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Preservation techniques and methods for onboard fish handling.



Methods for maintaining the quality of aquatic animals onboard. It's like a type of food preserving. That is to provide cooling down to maintain the freshness of aquatic animals are caught with use Ice or Refrigerator.



Examples types of fishing boat.



Small-scale fishing boat
Fishing operation period
of 1 day or 1 night



Otter board Trawl fishing vessel
Fishing operation period
of 3-5 day



Squid Trapping net vessel
Fishing operation period
of 3-5 day



Purse seine fishing vessel
Fishing operation period
of 14-30 day



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Illustrated fishes in fish hold of a purse seine. The fish is decomposing as results of lag of cooling medium.



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Compare bad fish with good fish.



Bad fish

VS



Good fish



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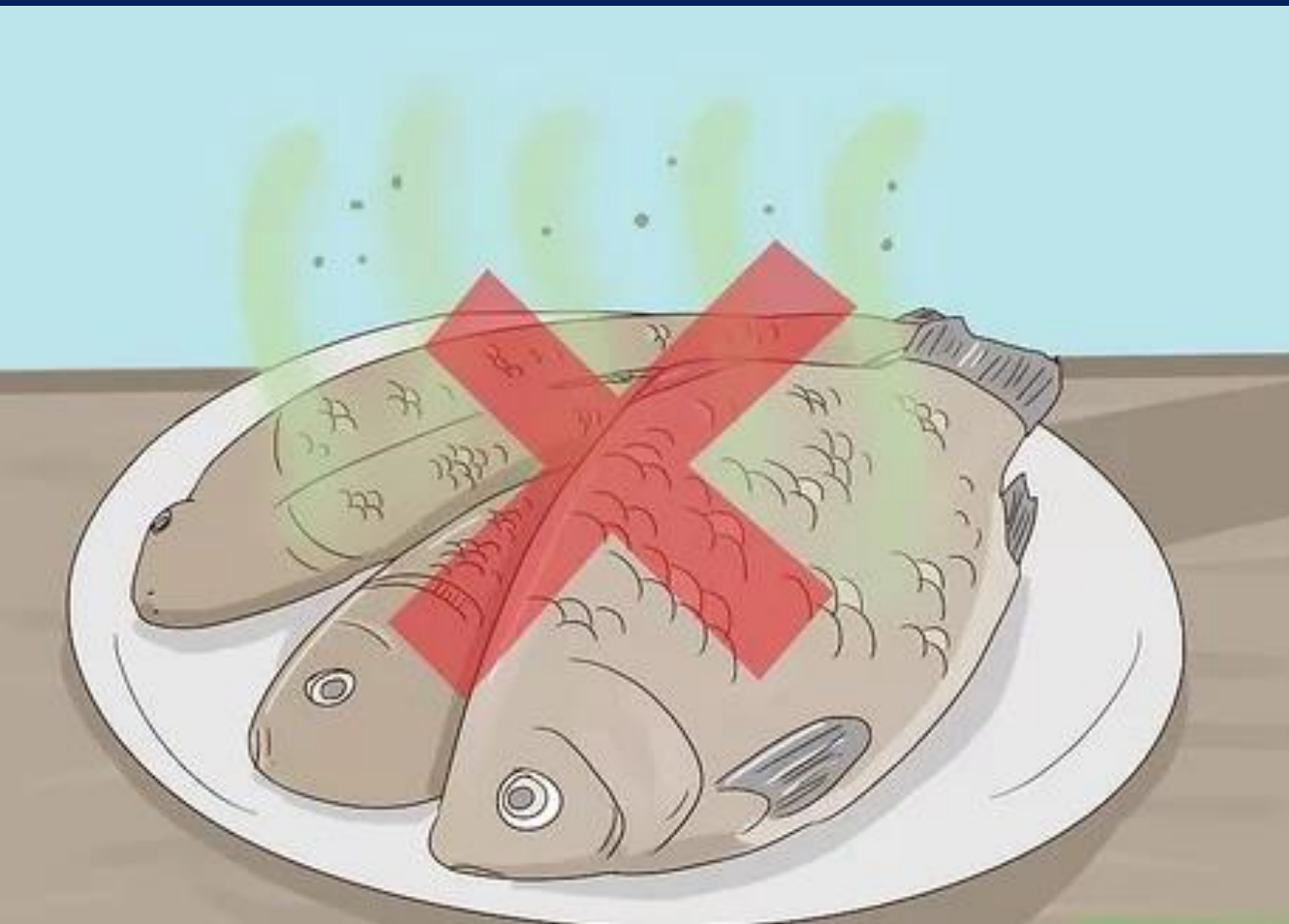
**How to know the fish is
good or bad**



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1. Smell

The key indicator is the smell. Fresh fish should not have a strong fishy odor; if it does, that means the fish is starting to decompose.



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2.Appearance

Examine the appearance of the fish. For sample, the eyes should appear bright and lively, the skin should be moist, the colors should be vibrant and specific to the type of fish, and the stomach should remain intact.





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3. Gills

Gills of fish have to only red color. We should avoid the fish that have gills are pale color or mixed with brown color.





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4. texture

Examine the texture. Using your fingers, softly press on the fish's body. Fresh fish will feel firm and will bounce back when you lift your finger. It's best to steer clear of fish that feels soft or has any dents in the skin.

There are two reasons why fish spoil or go bad. These are **bacteria** (germs) that are on the outside of the fish and in its stomach and **enzymes**, which are chemicals that act like acid. Enzymes are mainly found in the stomach of the fish.





What bacteria don't like



DRY CONDITIONS



VERY HOT TEMPERATURES



COLD



Fishermen's beliefs about various methods of preserving aquatic animals.

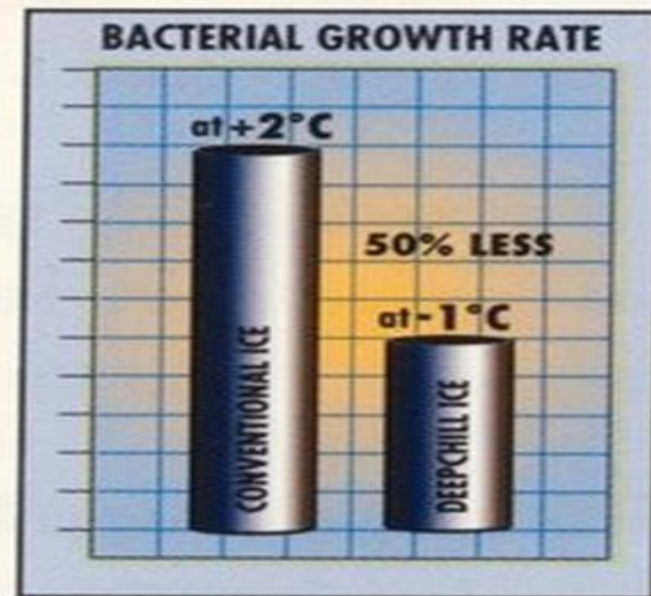


Aspirin



Formalin

Dangerous !!!!





