

**PROSPECTS OF MARKET OF SEAFOOD USING
IQF TECHNOLOGY IN
DOMESTIC & INTERNATIONAL MARKET**

A PROJECT REPORT

Submitted by

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Reg. No. 04-1185-2009

In partial fulfillment for the award of the degree

of

**MASTER OF BUSINESS ADMINISTRATION
INTERNATIONAL AGRIBUSINESS**

UNDER THE GUIDANCE

OF

Prof. Y.A.LAD

Assistant Professor

**INTERNATIONAL AGRIBUSINESS MANAGEMENT INSTITUTE
ANAND AGRICULTURAL UNIVERSITY**

ANAND - 388 110

JUNE- 2011

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CERTIFICATE

This is to certify that the project entitled “**Prospects of Market of Seafood Using IQF Technology in Domestic & International Market**” of M.B.A (International Agribusiness) embodies bonafide research work carried out by **Ravi Kant Anand** under my guidance and supervision and that no part of this project work has been submitted for any other degree. The assistance, guidance and help received during the course of investigation have been fully acknowledged.

Place: IABMI, Anand

(Prof. Y.A.Lad)

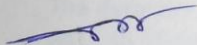
Date: /06/2011


Advisor

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CERTIFICATE


This is to certify that the project entitled “**Prospects of market of Seafood using IQF technology in Domestic and International Market**“ submitted by **Ravi Kant Anand** to the Anand Agricultural University, Anand in partial fulfillment of the requirement for the degree of M.B.A.(International Agribusiness) after presentation and defended by the candidate before the following members of the Advisory Committee. The performance of the candidate in this project has been found satisfactory; we therefore, recommend that the project report may be approved.


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This is to certify that **Mr. Ravikant Anand**, student of International Agribusiness Management Institute, Anand Agricultural University, Anand has successfully completed project work in our organization. The title of the project was "**Prospects of Market of Seafood using IQF Technology in Domestic & International Market**"

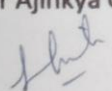
The duration of the project work was for three months from **15-02-2011 to 15-05-2011**. He had been a regular and responsible project trainee during the period.

During the period of his project work with the company he was found to be enthusiastic, hardworking and sincere.

We wish him all the very best in all his future endeavors.

Thanking you.

Yours faithfully,
For Ajinkya Chemtech Pvt. Ltd.


Harshanan V. Patil
Director



DECLARATION

I hereby declare that the project entitled **“Prospects of Market of Seafood Using IQF Technology in Domestic & International Market”** submitted for the M.B.A (International Agribusiness) degree is my original work and this has not formed the basis for the award of any degree, associate ship or other similar titles.

Place: IABMI, Anand

Name : Ravi Kant Anand

Date: /06/2011

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Date: /06/2011

Place: Anand

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**PROSPECTS OF MARKET OF SEAFOOD USING
IQF TECHNOLOGY IN
DOMESTIC & INTERNATIONAL MARKET**

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ABSTRACT

India is the third largest fish producer in the world and second in inland fish production. The fisheries sector contributes near about US\$ 4.8 million to the national income, which is about 1.4 % of the total GDP.

Marine products have created a sensation in the world market because of their high health attributes. With the high unit value, seafood has been acclaimed as one of the fastest moving commodity in the world market. The global frozen seafood market was around US\$388.9 billion in 2010 and is expected to grow with a 5.4 CAGR. Frozen & IQF shrimp continued to be the major export item accounting for 41.40% of the total US \$ earning.

The project is entitled “Prospect of Market of Processed Seafood Using IQF Technology in Domestic and Internationally”. This report provides the details of Individual Quick Freezing (IQF) technology, government policies

for the marine sector, raw material requirements for setting of a processing unit, financial aspect of setting of a processing unit and industry analysis of commercially important seafood. From the study it is found that IQF technology has created a sensation in the world seafood market. At present nearly 50 seafood processing units are running in profit using IQF technology in India and the future of this technology is very good as the consumer taste of the food is changing and the demand of the IQF seafood is increasing day by day. There is good availability of raw materials in India especially in Veraval of Gujarat & also in Maharashtra.

