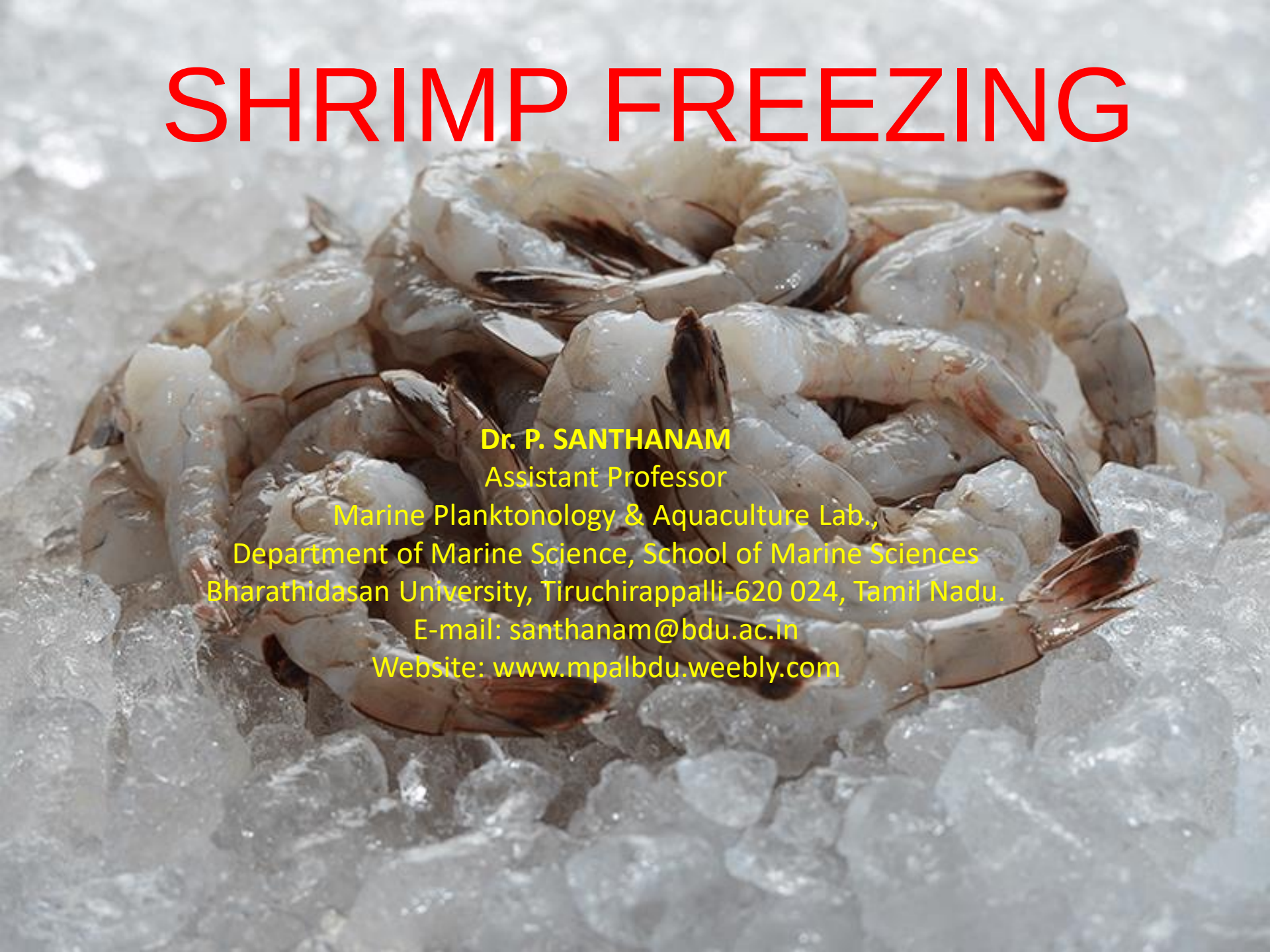
SHRIMP FREEZING



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FREEZING

In general fish tissue contains about 75% of water, most of which is free water but holding in solution suspension organic molecules such as proteins, carbohydrates, salt, etc.