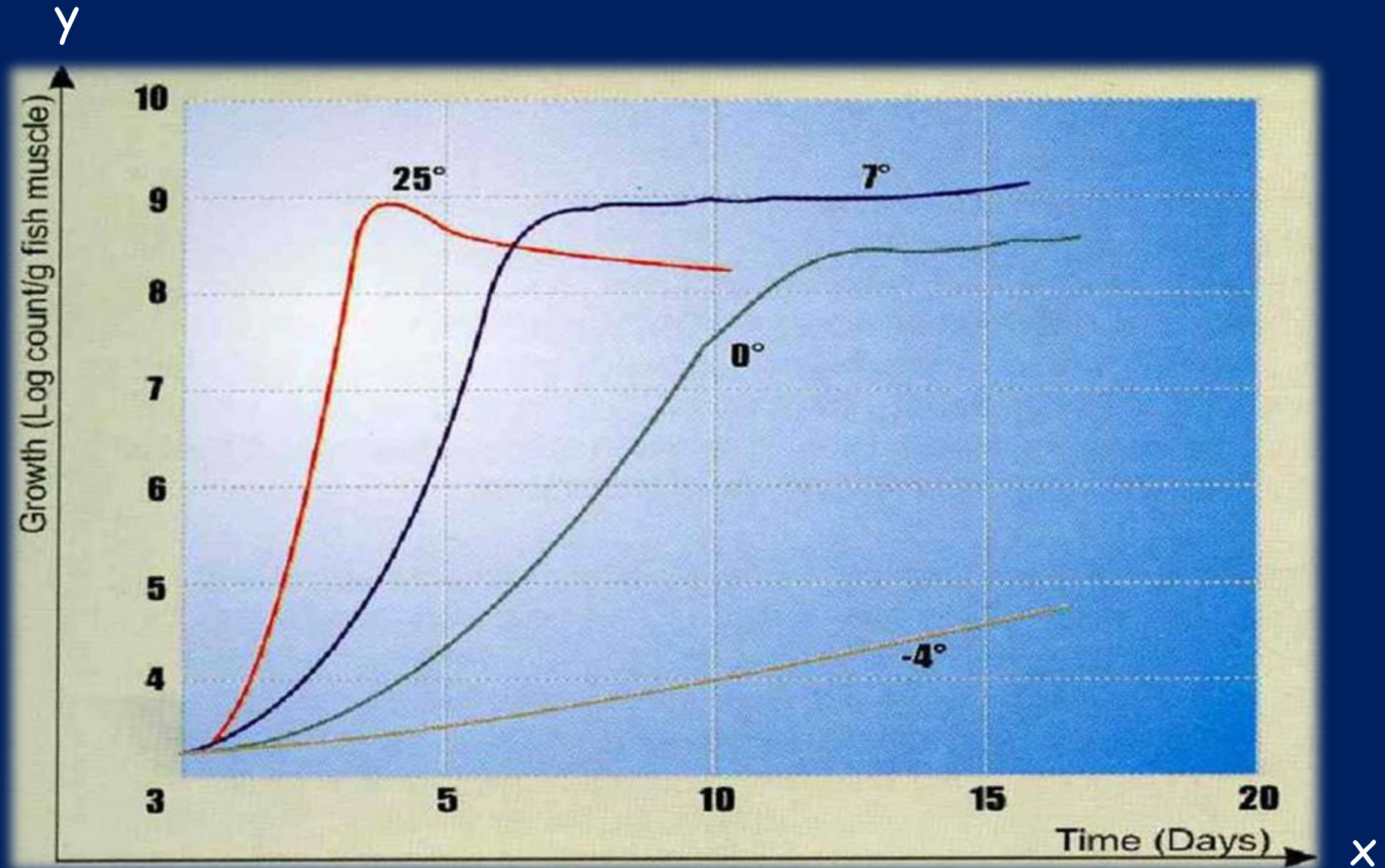
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Bacteria growth rate at different temperatures



The current Practices.

- Fish is put into the fish hold having the same temperature as the seawater temperature.
- Overload or press on the fish in lower layers.
- Cooled with insufficient crushed ice.
- Leave the catch too long period.





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Basic of preservation fish freshness onboard

- The fish must be clean with cold seawater (Pre-cooling) if possible and available onboard
- Cool down the temperature of fish immediately after the catch is the best way to preserve fish freshness.
- Clean Ice or cooling medium with sufficient volume is required to preserve fishes in order to maintain fresh quality and reduce bacteria growth rate.



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Onboard Practical Techniques for Fish Handling

- Prepare chilly water by mixing ice and seawater in an insulated tank, stir or circulate well, and maintain a chilly reach of about 0 to -4 °C.
- Submerge (chill) cleaned fishes into chilly seawater until the core fish temperature is close to 0 °C.
- Remove cold fishes to preserve in fish hold. There are two ways by icing preserve and the other by freezing.



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Fish preservation onboard

1. Live fish preservation
2. Fresh fish (unfrozen fish)
 - 2.1 Preservation by Ice
 - 2.2 Chilly sea water (CSW)
 - 2.3 Refrigeration sea water (RSW)
3. Frozen fish (freezing)



