



PROCESSING OF FROZEN FISH



AATMANIRBHAR BHARAT

**PM Formalisation of Micro Food Processing
Enterprises Scheme (PM FME Scheme)**

INTRODUCTION

Industrial Overview:



- Since prior to recorded history, fish from the world's aquatic and freshwater bodies have been a significant source of food for humanity.
- Ancient Egyptians, Greeks, and other Mediterranean cultures practiced collecting wild fish from fresh and sea waters and cultivating cultured fish in ponds.
- Almost 90 percent of marine commodity shipments are in frozen form. Shrimp, lobster, mackerel, tuna etc. are the most common products.
- Freezing is the process by which fresh fish and other seafood items are stored.

- Fish is a common source of protein since fish is rich in good fats such as omega 3 and 6, and plenty of B-vitamins, in addition to being comparatively lower in calories, saturated fats and cholesterol.
- Fresh fish, though, are often pricey and need to be used fast, so frozen fish or flash-frozen fish become safer alternatives.

- Freezing is commonly used in seafood reservations at varying temperatures.
- In order to maintain the flavor and nutritious value of the food, the use of an effective technique is important.
- The consumption of several species of fish that are common in the world has been promoted by modern processing and preservation practices

INTRODUCTION

Product Description:



- Most of the edible fish products are derived from skeletal muscles (flesh), which account for more than 50% of the animals' total body mass.
- Myomeres are separated by thin layers of connective tissue that are horizontal (myosepta) and vertical (myocommata).
- Frozen fish can last from four to six months in the freezer and still have the same health benefits.
- Research from Norway is exploring new methods for handling, frozen and thawing fish in order to ensure the best quality of fish throughout the year.

- The quality of frozen fish is affected by variables such as fish species, stress levels, pre-slaughter handling and rigor status.
- However, temperature management during freezing, storage, transportation and thawing are the most important factors determining the quality of frozen fish.
- Freezing must be fast and the temperature throughout the process must be low and constant, and during transport and storage, fluctuations must be avoided.

INTRODUCTION

Market Potential:

- The size of the frozen fish and seafood industry has the potential to rise by USD 31.76 billion in 2020-2024.
- Rohu, Catla, Mrigal are highly significant decisions among the freshwater carp fish species.
- India is the world's second largest fish producer with a harvest of about 10.8 million MT.
- Marine food production rate in India are currently at 23 percent.
- . Currently, Indian export sector is estimated at USD 5.8 Bn/ 1 Mn MT.
- The table size of rohu, catla, mrigal fish has an edible portion of 60-70 percent while carps over 3 kg have an edible portion of 75-80 percent

- Andhra Pradesh, West Bengal, Gujarat, Karnataka and Kerala are the top five fishing states in India, with a combined share of about 50 percent of the overall fish production.
- India exported marine products worth USD 5.8 Bn in 2016-17.
- The second largest export commodity was frozen cod, representing a share of 26 percent in quantity and 12 percent in volume.



- In terms of export rate, Pipavav is the main port and Vizag is the major port in terms of export value.
- From 2019 to 2024, the worldwide Frozen Seafood Industry is forecast to record 5.34% CAGR and hit USD 17.29 billion by the end of 2024.
- Asia-Pacific is expected to rise at the highest CAGR level in the global frozen market due to developing demand for seafood due to a rapidly expanding population.

GLOBAL MARKET, BY REGION

➤ Asia-Pacific

- Japan
- China
- India
- Australia and New Zealand
- Rest of Asia-Pacific

➤ Intended Audience

- Processors of frozen seafood
- Traders and distributors of frozen seafood
- Research and development institutes
- Potential investors
- Raw material suppliers
- Nationalized laboratories

INTRODUCTION

Raw Material Description:

- A wide variety of fish and shellfish suitable for canning are available.
- For canning/frozen packing, sardines, mackerel, tuna, seer fish and shellfish such as shrimp, clam, oyster, mussel, crab etc. are appropriate.
- Raw material processing involves de-scaling, beheading, gutting, fine reduction, tail removal and cutting into small parts, etc.

- The yield is influenced by the ratio between the edible and the inedible parts of the fish, and the technical value of the fish is a deciding factor.
- Fish are cold-blooded animals, with fins and a backbone. Many fish breathe with gills and have scales. About 480 million years ago, 22,000 species of fish started to evolve. The largemouth bass shown above has the usual (fusiform) torpedo-like appearance shared with many fish.

