CANNING
(A Preservation Process)

What is Canning?

- Canning is a method of preservation of food in which the food is processed and hermetically sealed in containers (of metal, glass, thermo stable plastic, or a multi-layered flexible pouch) through agency of heat.
- Canning provides a shelf life typically ranging from one to five years, although under specific circumstances it can be much longer.
- Heating is the principle factor to destroy the microorganisms and the permanent sealing is to prevent re-infection.

Why is Canning done?

- The high percentage of water in most fresh foods makes them very perishable. They spoil or lose their quality for several reasons.
- Microorganisms live and multiply quickly on the surfaces of fresh food and on the inside of bruised, insect-damaged, and diseased food.
- Oxygen and enzymes are present throughout fresh food tissues.
- Proper canning practices minimize the effects of these microorganisms.
- However, the main objective of canning is to preserve the food by the application of heat so that it can be safely eaten at a later time.
- Safety of the consumer is the primary concern when food is canned.

HISTORY

- During the first years of the Napoleonic wars, the French government offered a hefty cash award of 12,000 francs to any inventor who could devise a cheap and effective method of preserving large amounts of food.
- The larger armies of the period required increased and regular supplies of quality food.
- In 1809, Nicolas Appert, a French confectioner and brewer, observed that food cooked inside a jar did not spoil unless the seals leaked, and developed a method of sealing food in glass jars which was referred to as APPERTIZATION and now known as CANNING.

Nicolas Appert

Bouteille de stérilisation

Foods that are canned:

(a) ***Low acid foods:*** Meat, fish, poultry, dairy fall into a pH range of 5.0 to 6.8. This large group is commonly referred to as the low acid group.

(b) ***Acid foods:*** With pH values between 4.5 and 3.7. Fruits such as pear, oranges, apricots and tomatoes fall in this class.

(c) ***High acid foods:*** Such as pickled products and fermented foods. The pH values range from 3.7 down to 2.3, also Jams and Jellies are in this classification.

General Canning Flowchart

Processing steps:

1.Selection :

- For canning, fruits and vegetables should be absolutely fresh.
- The fruit should be ripe, but firm and evenly matured.
- It should be free from all unsightly blemishes, insect damage and malformation.
- Over-ripe fruit is generally infected with microorganisms and would yield a pack of poor quality.
- The vegetables should be tender and reasonably free from soil , dirt etc.

Mechanical Grader

2. Sorting and Grading:

- After the preliminary sorting, the fruits and vegetables are graded.
- The grading is done with respect to size, color etc.
- Generally done by hands or the grading machines (screen graders, roller graders, rope or cable graders etc.).

3. Washing:

- The graded fruits and vegetables are washed with water in different ways such as soaking or agitation in water, washing with cold or hot water sprays , etc.
- Vegetables may preferably be soaked in a dilute solution of potassium permanganate to disinfect them.
- Spray washing is the most efficient method.

4.Peeling, Coring, Pitting:

- Peeling of fruits and vegetables can be done in many ways:
  1. by hand or with knife
  2. by machine
  3. by heat treatment(Scalding)
  4. by lye solution (dipping the fruits and vegetables in a solution of boiling caustic soda or lye solution of strength 1-2%for 30 seconds to 2 minutes.
- Cores and pits in fruits are removed by hand or by machine.

PEELERS

Mechanical peeler

Hand peeling
by machine

Lye peeler

5.Blanching:

- Treatment of fruits and vegetables with boiling water or steam for short periods followed by cooling prior to canning, is called 'blanching'.
- Blanching is done with the objective of:

- ✓ Loosening the skin of the fruit or vegetable.
- ✓ Eliminate the no. of microorganisms.
- ✓ Inactivating the enzymes, thus preventing the possibility of discoloration.
- ✓ Improving the flavor by reducing the astringency in some foods.

6. Can Filling:

- The cans are washed and subjected to a steam jet remove any adhering dust or foreign matter.
- Before filling of the contents(fruits and vegetables) a small amount of syrup(for fruits) or brine(for vegetables) is poured in the can so as to provide a medium to the contents.
- Can filling can be done by machine or hand filling can be also employed.
- In India, filling by hand using rubber gloves is the common practice.