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Live fish preservation



Seawater outlet

Seawater inlet



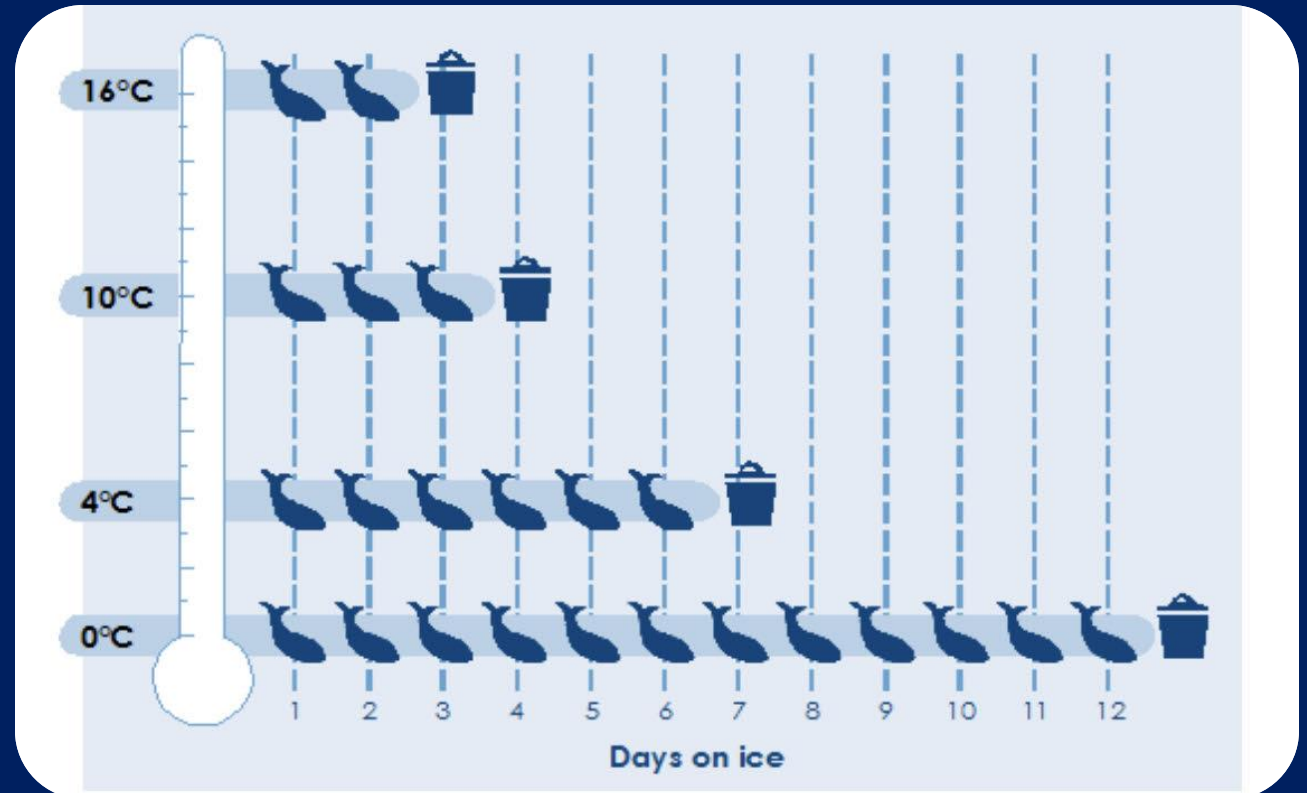
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Preservation by ice





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Why use ice?

1. Ice has a high cooling capacity and melts at a definite temperature (0°C)
2. Ice keeps the fish moist and will wash surface bacteria, blood and slime from the fish when it melts
3. Clean ice is harmless, and the price is low
4. Ice is convenient during storage and transport

How does ice cool



- Ice cools by melting
- Ice takes up heat from the fish and melts
- The melted water (0°C) can further cool the fish when flows over it



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Amount of ice needed

The amount of ice needed depends on:

- The temperature of fish.
- Surrounding temperature and conditions
- Fish hold insulation
- The length of time the fish is to be kept with ice



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Quality and safety of ice

Depends on:

- Quality of water
- Conditions during production
- Storage of ice
- Handling of ice





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Types of ice and cooling media

- Block ice
- Crushed ice
- Flake ice
- Slurry Ice



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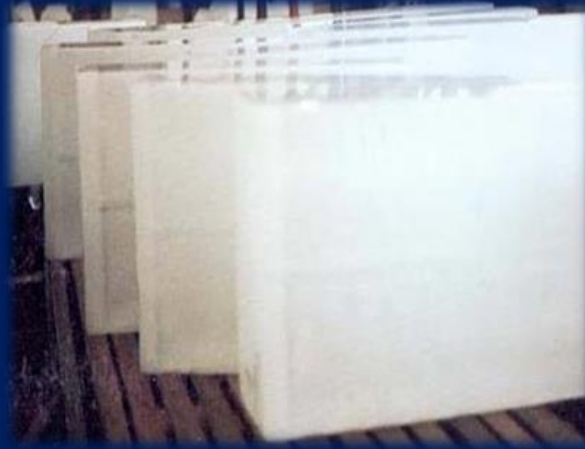


Block ice

Produced in large chunks

Big ice chunks melt slower than small (surface/volume)

Can be transported before crushing



Preservation by Ice block: The temperature of ice preservation, the fish body around 0°C Not less than this.



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Crushed ice

Particle size depends on
the crushing machine



Flake ice

Preservation by Flake ice: It is dry, not Wet, and thin shaped. (2-3mm)

Cool faster and more efficient, easy to store and handle, Ready to use, less handling than block ice





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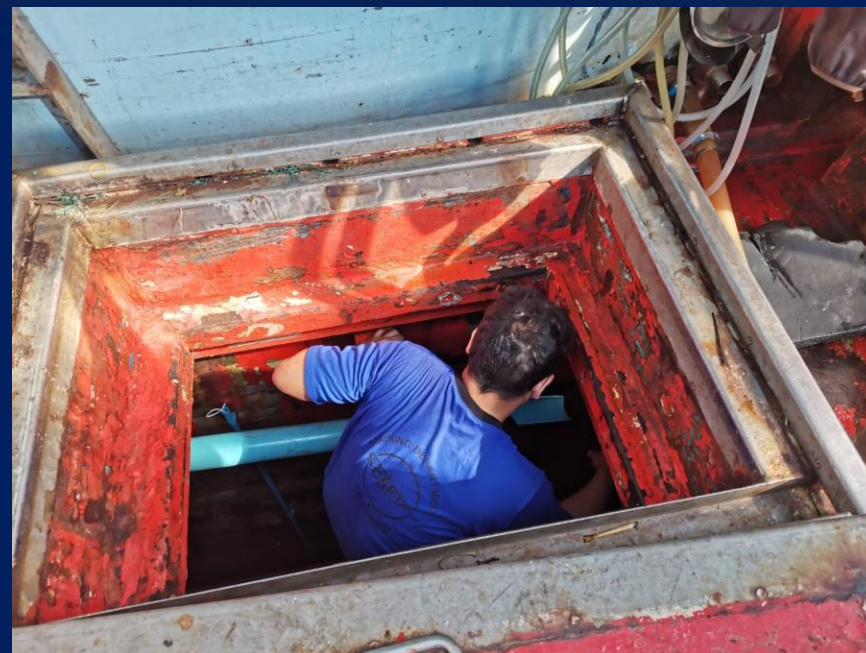
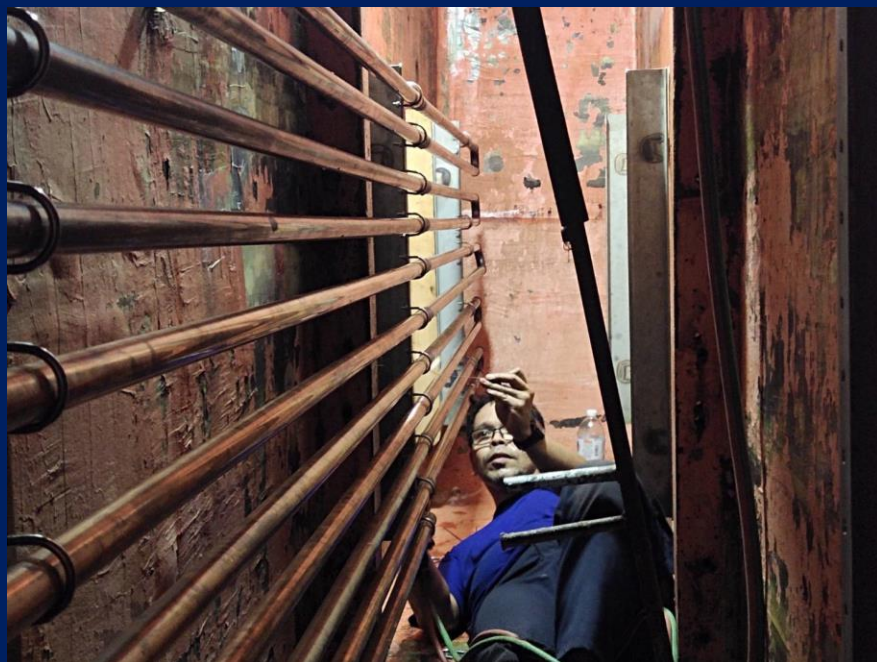
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Sherbet ice