The solid waste material can be utilized for various purposes like chitin preparation, compost preparation, fertilizer preparation, etc. which has a great demand in the market especially the compost. India has a number of ports for facilitating the export. The important one from where the frequency of shipping line is more is Pipavav port of Gujarat and JNP port of Maharashtra.

From the study it is clear that the establishment of a seafood unit requires building, IQF processing line, freezing equipment's, processing line equipment's, effluent treatment plant equipment's, quality control certificates, microbial testing lab setup, etc. From the study it is found that there is very less scope of IQF seafood in domestic market in general as the

feeding behaviour of the domestic people is like “why to eat frozen products if the same is available in fresh”. But despite of this there is ray of scope especially in metropolitan city & five star hotels.

European Union (EU) continued to be the largest market with a share of 29.89% in US \$ realization. China maintained the second place with a share of 17.80%, followed by Japan 13.06%, USA 10.01%, South East Asia 14.76%, Middle East 5.49% and other countries 8.99%.

For international market, from the import trends of different countries, it can be concluded that there is good potential of the export of IQF seafood. Also the potential product categories for export to these countries are mainly three viz; Shrimps, squids & mackerel.

The study also says that company should establish the processing unit in Gujarat at Veraval as there is abundant supply of the raw materials at an affordable cost. Also the government facility is more here as compared to the other states. Gujarat and more precisely Veraval is having the nearly all the facilities for an exporter to establish the processing unit.

The study also discusses the scope and opportunities for IQF seafood marketers apart from providing the knowledge of frozen seafood markets which is helpful for the company and emerging exporters.

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NOMENCLATURE

AAU	:	Anand Agricultural University
Assist.	:	Assistant
Assoc.	:	Associate
BOA	:	Board of Approval
BOD	:	Biological Oxygen Demand
C.G.	:	Chhattisgarh
CAGR	:	Compound Annual Growth Rate
CAR	:	Consolidated Annual Report
CFC	:	ChloroFloro Carbon
CFFT	:	Cuttle Fish Frozen Tentacle
C & P	:	Cooked & Peeled
Cr.	:	Crore
EU	:	European Union
EUC	:	European Union Countries
EPZ	:	Export Processing Zone
EOU	:	Export Oriented Unit
EUR	:	Euro
EPS	:	Expanded Polystyrene Sheet
etc.	:	et cetera
FAO	:	Food and Agriculture Organization
Fr.	:	Frozen
Fig.	:	Figure
GBP	:	Great Britain Pound
G.I	:	Galvanized Iron
Gm	:	Grams
HCFC	:	Hydrochloroflora Carbon

HFC	:	Hydrofloro Carbon
HP	:	Horse Power
HACCP	:	Hazard Analysis Critical Control Point
IABMI	:	International Agribusiness Management Institute
IQF	:	Individually Quick Frozen
IUU	:	Illegal, Unreported & Unregulated
JNP	:	Jawaharlal Nehru Port
Kgs	:	Kilograms
KVA	:	Kilo Volt Ampere
KWH	:	Kilo Watt Hour
Ltd.	:	Limited
Lb	:	Pound
LPG	:	Liquified Petroleum Gas
MPEDA	:	Marine Product Export Development Authority
MD	:	Managing Director
MOFPI	:	Ministry of Food Processing Industries
mT	:	Million Tons
MT	:	Metric Tons
m	:	Meter
mm	:	Milli Meter
MOEF	:	Ministry of Environment & Forestry
NABARD	:	National Bank for Agriculture & Rural Development
No.	:	Number
Prof.	:	Professor
Pvt.	:	Private
PUF	:	Polyurethanes Foamed
PUD	:	Peeled & Deveined
RBI	:	Reserve Bank of India