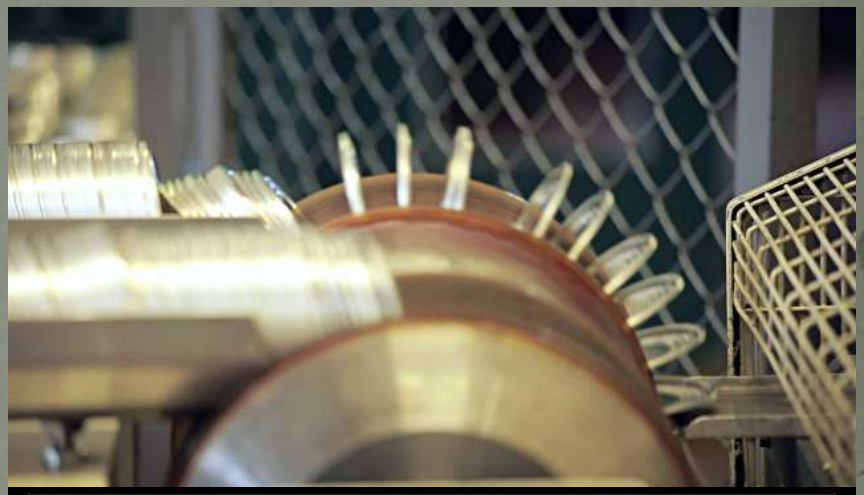
CAN FILLING

7. Syruping and Brining:

- The cans are filled with hot sugar syrup for fruits(concentration 35-40%) and hot brine for vegetables(concentration 1-2%).
- The syrup or brine should be added to the can at a temperature of 79°C to 82°C, leaving a headspace in the can so that when the filled can is closed on the double seaming machine, the headspace left inside ranges from o.32 cm to 0.47 cm.
- Objective of this step is to improve the taste of the canned product and to fill up the inter space between fruits and vegetables.

8. Lidding or Clinching:

- Cans after being filled, are covered loosely with lid and passed through the exhaust box.
- Lidding is now replaced by CLINCHING in which the lid is partially seamed to the can by a single first roller action of double seamer.