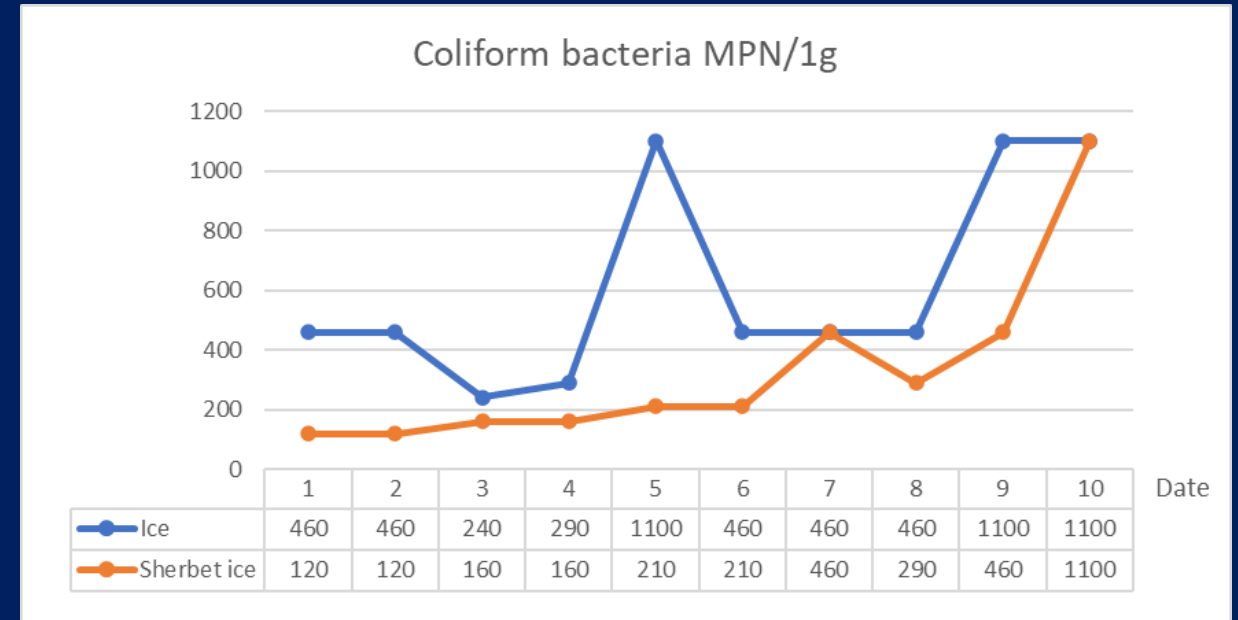
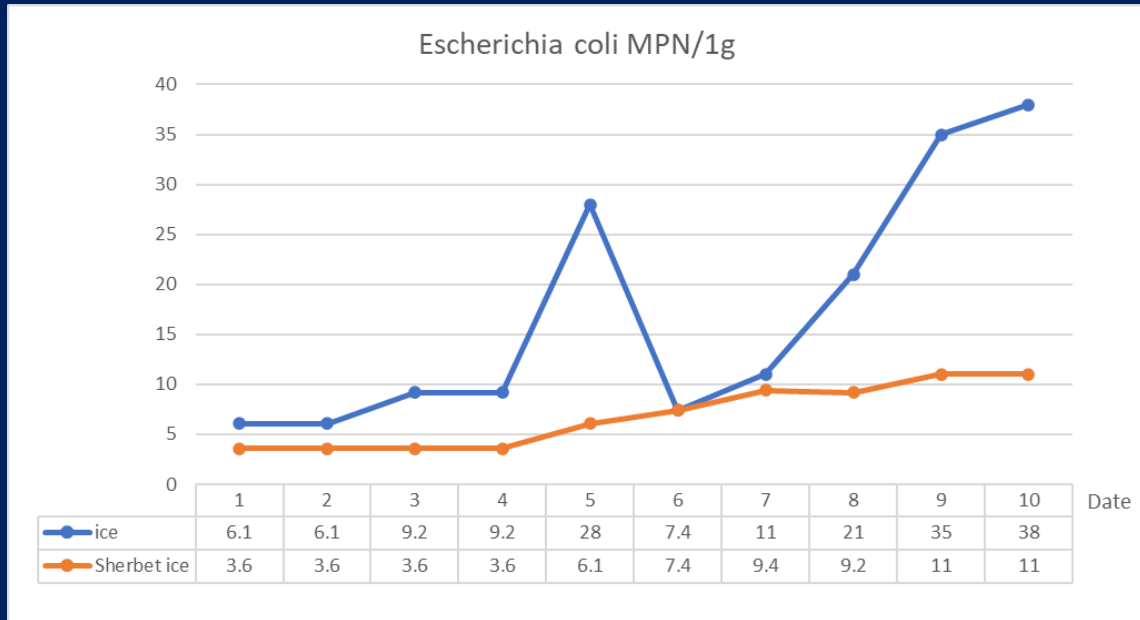








Example results of fish freshness analysis



Freshness analysis compares the bacteria growth in sherbet ice and crushed ice.