Freezing point of free water is 0°c

Tissue liquid freezing point is 0 to -5°c

Quick freezing yields a better quality product then slow freezer

When the time taken for getting over the critical temperature range of 0 - 5°C is 30 minutes, its more is slow freezing

About 80% of water in tissue is frozen between -0.8 to -5°c, 95% at -10°c and below.

FROZEN PROCESS

100% freezing is practically impossible and even at -35°C fish tissues have been shown to contain some non crystalline water.

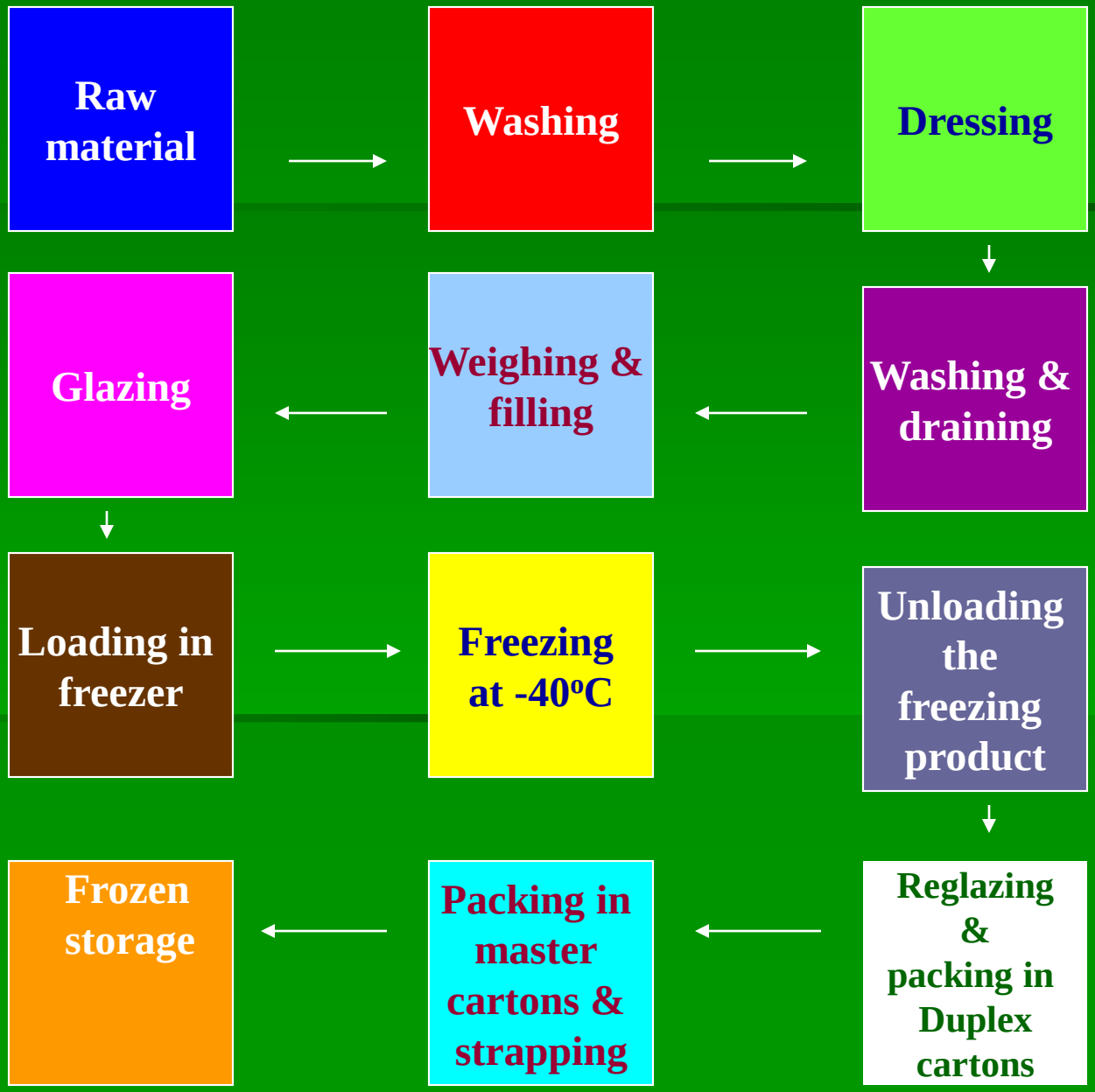
About 90% of bacteria present in fish are destroyed during freezing, as they belong to the mesophilic group.