Rs.	:	Rupees
RCC	:	Reinforced Concrete Cement
RPM	:	Rotation Per Minute
RH	:	Relative Humidity
SEZ	:	Special Economic Zone
SQW	:	Squid Whole
SQTN	:	Squid Tentacle
SQRN	:	Squid Ring
U.P.	:	Uttar Pradesh
UK	:	United Kingdom
USA	:	United State of America
USD	:	United State Dollar
USDA	:	United State Department of Agriculture
UV	:	Ultra Violet
W.B.	:	West Bengal
WTO	:	World Trade Organization
WHO	:	World Health Organization
%	:	Percentage
°C	:	degree centigrade

I. INTRODUCTION

1.1 Background of the Study

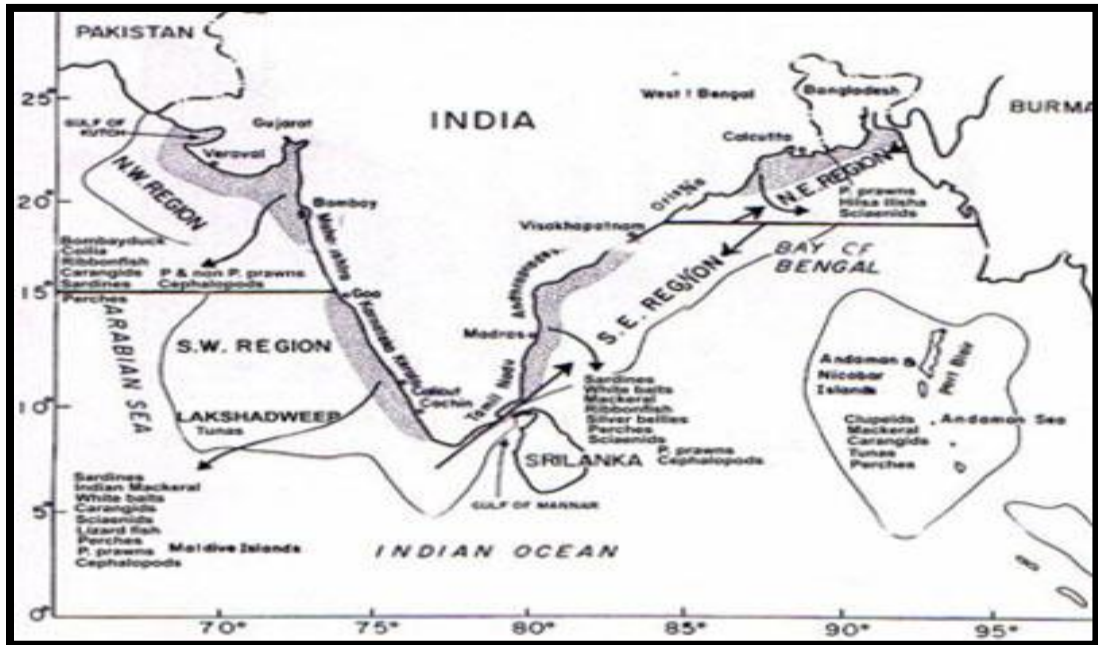
Significance of export of value added products in general and frozen (IQF) seafood in particular have increased substantially during the past few years as a result of changing economic environment globally. India has a vast potential of capturing, culturing, processing and exporting frozen (IQF) seafood. However, this requires a lot of efforts in terms of product quality and infrastructure. Despite being the larger producer of seafood in the world, India's share in exports is miniscule. This is due to several reasons like inappropriate product quality, insufficient infrastructure etc. The European countries, USA, Japan etc., markets for the frozen (IQF) are very particular in the quality specifications. Thus to match their quality standards, special efforts are needed. Keeping this in view an attempt had been made to study the prospects market of seafood using IQF technology in International market as well as in Domestic market.

1.2 The Indian Seafood Industry

India is the third largest fish-producing nation in the world, exporting to 73 countries. It has the potential to grow further in view of the growing demand in trading blocks such as the European Union, United States, Canada and MiddleEast.