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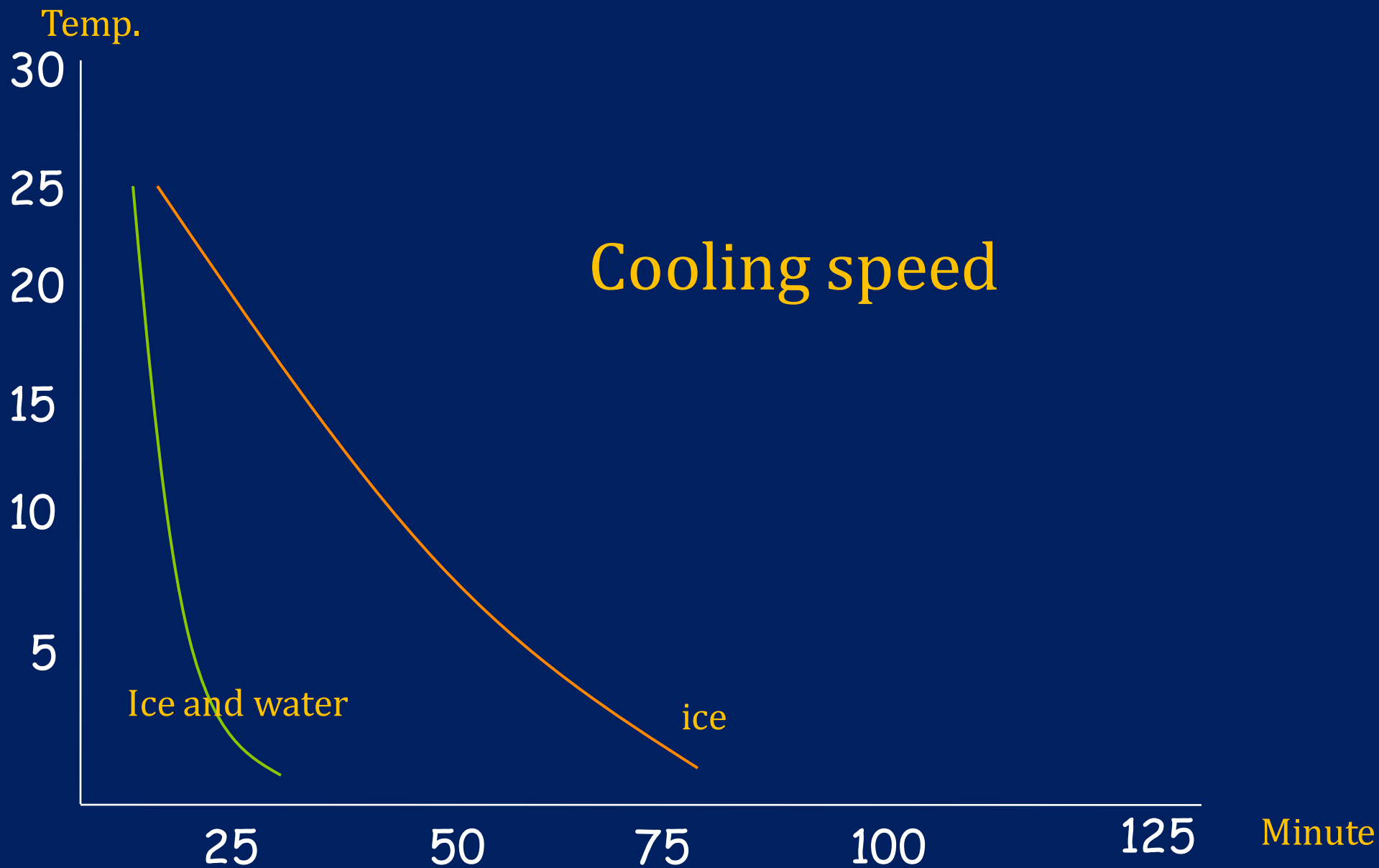
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Chilled Sea Water (CSW)

- Seawater and ice mixed in a container or hold
- Good for quick cooling
- Salt uptake can be a problem if fish is in CSW for a long time







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Preservation by Chill Sea Water :

The ratios for seawater, ice, and fish in an insulated container or chill tanks vary depending on the climate temperature. It's a very important method that should be doing it.



1



2



4



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Formula for calculating the amount of ice is used

$$I_w = \frac{(S_w + F_w)S_t}{80}$$

When

I_w = The amount of ice required to store fish (Kg.)

S_w = Weight of seawater used to collect fish (Kg.)

F_w = Quantity of fish to be kept (Kg.)

S_t = Sea water temperature (°C)

80 = Energy value of ice



Sample calculating of formula

Calculate to find the amount of ice. When there is 1000 kg. of water for storing 3000 kg. of fish and the sea water temperature is 32 degrees Celsius.

Solution

$$I_w = \frac{(S_w + F_w)S_t}{80}$$

When

I_w = The amount of ice required to store fish (Kg.)

S_w = 1,000 kg.

F_w = 3,000 kg.

S_t = 32 °C

80 = Energy value of ice



substitute in formula

$$I_w = \frac{(S_w + F_w)S_t}{80}$$

$$I_w = \frac{(1000+3000)32}{80} = \frac{(4000)32}{80} = \frac{128000}{80}$$

$$I_w = 1,600 \text{ kg.}$$



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Refrigeration Sea Water (RSW)





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An advantage of RSW is as follow:

- Reduced pressure on the fish body
- Lower holding temperature possible
- Quicker handling of large quantities of fish with little delay
- Extended storage time and fishing duration.