The Psychrophilic bacteria which survive the cold shock remain inactive as long as the fish is in frozen condition because of the low temperature and non-availability of free water for their activiy.

70-75 % in slow frozen.

50 % in rapid frozen.

FROZEN PROCESS



FREEZING OF PRAWNS

- Washing: The raw material is washed with potable water to remove dirt and any external matter.
- Dressing: The head, shell, tail and vein passing through the dorsal side are completely removed and the edible meat alone is used for freezing.
- Washing & Draining: The dressed meat is repeatedly washed with potable water. The slime and extraneous matter like pieces of shells and veins are thoroughly got rid of and the water is drained.

FREEZING OF PRAWNS

- Weighing & Filling: The prawns are then graded into various size grades either manually or with the help of a grading machine. The graded material is then weighed in 2kg lots and arranged in metallic trays of definite dimensions as specified by the buyers.

- In the case of larger size grades, they are arranged layer by layer in an attractive manner and the small size grades are just filled compactly. Grade labels are placed in the trays before arranging the material, so that they are clearly visible after freezing on the bottom surface. A code number label indicating the date and batch of production is also kept for purpose of pre-shipment inspection.

FREEZING OF PRAWNS

- Glazing: Ice-water is then poured into the trays to the brim. This is called glazing and serves to hold the prawns together in one block when frozen.
- Loading in Freezer: The trays are then covered with a plain metal sheet and loaded into the freezer.
- Freezing: The prawns are then frozen at - 40^{o}C which takes 3 to 5 hours depending upon the type of freezer employed.
- Unloading: After freezing, the trays are unloaded and the blocks loosened from them. A dip in ice-water for a few seconds facilitates this step.

FREEZING OF PRAWNS

- Reglazing & Packing: The frozen blocks are then dipped in ice-water for a few seconds. This step is called reglazing and is meant to give the block a uniform coating of ice all around, so as to prevent dehydration of the material during subsequent frozen storage. The reglazed blocks are then packed in waxed duplex cartons with 100/125 gauge polythene film lining inside.

The prepared material is arranged in waxed duplex cartons of the required size with a polythene-film lining inside. After adding glaze water and closing, the cartons are placed in trays and loaded into the freezer.

FREEZING OF PRAWNS

- Packing in duplex cartons: The duplex cartons are generally printed with the name of the packer, brand name, date of pack, type of pack, size grade, variety, etc.

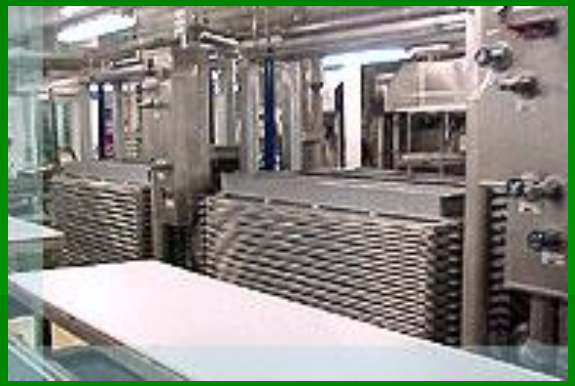
- Packing & Strapping: Ten duplex cartons are packed in one corrugated fiberboard master carton, which is also printed with the information on packer, etc., The master carton is then fastened securely with synthetic strapping tapes using a strapping machine.

- Frozen storage: They are then stacked in frozen storage maintained -18^{o}C or below.

TYPES OF FREEZERS

Horizontal-Plate Freezer

Hollow horizontal plates inside which copper pipes are fitted in a zigzag manner, through which the refrigerant, usually Freon 12 is circulated.

