

Canning Unit Operations



Preliminary Operations :

Preliminary operations depend upon the type of food and could include inspection, preparation, cleaning, peeling, destoning and size reduction. Where it is used, water quality is important and there will be considerable waste for disposal.

Blanching is an important operation, using hot water or steam. Different products have different time/temperature combinations. Blanching inactivates enzymes and removes intracellular air, thereby helping to minimise the internal pressure generated on heating. It also increases the density of food and softens cell tissue, which facilitates filling and it further cleans the product as well as removing vegetative organisms. It may lead to some thermal degradation of nutrients and some leaching losses for hot water blanching.

Filling:

Filling is an important operation, both for the product and any brine syrup or sauce that may accompany it. Cans should be presterilized to ensure the removal of the contaminants. Then can is filled with selected food. This can be done manually or with the help of machines. Milks or carbonated drinks filling is done with the help by automated machines. It is important to achieve the correct filled and drained weights and headspace.

Sauces, brines and syrups may be used; and their composition may be covered by Codes of Practice.

Benefits of syruping and brining are following:

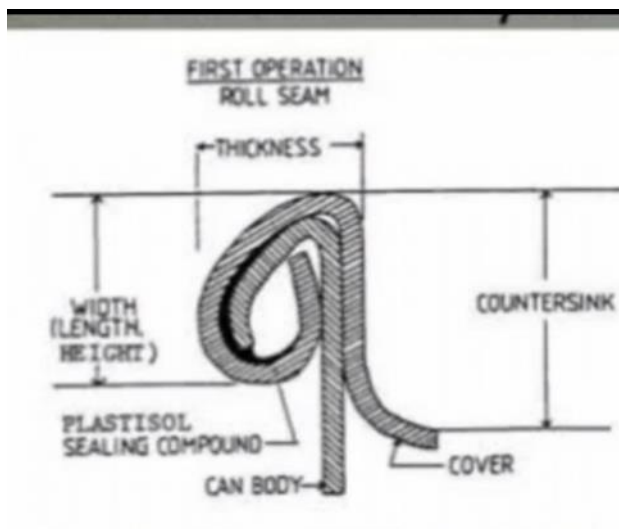
- To fill the interspaces between the food products so that air is driven out
- It improves the taste of the food
- Facilitate the heat transfer

Filling of syrup and brine in the containers is done at 79 to 82°C because the hot liquid helps to remove the air which is entrapped inside the can.

Lidding and clinching:

After adding syrup or brine into the can, the lid is placed on the open end of the can without sealing the can is called as Lidding. Meanwhile, during the exhausting operation there is a risk that the lid of the can may fall off and can contents spilled over. So, to avoid this condition the canners prefer to clinch the can. In this the curl end of the can is engaged with the flange of the can.

After syruing and brining the closing end of the jar or can is placed on the open end but without sealing it to the body of the can. This is known as lidding. But there is a danger that the lid of the can may drop during further processing therefore clinching is done. In this process the curl of the can end is engaged with the flange of the can.

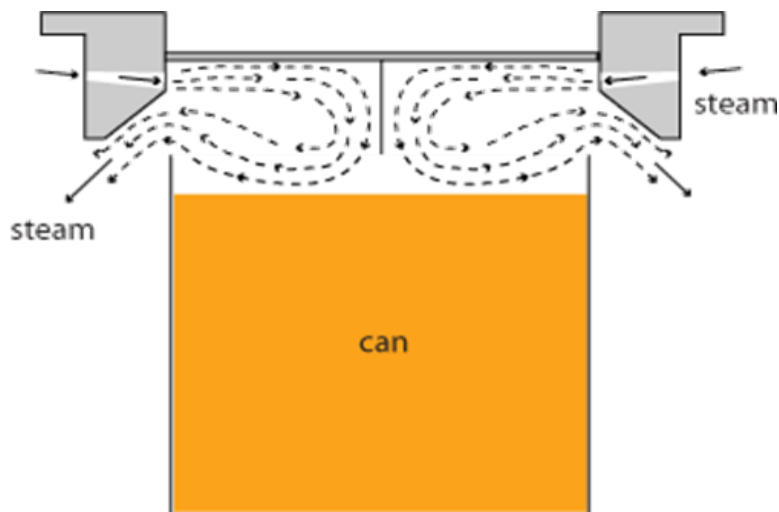


Clinching

Exhausting and Vacuuming:

Exhausting is another important process. It involves the removal of air prior to sealing, helping to prevent excessive pressure development in the container during heat treatment, which would increase the likelihood of damaging the seal.

The can contents contain air in the spaces between the food and the tissues of the food. Disadvantages of this air are that it can cause corrosion of the tin plates, aids oxidation processes in the food and also encourages the bacterial growth inside the can that survive the commercial sterilization. Therefore, it is essential to remove the air from the can by exhausting and mechanical means. By removing air vacuum is created in the can and vacuum prevent the undue strain on the can during heat processing.