In most cases, these four elements account for about 96-98 percent of total tissue constituents.

- Fins: Fins are appendages used to hold position, pass, steer and avoid by the fish.
- Scales- In most bony fish, the scales—most non-gar freshwater fish with ganoid scales and catfish without scales—are either ctenoid or cycloid.

- Gills: The gills are the fish's respiratory apparatus and are extremely vascularized, giving them their vivid red appearance.
- Eyes- Colour can be sensed by fish. Because of the refractive index of water, the eyes of fish are more oval than in mammals and focus is done by pushing the lens in and out, not distorting it as in mammals.
- Nares- To detect odours in water, paired nostrils, or nares, in fish are used and can be very sensitive.

- Mouth: The shape of the mouth is a clear clue to what fish are eating.
- The larger it is, the greater the prey that it can consume.
- Fish have a sense of taste and, if they are not obvious prey objects, can sample things to taste them before swallowing.
- Lateral Line- The lateral line is a sensory organ composed of fluid-filled sacs with hair-like sensory instruments that, through a series of pores, are exposed to the water, forming a line down the fish's side.

INTRODUCTION

Types of Raw Material:

- As long as the history of mankind goes, fish has become an important part of our diet.
- With 97% of the world under water, fish have always been a great source of food for humans as well as wildlife.
- The wide variety, simple availability and nutritional quality of fish and a host of other factors make fish a success around the world.
- As long as the history of mankind goes, fish has become an important part of our diet.
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PROCESS & MACHINERY REQUIREMENT

Raw Material Aspects:

10 majorly consumed fishes in India are:

➤ Rawas-

- Rawas is an edible fish that is one of the most loved and common.
- Rawas is commonly available in India and is popular for its mild flavoured pink to orange beef.
- A salmon fillet is said to have about 30 per cent of the fat, and is a boneless slice of fish.
- However, this oil, which contains Omega 3, Vitamin A, and Vitamin D, is perfect for your skin.

- Katla (Indian Carp or Bengal Carp):
 - Katla is a freshwater fish and is primarily found in Assam and North India's lakes and rivers.
 - Up to 2 kg can be measured by a fully-grown trout.
 - It is oily again, a very commonly eaten fish.

- Rohu a Rohu (Rohu or Carpo Fish)-
 - Rohu, a member of the Carp tribe, is a freshwater fish.
 - The fish are primarily available in Northern and Central India, respectively.
 - The fish weights up to 2 kilograms on average and is mainly eaten for meat.
 - It's high in Omega Fatty acids again.

- The Bangda (Indian Mackerel)-
 - The Indian Mackerel, also known as Bangda, belongs to the list of Indian staple fishes.
 - It is a saltwater fish that is present in the surrounding seas and the Indian Oceans.
 - The fish is fatty and is thus a perfect source of Omega 3 and protein.

- Rani-Rani (Pink Pearch):
 - In India, rani is a very popular freshwater fish.
 - The fish is pink, tiny in size and mild in taste.
 - Since it only has 5 percent body fat, the fish is referred to as lean fish.
 - If your only purpose is to provide protein, then this fish is a perfect choice.

- Hilsa: Bangladesh's National Tuna. In Odisha, West Bengal, Assam and Andhra Pradesh, Hilsa is very popular.

PROCESS & MACHINERY REQUIREMENT

Source of Raw Material:

- Indian rivers are the primary source of food for the irrigation scheme, drinking water and fish.
- There is a list of freshwater fish present in Indian rivers, with Rohu, Katla, Mahseer, Magur and Vaam being some of India's most common names for freshwater fish.
- As the primary target species for culture, a mixture of Indian main carps, including catla (Labeo catla), rohu (Labeo rohita) and mrigala.
- Katla or Catla, also referred to as the big Indian carp, is widely found in Indian rivers and lakes and is one of the most popular freshwater fish species.

Technologies:

Direct and indirect systems

The refrigerant absorbs heat directly from the material to be cooled inside the direct expansion device. The refrigerant consumes the heat that the brine absorbs from the substance to be cooled inside the indirect or brine method.

- Air-Freezing
- Freezing in still air:
- Air Blast Freezer
- Continuous air blast freezer
- Fluidized Bed Freezing

TECHNOLOGIES

Indirect Contact Freezing

By holding it in contact with a metal surface which is cooled by a refrigerant, indirect contact freezing can be described as freezing a substance.

