

Cold-Fill-Hold Processes for Acid or Acidified Foods and Beverages

Some **acid or acidified foods** such as mustards or dessert sauces may lose quality if hot-filled. Some flexible or semi-rigid containers, or certain types of closures, are not compatible with a hot-fill process. For these products, you may wish to consider a cold-fill-hold process.

Regulations require that canned foods are **commercially sterile**, vegetative pathogens and spoilage organisms have been destroyed which may grow in the product under normal storage conditions. Products with certain formulations may be pasteurized in a pre-packaging heating step, cooled to room temperature and 'cold-filled' into a container and held for a given length of time. Researchers have identified the product characteristics and hold times and temperatures necessary to ensure safety for a product that is filled at room temperature (cold-filled).

NOTE: A Process Authority is usually required to evaluate a cold-fill-hold process and establish the critical factors that ensure product safety and protect public health.

For products with an equilibrium pH of 3.3 or below. Holding the product at 50°F (or higher) for 6 days (or longer), OR holding the product at 77°F (or higher) for 35 hours (or longer) will ensure safety.

Steps in the scheduled process for this product might be written as follows:

1. Clean and sanitize containers and closures.
2. Prepare formulation as directed in the Scheduled Process, pasteurize, and cool.
3. Fill prepared sauce into containers, minimum 50°F, setting ½" headspace. Apply closure. Invert.
4. Turn containers right side up and hold for 6 days, or longer, at 50°F, or higher in warehouse prior to distribution.

Reference: F. Breidt, J. Hayes, and R. McFeeters. 2007. Determination of 5-log reduction times for food pathogens in acidified cucumbers during storage at 10 and 25°C. Journal of Food Protection 70:2638-2641. Available [online](#).

For products with pH 3.5 or 3.8.

- Product equilibrium pH 3.5 or below:
 - Formulated to include 2.5% acetic acid
 - Hold time of **4 days or longer at 50°F or higher.**
- Produce equilibrium pH of 3.8 or below:
 - Formulated to include 2.5% acetic acid
 - Formulated to include 0.1% benzoic acid
 - Hold time of **3.6 days or longer at 50°F or higher.**

Reference: F. Breidt, K. Kay, J. Cook, J. Osborne, B. Ingham, and F. Arritt. 2013. Determination of 5-log reduction times for *Escherichia coli* O157:H7, *Salmonella enterica*, or *Listeria monocytogenes* in acidified foods with pH 3.5 or 3.8. Journal of Food Protection 76:1245-1249. Available [online](#).

There is no research currently available in the published literature that supports cold-fill-hold conditions for higher pH foods, for those with different formulations, or for products that are not pasteurized prior to cooling and filling.

Accurate recordkeeping that identifies, for each lot of product, pH and the hold temperature and the hold time, is critical for a product that is cold-filled. Likewise, careful recordkeeping will ensure that formulation standards and other critical factors in the Scheduled Process are met.



Extension

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