Fish Preservation onboard (RSW)









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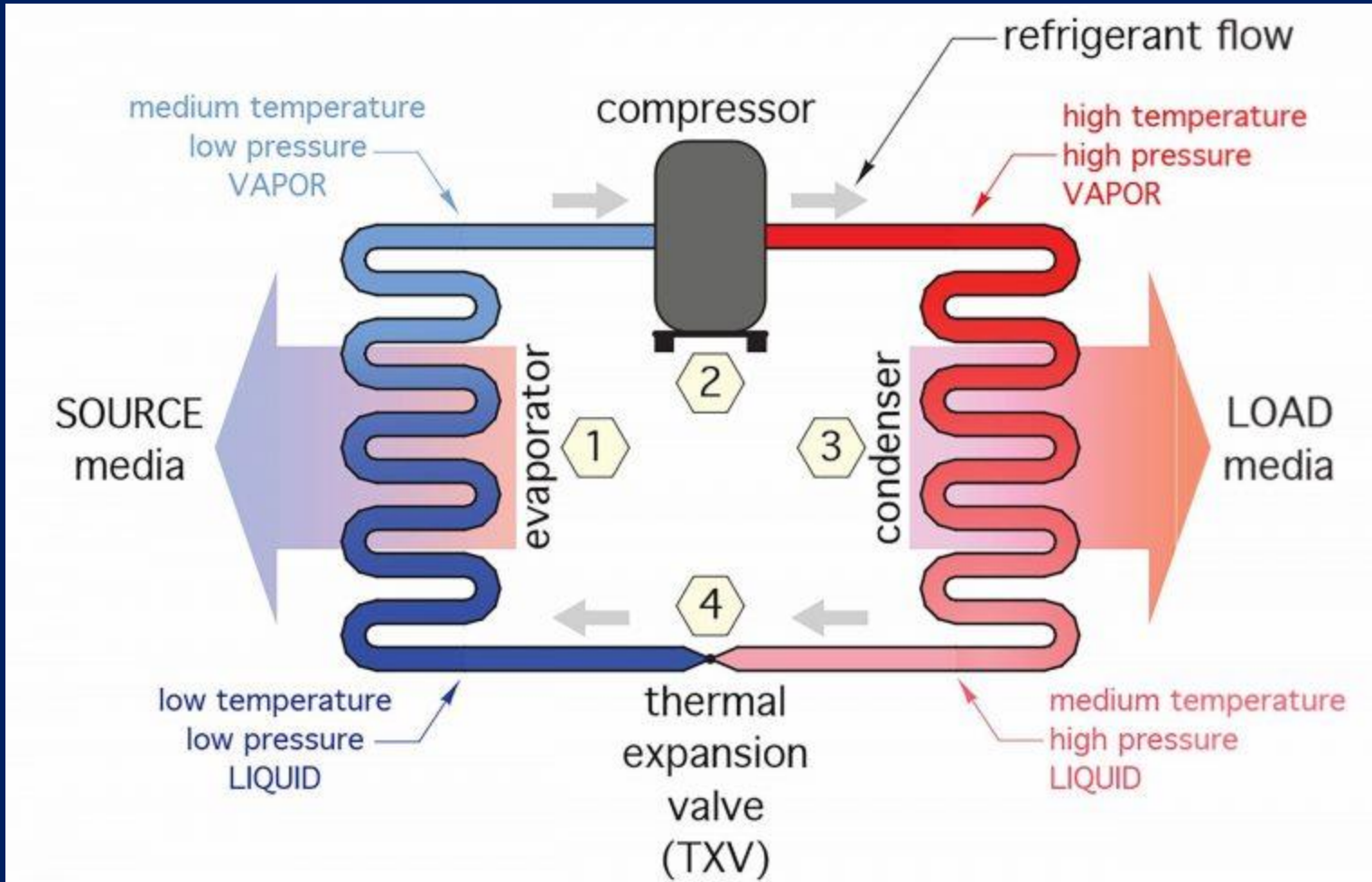
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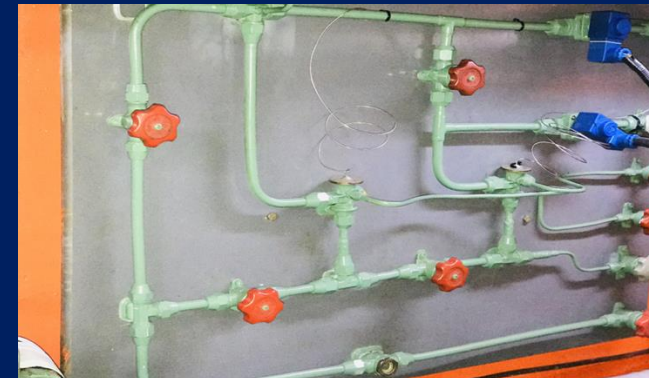
Working principle of refrigeration system



Simple Refrigeration System Wiring Diagram



Hybrid Refrigeration System Onboard (M.V. Plalung)