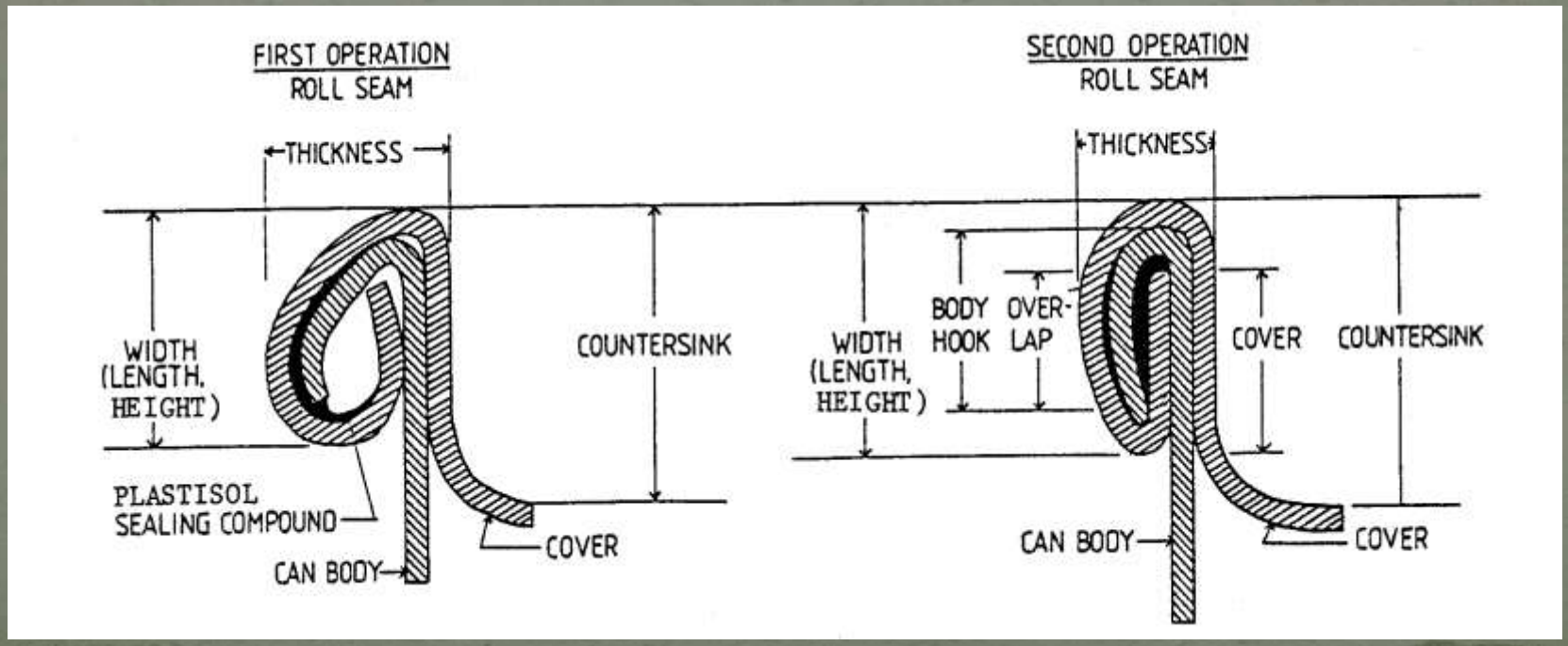


9. Exhausting:

- By exhausting, risk of corrosion of tin plate and pin holing during the storage and discoloration of the product is reduced as the oxidation process is prevented.
- Cans are passed through a trough of water at 82-87°C or a moving conveyor belt through a steam box. The time varies from 5-25 min. on the nature of the substance.
- During exhausting, expelling of all the gases takes place which prevents spoilage of the canned product by ceasing the chemical reactions and also the bulging of can.

10. Sealing:

- After exhausting, the cans are sealed by special closing machines known as double seamers.
- There are hand operated as well as semi-automatic and fully automatic seamers.



11. Processing/Sterilization:

- Processing consists of heat treatment which is sufficient to eliminate the growth of spoilage causing microorganisms.
- All fruits can be satisfactorily processed at 100°C and vegetables at 116-120°C.
- **The total time required to sterilize canned food is largely depends on:**

a) Size of can
b) Processing temperature
c) Rate of heat penetration at the center of the can.
d) pH of the food
e) The type and number of organisms present

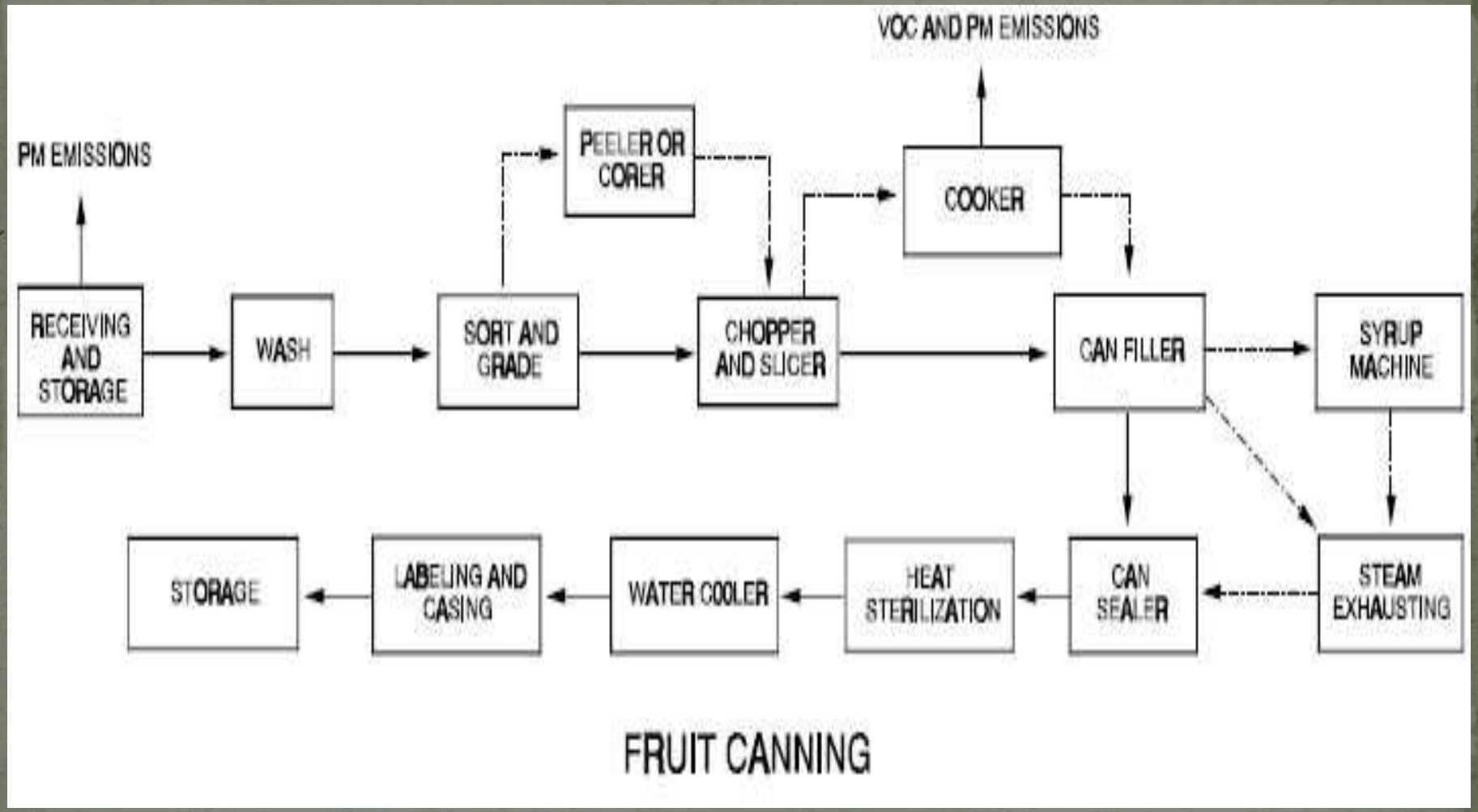
12. Washing and Cooling:

