applied tension in the finished rolls can lead to adhesive 'Halo' and 'Ooze' which can also contribute to back label transfer during label application.

Inks

Labels stay with the HDPE containers during the recycling process, therefore, inks should be chosen for optimal application performance.

In addition, the inks and varnish need to remain on the label during the wash. Based on current regional testing*, we can recommend per printing technology:

- UV inkjet – no varnish necessary*
- UV Flexo – varnish/over lamination recommended
- Toner – varnish/over lamination recommended
- Water-based flexo – not accepted by APR; can be tested with over lamination

Varnishes

A varnish may be used in place of an overlaminating film, but only after thorough testing to confirm the inks cannot be separated from the base label during the recycling process and that the ink will not stain the natural HDPE flake.

Overlaminating Films

Overlaminating films are typically needed to protect the ink during the natural HDPE recycling process. Water-based ink systems are prone to staining of the natural HDPE flake, even when used with an overlaminating film. Polypropylene films are recommended, as they have a total density of less than 1 g/cm³.

With recent market developments, there are over lamination films available as thin as 20–30 micron, both with PSA and available for adhesive application on press.

Metallized

Metal foil, metallized and metallic printed labels require testing to determine the appropriate APR recyclability category. Previously, the APR only recognized metallized labels under two square inches as complying with its critical guidance for HDPE and PET recycling. It was believed that larger metallized labels would cause a plastic bottle to be rejected by a recycler's metal detection hardware. The results of a new 2023 study confirm that metallized films can be a total of 30 square inches or below and be recognized in existing recycling streams. Avery Dennison metallized films with AD CleanFlake technology have been recognized for PET and HDPE recycling. Labels above 30 square inches require further testing. EPBP/PRE considers metallized labels detrimental to the recycling process. Using a metallized face usually results in reduction of RecyClass rating, e.g. from class B to class C when moving from a clear/white to a metallized face using the same adhesive.

Application

For beverage applications, appropriate Air Knife System & Heat Tunnel should be situated as close to the label applicator as possible, to remove any over-spill and condensation from the body and shoulders of the container, with the desired goal being a dry bottle prior to labeling.

There will be no change to applicator settings or wipe down mechanisms compared to general purpose adhesives on film labels with a similar liner supplied by Avery Dennison.

- Clean, dry bottle - minor condensation on the bottle will cause water whitening of the label which should dissipate within 24 hours, but larger water droplets would cause the water whitening to remain. The clarity of the adhesive is very good on dry HDPE bottles, but where there are water droplets or excessive condensation on the HDPE bottles, the adhesive can become cloudy and give a milky appearance. Since the adhesive will turn white when there is water entrapment (droplets) behind the label, it is best to have bottles/containers as dry as possible prior to labeling.
- Label applicators should be clean and free of any residue, a scheduled maintenance should be set up to drive production efficiencies.
- Appropriate peel tip radius should be used, ie. film V paper
- Peel tip angles on the applicator are typically set at 10° – 20° angles to the container.
- Ensure adequate wipe down on label to release any entrapped air/moisture during label application - Squeegee or Wipe Down Pad would be the most efficient wipe down mechanism pending on label size and container shape.
- For AD CleanFlake™ with clear film on HDPE constructions, the appropriate sensors on the applicator are needed for clear-on-clear film labels
- Product can be dispensed at 200+ units per minute.

Compliance with local recycling

In most of the world, recycling guidelines are evolving and collection systems are still in their early stages. Navigating this complex chain can be confusing, but AD CleanFlake™ makes complying worldwide simpler as it fulfills most regional requirements. Listed below is a quick overview of the main requirements and considerations for North America.

North America

It is often a delicate balance to conform to Association of Plastic Recyclers (APR) guidelines while maintaining critical ink, coating, design and selection requirements. AD CleanFlake™ adhesive technology passes the APR Critical Guidance, which recognizes those who have met both the criteria of the APR Design® Guide, as well as the strictest criteria identified in the Guidance Documents.

- It is recommended to test ink systems for suitability with the APR guidelines without negatively impacting the converting and finished label quality
- UV based inks provide the best chance of meeting the APR requirements*
- In addition to the choice of substrate, ink systems should be tested for suitability with Design Guidelines, without negatively impacting conversion or finished label quality. To ensure clean separation between the label and the HDPE flake, the final (print+label+adhesive) layer must have a total density of less than 1.0 g/cm³ at ambient temperatures.
- Because HDPE bottles and containers can vary with respect to ease of recyclability, specific application testing to assure performance is highly recommended.

*Please note, each end use application must be certified.
As with all packaging applications, fit for use testing is required.

label.averydennison.com

03/2025

All Avery Dennison statements, technical information and recommendations are based on tests believed to be reliable but do not constitute a guarantee or warranty. All Avery Dennison products are sold with the understanding that purchaser has independently determined the suitability of such products for its purposes. All Avery Dennison products are sold subject to Avery Dennison's general terms and conditions of sale found at label.averydennison.com/en/home/terms-and-conditions.html.

© 2025 Avery Dennison Corporation. All rights reserved. The "Making Possible" tagline, Avery Dennison and all other Avery Dennison brands, product names and codes are trademarks of Avery Dennison Corporation. All other brands or product names are trademarks of their respective owners. Fortune 500® is a trademark of Time, Inc. Branding and other information on any samples depicted are fictitious. Any resemblance to actual names is purely coincidental.