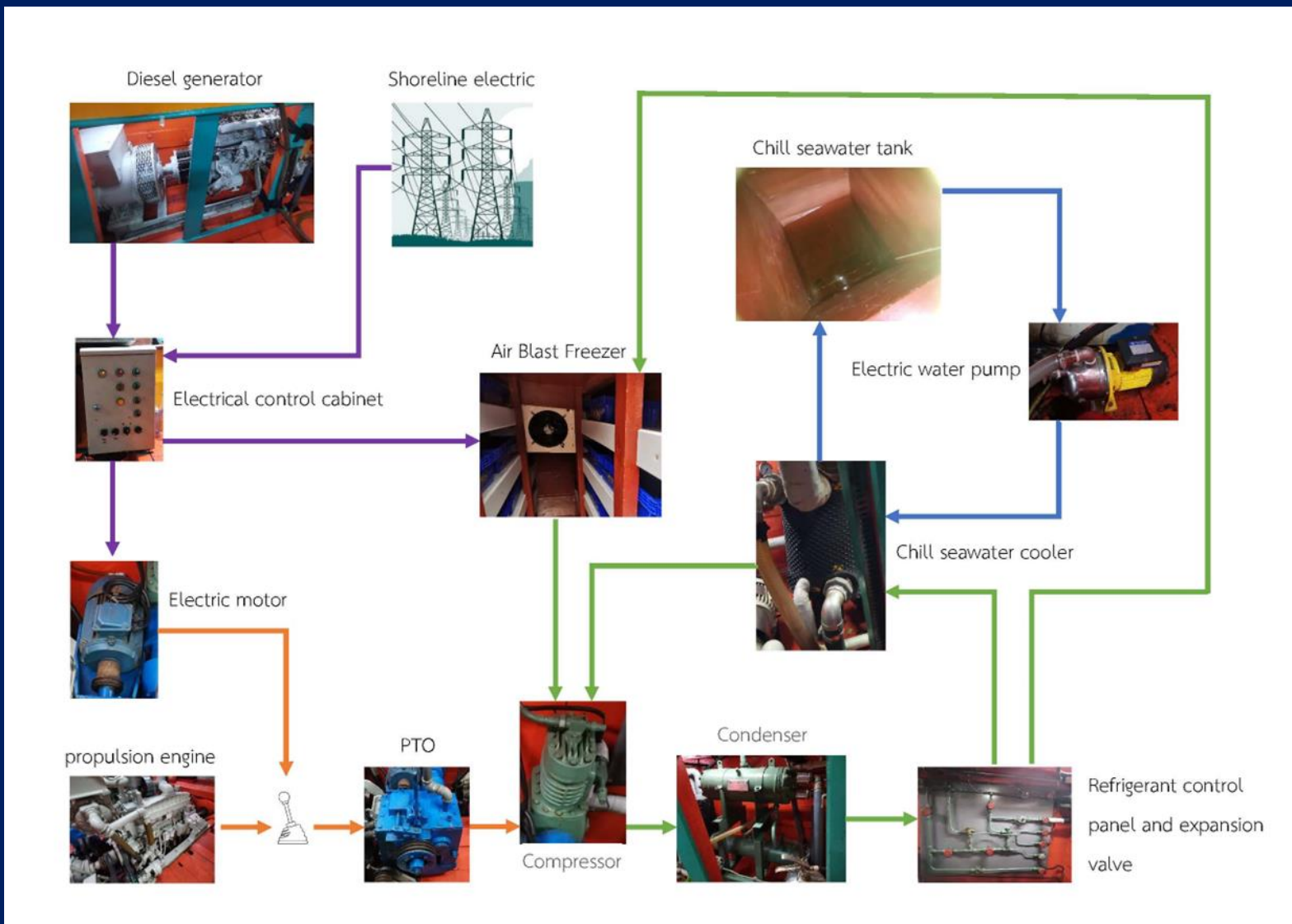
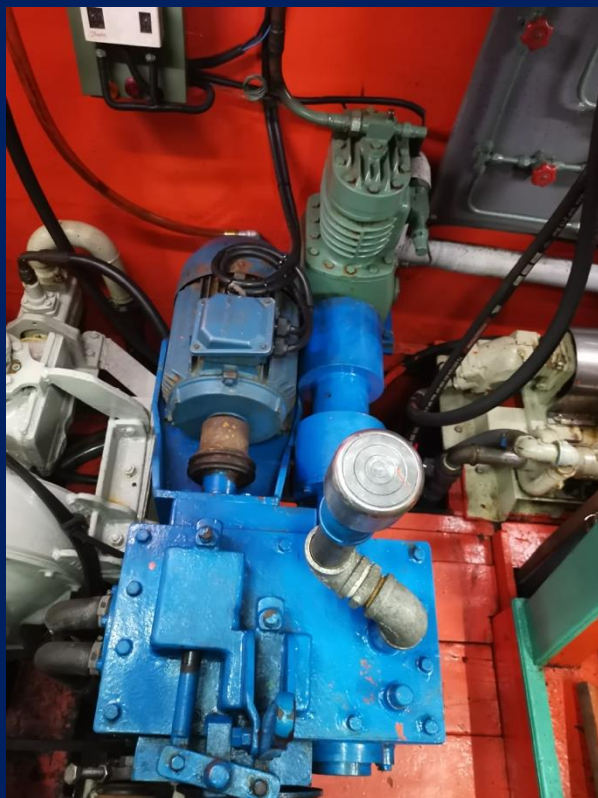






Power Take-off (PTO)

Hybrid refrigeration system wiring diagram





RSW system



Live fish preservation

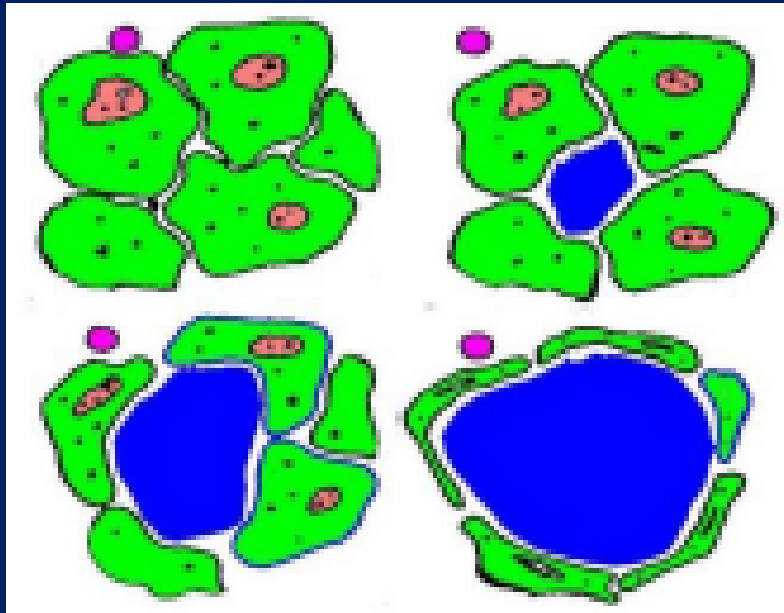


Air blast freezer system

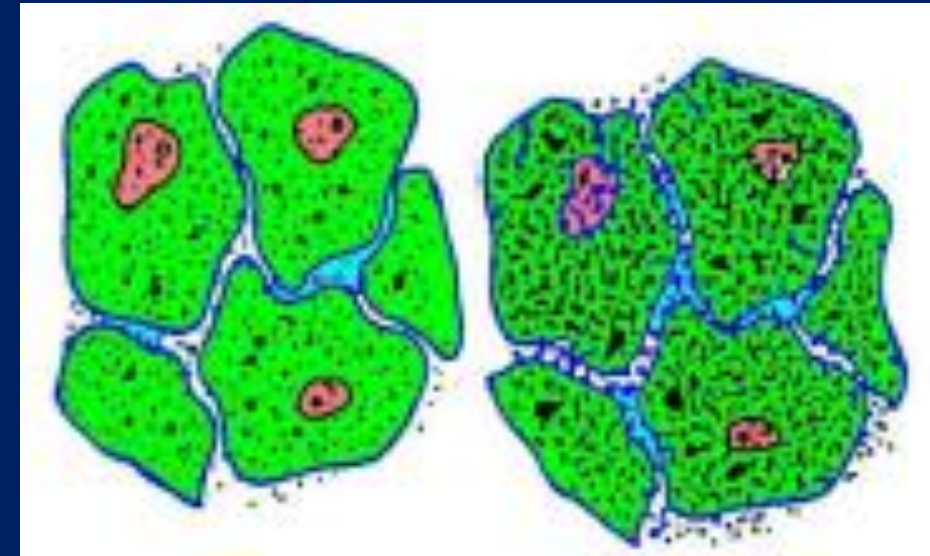




Characteristics of ice crystal in fish cells in freezing.