- After the cans are closed, they pass through a detergent spray washer to remove grease and other material. The washing should consist of hot water (66°C) then by suitable pre-rinse, detergent spray wash. Followed by a fresh warm water rinse (66°C).
- Immediately after processing, the cans are COOLING in water to a temperature of 36°C to 42°C. to avoid thermophilic spoilage or can rust. If the cans are cooled much below 36°C, they may not dry thoroughly and rusting well result. If the cans are cased at temperatures much over 42°C, thermophilic spoilage may occur.

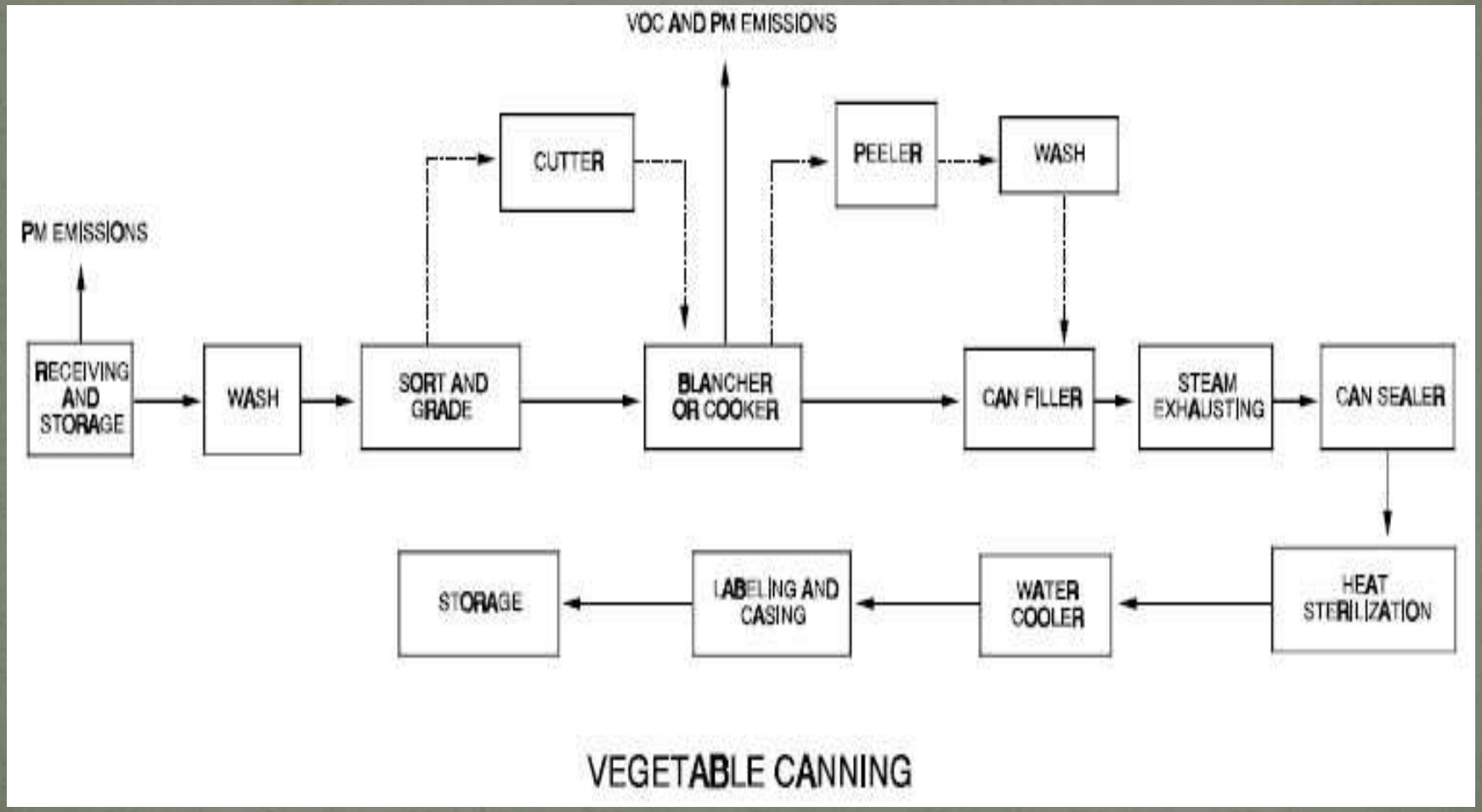
12. Labeling and Storage:

