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An Avure Packaging Primer - Bottles for HPP

How bottles containing juices, smoothies, and more can be used for HPP



Package Type:

Semi-rigid, sealed polymer containers primarily used for liquid products consumers consume directly from the bottle or easily pour for use. Typically labeled.

Typical HPP Product Uses:

- Juices (fruit, vegetable & blends)
- Smoothies
- Milk, colostrum, and other dairy drinks
- Cleanses and other health regimen drinks

Key Characteristics:

- Openings at top of container sized for direct consumer consumption
- Twist tops for easy opening and resealing,
- Height to width ratios of 1.5:1 to greater than 3:1

Bottled containers must also be sufficiently rigid for ease of gripping by consumer, while ensuring sufficient flexibility and resiliency to accommodate distortion from the head space compression experienced during the HPP cycle and return to original configuration after pressure release.



HPP Defined: Extreme Pressure and Water

Avure's HPP uses ultra-high pressure (up to 87,000 psi or 6,000 bar) and purified, cold water to keep packaged food and beverages pathogen-free, and stay fresh longer without preservatives or chemicals. Learn more at Avure-HPP-Foods.com

Typical Container Materials & Production Process:

- ***PET** - Injection stretch blow molded for clear containers.
- ***HDPE** - Blowmolded for translucent to opaque containers.
- PET bottles offer higher oxygen barrier than HDPE at common thicknesses.
- PET or HDPE bottles can be premade and shipped to filling location or for high volumes can be formed at filling location (PET from preforms).
- ***PP** - Commonly used as base material for closures, which can also incorporate thermoplastic elastomers (TPE) in some versions for tight seals.
- Induction sealable liners principally comprise aluminum foil combined with a heat seal peelable layer of LDPE or copolymer-type materials.
- Head space can be flushed with N₂ after filling to minimize oxygen in head space.

***NOTE** that glass or other non-deforming bottle structures are not suitable, as breakage will occur during headspace compression.



HPP helps orange juice retain 90 percent of its vitamin C even after 20 weeks of refrigeration.

Special Design Considerations:

- Cylindrical and square with rounded corner cross-sections preferred.
- Bottoms and top shoulders more rigid than sidewalls; head space compression taken up in sidewalls with no permanent distortion.
- Simple sidewall designs with no or minimal embossed or raised features that can permanently invert during head space compression.
- Use induction sealed liner on bottle opening or “plug-style” closures proven to perform in HPP cycle without allowing ingress of HPP process water or leakage of product.
- Properly sealed liners offer the greatest security, but growing consumer preference for ‘twist and consumer’ is pushing development and use of closures that will not be used with inner sealed liners. These must be rigorously tested to ensure the designs are capable of handling an expected range of head space without allowing process water ingress or product leakage during compression and decompression cycles.
- Bottle finish (threaded top portion) must be compatible with closure design; closure suppliers can supply insights to fine tune bottle finish designs.
- Pre-HPP process pressure sensitive or glue-applied labels should avoid water-absorbing materials, be well adhered over entire label surface to avoid water incursion between label and bottle sidewall, and undergo reversible sidewall distortion without visible effect.
- When using pre-applied shrink sleeve labels, avoid extreme bottle sidewall contour profiles to prevent fracturing of film label during compression.
- Test post-HPP applied labels to ensure proper adhesion and smooth lay on bottle surface at the application temperature and humidity conditions.



A Selection of HPP Products

HPP foods and beverages include ready-to-eat and ready-to-cook meats, fruits and vegetables, salsa and guacamole, juices and smoothies, ready meals, soups and sauces, wet salads and dips, dairy products, seafood and shellfish.