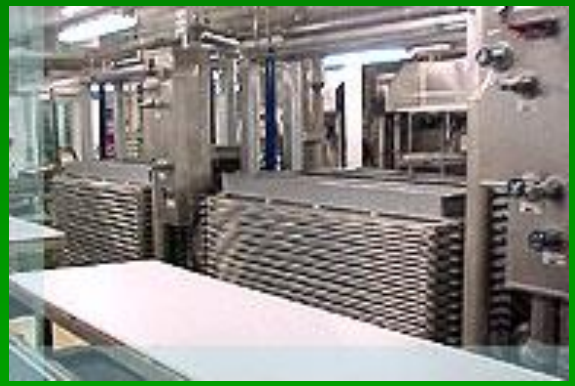


The plates are movable vertically and are arranged inside an insulated chamber cabinet. The clearance between the plates is adjusted by means of a hydraulic or pneumatic ram which moves the plates up and down with the bottom-most one being fixed

TYPES OF FREEZERS

Horizontal-Plate Freezer

For loading, the space between the plates is sufficiently widened by means of the ram and the trays containing the fish are placed on the plates.

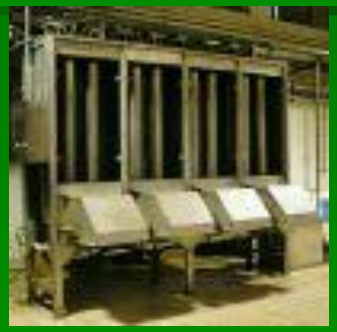


After loading fully, the plates are brought closer, exerting a slight positive pressure on the material to be frozen, which in effect gets sandwiched between two plates, one above and the other below.

Freezing time is 3 hrs. Plates are cooled to -40°C by the refrigerant. Prawns, Fish fillets, Fish steaks were frozen by this freezer.

TYPES OF FREEZERS

Vertical contact- Plate Freezer



As like Horizontal freezer but is more useful for bulk freezing of fish in large blocks. Such freezers are used in factory trawlers in developed countries, but these are not in common use in India.

TYPES OF FREEZERS

Tunnel/Air Blast Freezer

It consist of an insulated tunnel into which the material to be frozen arranged on trolleys is pushed in and air at temperature of -35 to -40^{o}C is blown into it at speeds ranging from 5 to 7 meter/sec. Freezing time is about 5 hrs.

More suitable for large prawns, lobster tails and round fishes.

TYPES OF FREEZERS

Shelf Freezer

Materials are kept on shelves through which refrigeration pipes are passed.

Freezing is accomplished partly by contact at the bottom of the material and largely by the circulation of air by convection currents within the freezer.

The overall heat transfer rate is very slow and freezing takes very long durations of time.

TYPES OF FREEZERS

Immersion Freezer

Freezing is accomplished by immersing fish in a cooled liquid, generally brine.

As there is intimate contact between the coolant and the material, heat transfer is very efficient.

Brine-spray freezing

The super-cooled brine is sprayed on the fish to be frozen or the prepared material in metallic containers/cans and keep them immersed in calcium chloride brine, as in the case of ice-making plants.

TYPES OF FREEZERS

Fluidized bed Freezer

The materials to be frozen in small individual pieces are fed on to a conveyor moving inside a closed insulated tunnel and cooled air at high velocity blown from below.

The material moves in a fluidized manner, almost floating in the cooled air and freezing is very rapid.

The freezer is suitable for individually quick frozen (IQF) shrimps, fish fillets and small fishes.

TYPES OF FREEZERS

Cryogenic Freezing

Freeze the material with liquified gases at extremely low temperatures, such as liquid nitrogen (-196°c), liquid air (-194.2°c) and liquid Carbon dioxide (-71°c).

The liquid is carefully sprayed in required quantities on the material passing on a conveyor belt.

Utmost care is required in adjusting the quantity of liquid sprayed, as even a slight excess may cause freezer-burn on the material due to extremely low temperature.

Common Refrigerants used in the Industry

Freon 11	- Trichloro-fluoro methane.
Freon 12	- Dichloro-difluoro methane.
Freon 13	- Chloro-trifluoro methane.
Freon 14	- Carbon tetrafluoride.
Freon 21	- Dichloro-fluoro methane.
Freon 22	- Chloro-difluoro methane.
Freon 23	- Fluoroform.
Freon 112	-1, 1, 2, 2-Tetrachloro-1, 2-difluoro ethane.
Freon 113	-Trichloro-trifluoro ethane.
Freon 114	-1, 2- Dichloro-tetrafluoro ethane.
Freon 115	-Chloro-pentafluoro ethane.
Freon 142	-1- Chloro1, 1-difluoro ethane.
Freon C-318	-Octafluoro cyclobutane.
Ammonia	-NH_3