- After the completion of the canning process, the cans are labeled, packaged and stored at a clean and dry place.
- Storage temperatures of sterile canned meat products should not be above 21.1°C, because higher temperatures markedly accelerate deterioration during storage, thus limiting shelf life.

FRUIT CANNING PROCESS:



VEGETABLE CANNING PROCESS:



Containers for Canning:

The container plays a vital role in food canning, it must be:

1-) Capable of being hermetically sealed to prevent entry of microorganisms.

2-) Impermeable to liquids and gases, including water vapor.

3-) Maintain the state of biological stability (*i.e.* , commercial sterility) that was induced by the thermal process alone or in combination with other chemical and physical processes.

4-) Physically protect the contents against damage during transportation, storage and distribution.

Can materials:

For canning the various materials used are tin, steel, plastic and glass containers with metal closures.

Although the wide variety of containers for canned foods, the metal ones are preferred because:

1-) It has a high conductivity of heat.

2-) It cannot easily be broken.

3-) Being opaque, so any possible bad effects of light on food stuffs are avoided.

4-) Be able to withstand the stresses imposed during thermal processing and cooling.

5-) Be able to withstand the subsequent handling, which includes transportation, storage and distribution.

Defects in cans:

1- **Swell:** bulging of both can ends by positive internal pressure due to gas generated by microbial or chemical activity. Either hard or soft swell.

2- **Flipper:** a can with normal appearance but one end flips out when the can is struck against a solid object but snaps back to the normal under light pressure.

3- **Springer:** a can bulged from one end which if forced back into normal position, the opposite end bulges.

4- **Leakage:** perforated can.

5-**Overfilled can:** has convex ends due to overfilling and not regarded as spoiled.

Microbial spoilage in Canned foods:

Canned food	Products	Type of spoilage	Organism	Signs of spoilage	
				In the can	In the canned food
Corn, peas, spinach, asparagus	Low and medium acid products; pH above 4-6	Flat sour spoilage	*Bacillus steavo-thermophilus*	Possible loss of vacuum	Lowered pH; sour, slightly abnormal odur, etc.
		Thermophilic anaerobic	*Clostridium thermosaccharo-lyticum*	Can swells, may burst	Fermented, sour cheesy, or butyric odour
		Sulfide spoilage	*Clostridium nigricans*	Can flat	Usually blackened, 'rotten egg' odour
		Putrefaction	*Clostridium sporogenes*	Can swells; may burst	Typical putrid odour; pH slightly above normal; may be toxic
Tomato juice, fruits, fruit juices	Acid products; pH below 4.6	Flat sour	*Bacillus thermo-acidurans*	Little change in vacuum	Slight pH change; off flavour and odour
		Butyric anaerobes	*Clostridium butyricum*	Can swells; may burst	Fermented, butyric odour
			Mostly lactic acid type of bacteria	Can swells; may burst	Acid odour
			Yeasts	Can swells; may burst	Fermented, yeasty odour
			Molds	Can flat	Surface growth, musty odour