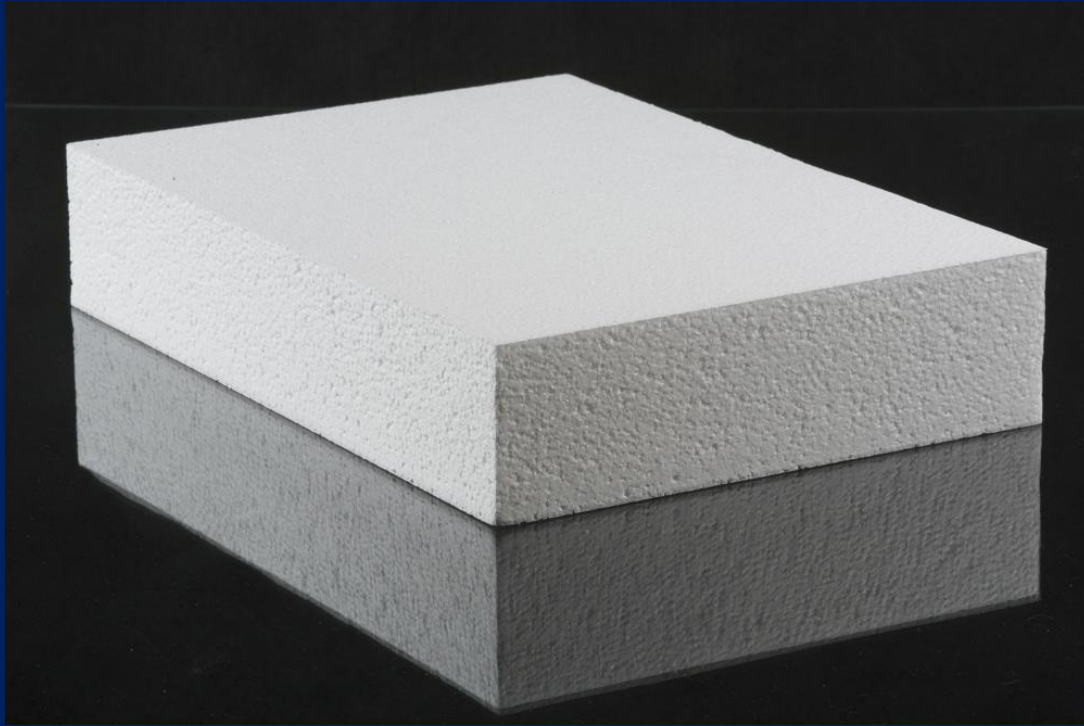


The slow freezer temperature to result freezing slow ice crystals causes cell damage.

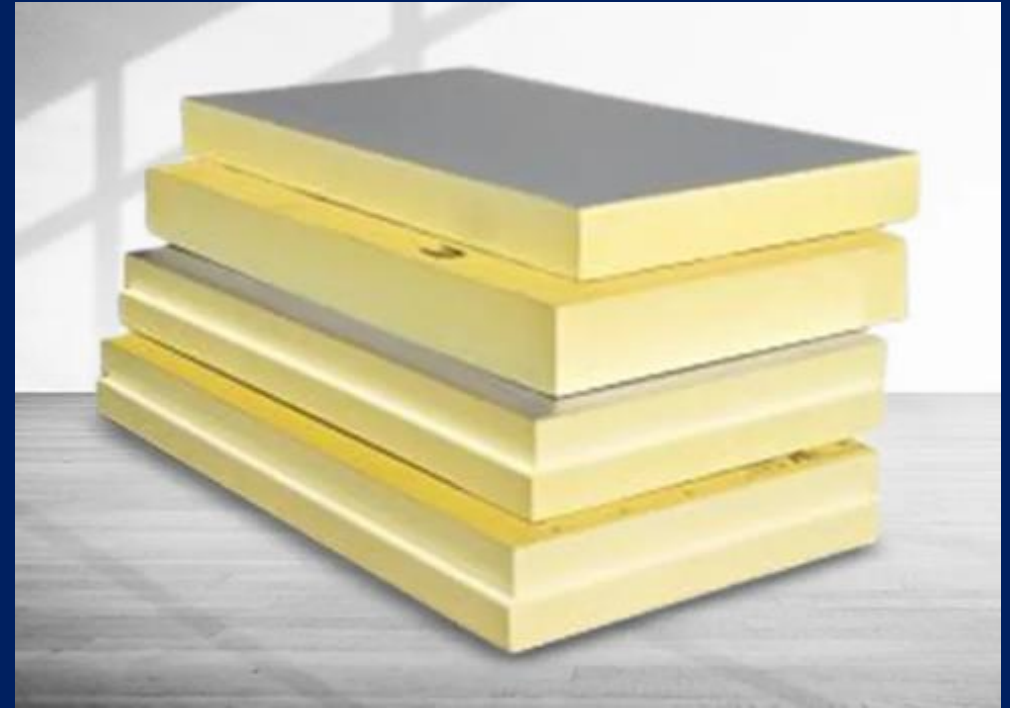


The quick freezer temperature to result freezing to fast ice crystals into the cells of fish causes they are not damage.

Examples of insulation used for cold rooms



(Polystyrene Foam, EPS Foam)



Polyurethane foam (PU Foam)

Examples of insulation used for cold rooms



(Polystyrene Foam
or Expanded polystyrene,
(EPS Foam)

Polyurethane foam (PU Foam)



Property	Polystyrene Foam	Polyurethane foam
Maximum operating temperature (°C)	80	120
spread of fire	Flammable but does not spread fire.	Flammable but does not spread fire.
sound insulation	Good	Bad
Heat protection	less than PU	More than EPS
Usable wall panel thickness	>100 mm.	>50 mm.
Price	Cheap price	Expensive



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Summaries

1. We cannot determine, What is the best way to preserve the fish onboard. It's many factors such as 1) the Period of the fishing operation and 2) the distance between the fishing ground and the fishing port. 3) Type of fishing gear. Each fishing gear it's a different fish handling and preservation technique. Should be considered. What is appropriate for the fishing vessel/Fishing boat.
2. Pre-cool process is important that needs to promote and raise up awareness for fishermen. You can do whatever Keep the fish caught to cool down as much as possible and as quickly as possible. After that, it will be stored as appropriate. or according to the potential of the fishing vessel.
3. The preservation onboard depends on the availability and investment potential of the fishing vessel owner.
4. initiative of a fishing vessel owner. Therefore, if the fishing vessel owner does not have the initiative. The preservation method for onboard will never be developed.
5. The last is the marketing mechanism is a key factor. As long as there is no difference in the price of fishery products. Improving the preservation of quality and freshness of fishery products will be meaningless. Therefore, we need to improve the preservation technique onboard in parallel with marketing mechanisms.



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*Thank You
For Your Atten.*