- The horizontal plate freezers
- The vertical plate freezers

Manufacturing Process:

➤ **Immediate cooling-**

Fast cooling and retention of fish at temperatures between 2 and -2 °C (36 and 28 °F) occurs shortly after processing.

➤ **Rapid freezing-**

Rapid temperature drop to between -2 and -7 °C (28 and 20 °F) is the secret to freezing.



➤ **Freezing-**


Among the various preservation processes used to preserve seafood, the taste and consistency of fresh fish can only be retained by freezing.

➤ **Freezer Chamber-**



In order to preserve a long shelf life and ensure consistency, fish must be preserved at a steady temperature of -23 °C (-10 °F) or below when frozen.

Flow Chart:

Machine Name	Description	Machine Image.
<p>Vaccum Packaging Machine</p>	<p>The Fish Vacuum Packing System extracts and seals air from the pouch in an airtight way. Vacuum packing increases the shelf-life and helps maintain the product's consistency.</p>	
<p>Blast Freezer-</p>	<p>For deep freezing fillets of cod, air blast freezers are also used. On their travel into the tube, the fillets lie on a conveyer belt and freeze.</p>	

Machine Name	Description	Machine Image.
Freezer/cold storage	A plant for the refrigeration, freezing and cold handling of perishable foodstuffs and other perishables.	

Additional Machine & Equipment:

Machine and Equipment	Uses	Pictures
<p>Gutting machines</p>	<p>Gutting machines reduce the amount of waste by basically gutting all forms of fish with extremely high accuracy, leading to a decline in the cost of processing. The guts are sucked out with the aid of a vacuum when the fish is gutted and sliced. Problems involving knife sharpening as a result of stones eaten by fish are thereby avoided.</p>	
<p>Washmaster</p>	<p>For initial cleaning, rinsing during processing or final washing before packaging, Wash master may be used. Wash master is available as a 2-chamber device, meaning that some of the water can be</p>	

Scalemaster

The Scale master unit is mounted on a rigid spring suspension frame in order to change the size of the fish. The fish is kept in place by tight connections during the decaling process-it is necessary to maintain the fish in place to ensure a successful decaling. The tightening of the ties is performed pneumatically and it is easy to seamlessly change the tightening process. The links can be cut for better cleaning of both the ties and the unit in a minute.



General Failures & Remedies:

General Failures	Remedies
Ball bearing failure of various machine	1. Proper periodic lubrication of all bearings in various machines.
Power Drive Overload	1. Ensure proper weighing & metering specially in case of semi-automatic plant.
Mechanical Key Failure	1. Ensure that mechanical keys are replaced as per there pre-defined operational life. 2. Prevent Overloading.
Loss of Interface	1. Provide proper physical shielding for the connections.

Nutritional Information:

- The Proteins- An outstanding source of high-quality protein is fish.
- Fat- Fat is mainly liquid (i.e. fish oil) in fish and it contains a comparatively low proportion of fatty acids that are saturated.
- Vitamins and mineral substances- Fish supplements the diet with a variety of essential vitamins and minerals.

- Microbiology- Fish are highly prone to microbial pollution due to their soft tissues and the marine climate.
- Fish bear a heavy microbial load on the surface of their skin, in their digestive tract and in their gills at the time of harvest.
- Species of Pseudomonas, Moraxella, and Acinetobacter, found primarily in marine fish, and Bacillus and Micrococcus, found in freshwater fish, are typical spoilage microorganisms in fish.

Export Potential & Sales Aspect:

- Factors driving the global frozen seafood industry are growing the demand for frozen seafood products globally.
- Manufacturers concentrate on delivering healthy offerings of items.
- Frozen seafood products are frozen with cryogenic technology that aims to prevent the bacterial growth of frozen seafood products.
- Several frozen seafood companies worldwide use cryogenic freezing equipment to retain low temperatures of solid carbon dioxide or liquid nitrogen that is specifically added to frozen seafood products.
- Frozen seafood items can be preserved for a long period of time with the aid of advanced freezing technologies.

PM-FME Scheme

- Support for capital investment for up-gradation and formalization with registration for GST, FSSAI hygiene standards and Udyog Aadhar;
- Capacity building through skill training, imparting technical knowledge on food safety, standards & hygiene and quality improvement;
- Hand holding support for preparation of DPR, availing bank loan and up-gradation;
- Support to Farmer Producer Organizations (FPOs), Self Help Groups (SHGs), producers cooperatives for capital investment, common infrastructure and support branding and marketing.



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