Pepsi


HÖGA KUSTEN
SURSTRÖMMING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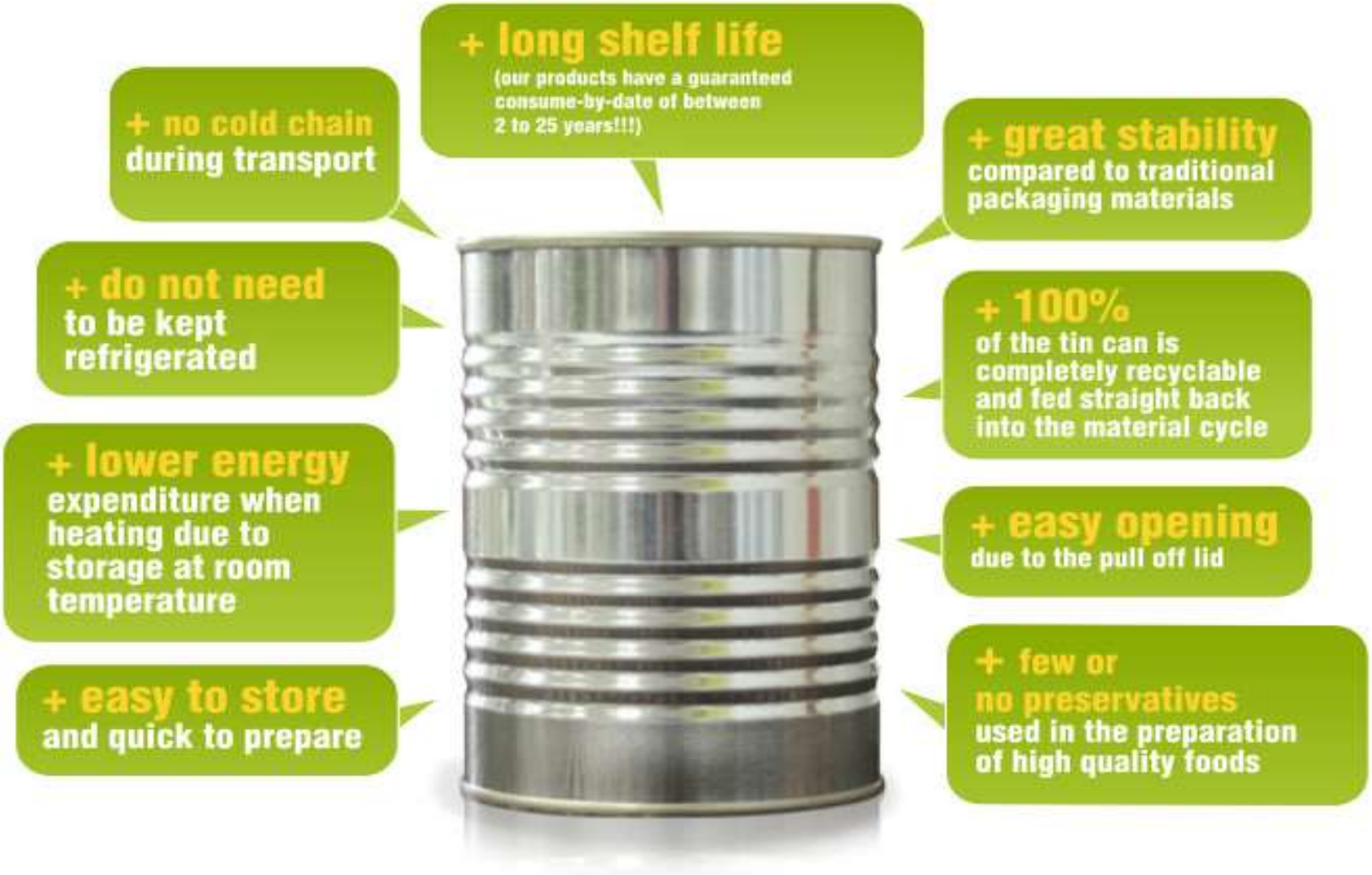
Nutrition Facts

Advantages of Canning:



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