There has been huge transformation in the Indian seafood industry over the last few years many of which have not been highlighted or marketed in the international arena. In 1997 the EU banned Indian seafood, citing lack of hygienic and phytosanitary measures in the industry, this was a

landmark as thereon India has come a very long way. The challenge was on and India spearheaded quality control and HACCP was put into place. Today, we have excellent facilities, competitive labor and our infrastructure is catching up fast.



Source: MPEDA

Figure 1.2.1: The Indian Coastal Eco-regions

With 8,129 kms of sea-coast, the Indian seafood industry is the 3rd largest seafood market in the world.

1.3 Statistics on the Indian Seafood Market:

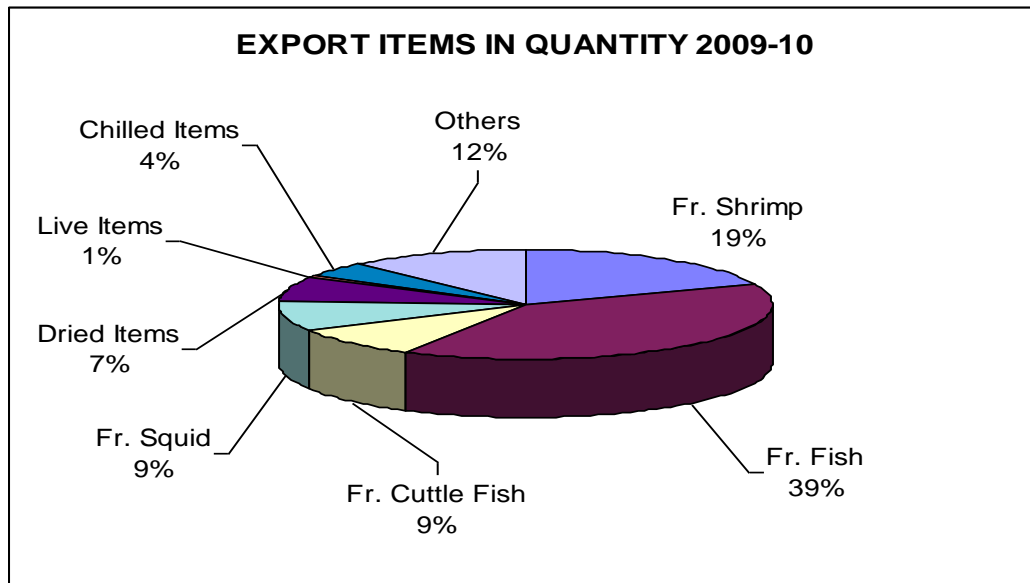
- The overall export of marine products reached a record figure of \$2.61bn during 2009-10.
- Exports have shown an increase of 20% in quantity and value. Frozen shrimp continues to be the largest item exported in terms of value at 52%.

- Fresh fish is the largest export item in terms of quantity with 36% of total export volume.
- India with a fishery production of nearly 7.2 MMT a year is now the 3rd largest fish producing country in the world. However it is ranked 16th in terms of seafood exports with a 4% share in global marine trade.
- India has the largest number of EU approved processing plants in the world with more than 3 MMT annual capacities, however only 20% is being currently utilized.
- Tuna fish farming is growing in importance. India has the resource potential of 213,000 tonnes but currently lands less than 10% a year.

Table 1.3.1: Major Markets of Indian Marine Products (2009-10)

Country	Qty (MTs)		Value in US \$ million	
EU	164799	24.29%	3013	29.99%
USA	33444	4.93%	1012	10.08%
Japan	62690	9.24%	1289.5	12.83%
China	144290	21.27%	1790.9	17.82%
SE Asia	149353	22.01%	1479.5	14.72%
M. East	34907	5.15%	553.5	5.51%
Others	88935	13.11%	909.11	9.05%
TOTAL	678436	100.0%	10048	100.0%

Source: MPEDA



Source: MPEDA

Fig.1.3.1: Product wise export 2009-10

1.4 Company Profile

“AJINKYA CHEMTECH PVT. LTD.”

