

## Post-Harvest Management Protocols

# FROZEN FOODS

The quality of frozen foods depends fundamentally on the quality of food materials used and product manufactured but can be jeopardized by failure to maintain product temperature at a suitable low level in any part of the cold chain, including storage, transport, distribution, and display in retail stores, or by faulty inventory control at all levels that would allow product to be retained for unduly long periods in the cold chain. Such operational failures may lead to customer dissatisfaction and harm to the entire industry, and not only those who may be at fault.



Freezing is one of the oldest and most widely used preservation methods which allows preservation of taste, texture, and nutritional value. The freezing process is basically a process wherein low temperature atmosphere prevents the growth of microorganism and delays chemical as well as metabolic reactions.

Since processed food have very little shelf life, one of the critical requirements for storing processed food is in maintaining FEFO (First Expired First Out). Hence, receiving the stock as well as delivery can be done in FEFO manner. Frozen products must be stored in frozen rooms maintained at a temperature of -18 °C or below. Chilled products must be stored and maintained in cold rooms at a temperature of 5°C Degree Celsius or below. Records of temperature monitoring must also be maintained.

### Freezing is carried out in a large variety of foods including:

- Processed fruits and vegetables
- Milk Products
- Meat products
- Poultry and Fish
- Ready to eat products

### Different foods need to undergo different types of processes before they undergo freezing:

- Items like green peas & corn need to be blanched & then cooled before freezing.
- Pulpes like mango, tomato puree need to be pasteurised before packing & freezing.
- Meat, carcasses need to be chilled to about 4°C before deboning & making of portions. The process halls need to be maintained at 12 to 15 °C.
- Fish and products need to be chilled before processing and freezing.

## HANDLING

Exposure to high temperatures can lead to quality loss in frozen foods. Generally, short periods of exposure are not serious, unless often repeated, but prolonged exposure can cause food loss. However, for some particularly sensitive products, even a short exposure to temperatures warmer than 10-15 °F will result in marked loss in quality which will only become apparent after further storage. Temperature fluctuations should be avoided because they will cause migration of moisture from the product or within the package causing formation of ice

crystals and partial dehydration of the product. Product temperature is a more important factor than atmospheric temperature. A change in air temperature for a short period may not affect the product temperature significantly. Refrigeration equipment used to transport frozen foods is designed to remove heat that may leak into the load compartment of the railcar, truck, or container. It should be noted that the refrigeration capacity does not provide for removal of much heat from the load. Therefore, if products are loaded with the temperature warmer than 0 °F (-18 °C), there is little or no opportunity for the product temperature to be reduced to the desired level during transit. Similarly, retail display equipment cannot be expected to remove significant heat from frozen foods. Therefore, it is imperative that frozen foods be at 0 °F (-18 °C), or colder, when they are loaded for transport or placed in retail cabinets.

## PRECOOLING

Rapid removal of field heat is critical to retard deterioration in frozen foods. Maximum quality is retained by precooling corn to 0 °C (32 °F) within 1h of vegetable harvest and holding it at 0 °C (32 °F) during marketing. In practice, cooling to this extent is rarely achieved. However, precooling is the first step in a good temperature-management program. Foods with a high respiration rate, have a high rate of heat generation. Vacuum-cooling can be adequately used in precooling 30 °C (86 °F) to 5 °C (41 °F) in 30 min. Hydrocooling by spraying, showering, or immersion in water at 0 to 3 °C (32 to 38°F) is effective, though it takes longer than vacuum-cooling. During circumstances where vacuum cooling or hydro-cooling is not available, packaged ice or top ice is used for precooling.

## INDIVIDUAL QUICK FREEZING (IQF)



IQF is a way to preserve foods quickly. This method is commonly used in Fruits, vegetables and even sea food, meat, poultry etc. The exact time depends on the type of IQF freezer and the product. The short freezing prevents formation of large ice crystals in the product's cells,

which would otherwise destroy the membrane structures at the molecular level. This makes the product keep its shape, colour, smell and taste after defrosting, to a far greater extent. During IQF, the foods get packaged individually, wherein the items are sent through a conveyer belt of a blast chiller. The food items stay separate as they get frozen.

