

JAN. 2016

An Avure Packaging Primer - Tubs, bowls, and cups for HPP

How tubs, bowls, cups, and more can be used for HPP



Package Type:

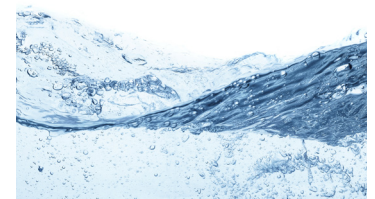
Semi-rigid, sealed polymer container capable of use for paste, solid/sauce mixtures or liquid products consumers either consume or dip directly from the container or spoon out into a serving dish. Typically labeled or decorated on sidewalls as well as on snap fit lids that cover film seals.

Typical HPP Product Uses:

- Guacamole, salsa
- Hummus, tabuli, and other dips
- Sauces, dressings
- Potato, pasta, egg and other salads
- Soups or broths

Key Characteristics:

- Generally round in cross-section, sometimes with subtle flat panels creating pseudo corners; typically premade by container supplier and provided in nested stacks to filling operation.
- Peel seal lid films on top flange of containers and post process applied snap fit lids.
- Wide openings for easy product access.
- Sufficiently rigid for ease of gripping by consumer, while ensuring sufficient flexibility and resiliency to accommodate distortion from the headspace 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

Key Characteristics (cont.):

- Can be gas flushed to limit oxygen in headspace and extend shelf life.

Typical Container Materials & Production Process:

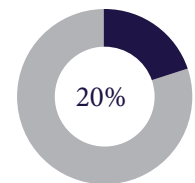
- PET - clear or pigmented containers.
- HDPE - translucent to opaque containers.
- PP - good contact clarity containers.
- Co-extruded structures can include EVOH or nylon for enhanced oxygen barrier; barrier lid films should be used in conjunction for high total package barrier.
- Majority of containers are thermoformed, but injection molded versions also possible, and make incorporation of in-mold labeling (IML) technology for integral sidewall labels. Injection molding also permits greater control over container thickness profiles and can achieve higher height to width ratios with good thickness profile control.
- Lid films range from oriented films with peel-seal layers to complex and heavy weight coextruded films.
- Snap fit lids or over caps are generally PET or PP, although PE versions can be used; they typically are monolayer, do not provide barrier and are labeled or decorated; they can be clear or opaque depending on the appearance of the product or marketing considerations.



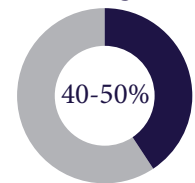
HPP helps orange juice retain 90 percent of its vitamin C even after 20 weeks of refrigeration.

Estimated Global Yearly Food Losses

Meat & Dairy Products



Fruits & Vegetables



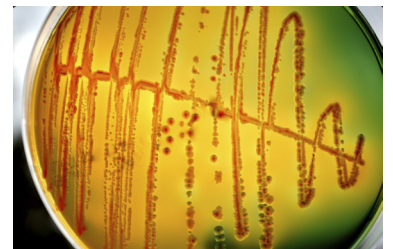
Special Design & Operational Considerations:

- Rounded corners at transition from sidewall to bottom preferred.
- Rigid flanges minimize stress of headspace compression on lid films, avoiding seal failure or fracture of barrier layers in film lidstock.
- Lid films must possess sufficient tensile strength to avoid permanent stretching during pressurization and good puncture resistance to withstand handling during processing prior to application of snap fit lids.
- Snap fit lids need not achieve liquid-tight seals after lid film removed, and typically are not barrier structures, but should convey reclosure security to consumers.
- Bottoms can incorporate contours (mainly recesses) to increase container stability and add strength to thermoformed versions.
- Simple sidewall designs with no or minimal embossed or raised features that can permanently invert during headspace compression are best.
- Minimizing headspace reduces the amount of distortion that must be taken up in sidewalls to avoid rupture or permanent deformation after pressure cycle; excessive headspace will lead to unacceptable container failure rates and downtime for clean up.
- While minimizing headspace, filling operations must avoid product contamination on top sealing flange or rim, as it will interfere with creation of strong seals that survive the pressure cycle.
- Alignment of containers in lid film heat-seal station crucial to create strong and uniform seals around the entire top flange or rim. Failure to achieve this will result in weak points that can rupture during pressure cycle.
- 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.



HPP inactivates dangerous foodborne pathogens, such as *E. coli* and *Listeria*.