Exhausting and Vacuuming in Can

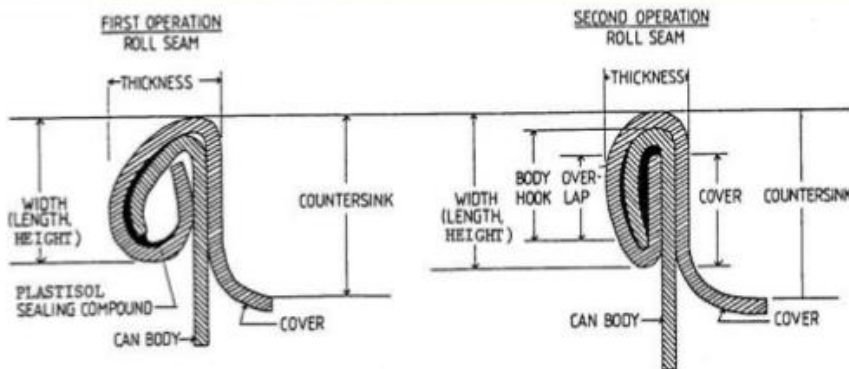
A cable exhaust box is used for removing air from inside the can. For fruits the exhausting temperature is 82 to 96°C. When the can reaches 77 to 82°C the can would have been exhausted. Exhausting time depends on the nature of the food material and also on the size and the type of the container.



Exhaust Box

Sealing:

When the cans comes out of exhaust box, these are hermetically sealed by the double seamer. At first the curl of the can was engaged with the flange of the can. Now simply a pressure is applied on that hermatic seal and can become seal permanently. It forms a strong mechanical structure like air and water tight.



a) Clinching

b) Sealing

Heat processing:

Heat processing means giving heat to cans at certain temperature to destroy all microorganisms and other food spoiling bacteria for a sufficient length of time. The main aim of food processors is to kill maximum microorganisms and minimum nutrients loss.

Effect of Heat Processing

The success of canning depends on how processing is performed, as well as the degree of vacuum inside the container and the quality of the seal. There are two major factors that determine the processing requirement of a particular food. These are

Lethality of Micro-Organisms and Heat penetration through container and food contents.

1) Lethality of Microorganisms

Nature and number of microorganisms, the environmental conditions in which microorganisms are to be heat processed and the time/temperature relationship affect lethality of microorganisms during heat processing

1.1 Nature and Number of microorganisms

Yeasts and mould are easily killed while bacteria are more heat resistant and required longer time or higher temperature for their destruction. Mature cells and spores are more heat resistant and hence difficult to kill. A material that contains mature cells and spores will require a severe heat treatment for thermal destruction. Hence greater number of microorganisms longer time will required to kill.

1.2 Food Composition :

The composition of food materials affect the heat resistance of microorganisms. Inorganic salts can increase or decrease the heat resistant. Microorganisms are influenced by the pH of the food. For practical purposes, in heat processing the food processor regards pH 4.5 as the dividing line between foods that can be heat processed at either 100.

1.3 Time and Temperature Relationship.

There is inverse relationship between time and temperature. For instance, in low acididc media, clostridium botulinum spores are destroyed at 100 °C in 330 minutes while at 121 °C in just 2.79 minutes. It is less harmful for the food to be exposed to high temperature for a short time than to the temperature for long time.

2. Heat Penetration throught the container and Food contents.

Factors that affect the heat processing into the food are

2.1 Nature and size of container

In canning, glass and tin are commonly used. Glass is a bad conductor of heat and therefore, food packed in it will longer time to heat process. Heat penetrate quickly in small container as compared to large container.

2.2 Kind and Consistency of Food

Liquid (condensed milk, fruit juices) semi solids (baby foods) or solids suspended in syrups or brine (apple slices) or solid pack (meat and spinach) are canned in industry. Heat processing of each varies according to the heat conductivity of the foods. Compactly solid food requires longer processing time at the same temperature than the same food packed loosely in some liquid; liquid foods need much less time to attain particular temperature under the similar processing conditions.

Processing Methods

For obtaining commercially sterile food there are two methods.

Aspartic Canning

In this method initially food is heat processed and then filled and packed in the sterile container. This is done for fluid food.

Conventional Canning

In this method food is first filled in the container which is hermetically sealed then heat processing is done.

Processing Equipment: Retort

Retorts are pressure cookers in which low and medium acid foods are processed at higher temperature packed in metals and glass jars.

Efficiency of retorts are increased by providing agitating movements inside the equipment



Cooling

During heat processing the temperature of the food inside the can reaches 100°C or higher. If the cans are held at this temperature longer than necessary, the heat energy will cause damage to the

nutrients. To avoid the nutrient losses and over cooking of food cans must be cooled around 43°C. This temperature is suitable for cooling of cans, cans will dried by their own internal heat. Cans can be cooled by using modern retorts after heat processing. On small scale, cans can be cooled by spraying cold water or by exposing them to running cold water and the dried.

Labelling:

Labelling can be done by two methods. Laser labeling on cans and labels printed on paper attached with cans with the help of glue. Modern cans are coming with laser labeling and they are used at large scales. At domestic level or in small factories usually paper printed labels are used. That are placed on container with glue.



Storing and packing:

Although proper heat processing is done to ensure the safety of food from spoilage. But some chemical reactions and microbial attack can still occur in canned food if it is stored at higher temperature. That's why canned food should be placed in a cool and dry place. This enhanced the shelf life of food. For shipping to far off places, several cans are packed into suitable sized cartons.