## The two technologies used under IQF include:



### Liquid Nitrogen

Here, Liquid nitrogen is vapourised until it becomes so cold that it can freeze food products.

### Carbon Dioxide

The gas in liquid form is placed inside a machine as a high-pressure liquid which eventually solidifies into dry ice and then sublimates into a gas at freezing temperature.

### Ammonia based refrigeration

The gas in liquid form is placed inside a machine as a high-pressure liquid which eventually converts to gas at freezing temperature.

## STORAGE PROTOCOLS FOR FROZEN VEGETABLES

### Frozen beans

Frozen Beans are prepared from fresh, clean, sound, succulent pods of the plants of the species *Phaseolus vulgaris* L. or *Phaseolus coccineus* L. Strings, stems, and stem ends shall be removed, and the pods washed and sufficiently blanched to ensure adequate stability of colour and flavour and shall be stored at -18°C or below.



The product shall be of reasonably uniform colour and free from foreign flavour or odour, other than those imparted by any added ingredients. It shall be clean, free from sand, grit and other foreign material and shall test negative for Peroxidase.

The product may contain sugars (Sucrose, invert sugar, dextrose, fructose, glucose syrup, and dried glucose syrup), salt, spices, and herbs.

Frozen beans may be of the following styles and shall be labelled accordingly as:

- Whole
- Cut
- Short cut
- Sliced
- Other

### Frozen Cauliflower

Frozen cauliflower is from fresh, clean, sound heads of the cauliflower plant of the species *Brassica oleracea* L. var. *botrytis*. The heads are trimmed and separated into parts, washed, and sufficiently blanched to ensure stability of colour and flavour and stored at  $-18^{\circ}\text{C}$  or below. Frozen cauliflower may contain salt, spices, and herbs.

The product shall be of reasonably uniform white to dark cream colour which may be slightly dull and have a tinge of green, yellow or pink over the flower surface. The stem or branch portions may be light green or have a tinge of blue. It shall be free from foreign flavours or odours, other than those imparted by any added ingredients. The product shall be clean, free from sand, grit and other foreign material and shall test negative for peroxidase.

Frozen cauliflower may be presented in one of the following styles and shall be labelled accordingly: -



- **Whole**

The whole, intact head, which is trimmed at the base, and which may have attached small, tender, modified leaves.

- **Split**

The whole head, cut vertically into two or more sections.

- **Florets**

- segments of the head, which may have a portion of the secondary stem attached. Small, tender modified leaves may be present or attached to the units.

- **Others**

Any other presentation of the product is permitted if it is sufficiently distinctive from other forms of presentation laid down in this standard and is adequately described on the label to avoid confusing or misleading the consumer.

### Frozen Pea

Frozen peas is prepared from fresh, clean, sound, whole, immature seeds of peas plant of the species, *Pisum sativum* L which. They must be washed, sufficiently blanched to ensure adequate stability of colour and flavour. It is stored at  $-18^{\circ}\text{C}$  or below.

The product may contain sugars (Sucrose, invert sugar, dextrose, fructose, glucose syrup, dried glucose syrup), salt, spices, and herbs.

The product shall be of reasonably uniform green colour according to type, whole, clean, free from foreign matter and damage by insects or diseases. It shall be free from any foreign taste or smell and shall have a normal flavour, taking into consideration any ingredients added.



### Frozen Sweet Corn

Sweet corn's [*Zea Mays* convar] harvest maturity is determined by a combination of ear fill, silk drying, kernel development, kernel sweetness, and kernel tenderness. The appearance of the juice, or endosperm, is a good indicator of maturity.

Blanching, followed by chilling in ice water, are critical processes for producing quality frozen corn. The natural enzymes in corn need to be inactivated before freezing to prevent both loss of color and nutrients, and flavor and texture changes. These enzymes are inactivated by a hot blanch treatment. The chilling process then prevents the corn from becoming mushy due to overcooking of the starch.

This Frozen Sweet Corn is hygienically packed and have the best quality. These delicious corn kernels are not only used for direct consumption but also used in a variety of dishes. They are stored at a temperature of below  $-18^{\circ}\text{C}$ .

