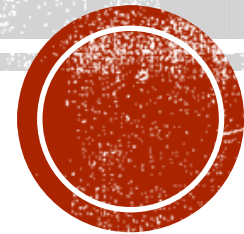


CHILLING TECHNOLOGY



Chilling technology

Ice as a cooling medium for fish has a great deal in its favour, it has a very large cooling capacity for a given weight or volume, it is harmless portable and relatively cheap. When fish are being cooled with ice, heat transfer is achieved by direct contact with the ice, by conduction through adjacent fish and by melt water flowing over the fish. Cold melt-water takes up heat from the fish and ice not only reduces the thickness of the layer of fish to be cooled but also promotes this convective cooling interaction between ice melt water



Effect of temperature on spoilage

The speed with which bacteria grow depends on temperature. The higher the temperature, the faster the bacteria multiply, using the flesh of the dead fish as food. When the temperature is sufficiently low, bacterial action can be stopped altogether, frozen or chilled fish stored at a very low temperature will remain wholesome for a very long time because bacteria are either killed or completely inactive at these temperatures and the other forms of spoilage progress very slowly. The chemical changes that contribute to spoilage are also kept in check by reducing the temperature.



How long will fish keep with chilling?

Generally, all fish spoil in much the same way with 4 distinct phases of spoilage.

- **In phase 1**, there is very little deterioration apart from some slight loss of natural or characteristic flavour and odour.
- **In phase 2**, there is a considerable loss of flavour and odour.
- **In phase 3**, the fish begin to taste stale, appearance and texture begin to show obvious signs of spoilage, and the gills and bell cavity have an unpleasant smell.
- **In phase 4**, the fish are putrid and generally regarded as inedible.



The chilling methods

□ *Ice cooling*

- *Block ice*
- *Flake ice*
- *Tube ice*
- *Plate ice*
- *Slush ice*



- *Chilling with water-ice mix*
- *Dry ice chilling*
- *Deep chilling*

□ *Refrigerated seawater*

- *Mechanical chilling with heat change*



The advantages of Refrigerated seawater chilling

- Greater speed of cooling,
- Reduced pressure on the fish,
- Lower holding temperature if possible,
- Quicker handling of large quantities of fish with little delay or labour,
- An extended storage time



Parameters associated with chilling

- *Temperature*
- *Humidity*
- *Air rate*
- *Ventilation*



Factors affecting storage conditions

- *The size and shape of product*
- *Product temperature*
- *Operating temperature,*
- *Product contact area and density,*
- *Species of products*



Changes in composition of products during chilling

- *No change in protein, lipid, dry matter and ash*
- *The decline in essential a.a ,*
- *The increase in TVB-N values,*
- *The first loss of freshness, the activity of endogen enzymes and the oxidation of lipids and pigments,*
- *And the last spoilage is bacterial one*