1.4.1 History

Ajinkya Chemtech Pvt Ltd was established in the year 1996 with a major focus on providing organic farming input solutions to farming community to improve quality of produce and yield of farm. Ajinkya Chemtech Pvt Ltd is one of the emerging players in the field of organic farming and has a wide domestic market in Maharashtra, UP, Himachal Pradesh, Haryana, Karnataka, and Uttaranchal. Wide range of solutions for organic farming includes biopesticides, organic fertilizers, plant growth regulators and special solutions for the most genuine problems in the field of agriculture. They are also involved in contract farming of Grape, Pomegranates, Bananas and Mangoes. They are also doing

mango pulp processing and exporting them to Middle East and European countries.

1.4.2 Quality Products:-

Ajinkya Chemtech Pvt. Ltd. is very much concern with the quality of the products as company motto is “providing quality product at competitive price to the farmers”. Each product is strictly controlled throughout its manufacturing life from the formulation to the final packaging.

1.4.3 Service:-

Ajinkya Chemtech Pvt.Ltd. is providing the extension service to their dealers & more importantly to their farmer with the help well qualified extension officers regularly. We strive to build lasting supply relationships, offer value-added services and help our customers meet their cost savings goals.

1.4.4 Values:-

Excellence, honesty and quality are the Ajinkya Chemtech Pvt. Ltd. principles that have shaped and continue to guide solid, growing and vertically integrated company.

1.4.5 Pricing Policy:-

Ajinkya Chemtech Pvt. Ltd. always offers competitive prices and supplies products as per customer requirements. Our key to this is the direct relationship we develop with each and every customer.

1.4.6 Products of Company:

1) Products for organic farming: -

- i) Fungicides:-
 - a) Bordogold
 - b) Licop

- ii) Fertilizers:-
 - a) Phospomine
 - b) Ecohumic granule
 - c) Ecomeal
- iii) Bactericide:- Bactrophor
- iv) Sulphur formulation: - Ecosulf
- v) Plant growth regulator:-
 - a) Ecozyme
 - b) Ecostim
 - c) Ecohumic
- vi) Special formulation:-
 - a) Velvet
 - b) Nevigator
 - c) Mitigator

2) **Canned Products:** - Mango pulp

1.4.7 Management Team:-

Ajinkya Chemtech Pvt.Ltd. is managed by following highly qualified & experienced managers.

Table 1.4.7.1: Management Team

Top Management – MD	: Mr. Harshanan V. Patil
Extension Manager	: Mr. Manjusha H. Patil
Business Development Manager	: Mr. Prashant Prasad
Marketing Manager	: Mr. KavishvarPatil
HR & Admin.	: Mr. Prashant Patil
Production Manager	: Mr. AjinkyaIngale

1.5 Objectives

The study was under taken with the following objectives:

- 1) To study about the Individual Quick Freezing Technology.
- 2) To identify the suitable and feasible location for plant operation.
 - ✓ To study the availability of the raw materials.
 - ✓ To study Government policies and support (inclusive of all subsidies and incentives).
 - ✓ To study frequency and availability of nearby port.
- 3) To study and identify the crucial requirements for establishing the seafood processing unit using IQF technology.
- 4) To study the solid waste management of seafood processing unit.
- 5) Competitive analysis of the IQF seafood processing segment, nationally and internationally.

II. REVIEW OF LITERATURE

2.1. Details of freezing & IQF technology

2.1.1 Fundamentals of Freezing

Freezing involves cooling down of the materials from a refrigerated temperature (0 to 2°C) to temperature below the freezing point (at least -15 °C). There are three stages in freezing.

1. During this stage, the temperature fairly falls rapidly to just below 0°C.
2. This stage is also known as a thermal arrest period, is the stage in which temperature remains fairly constant at about -1°C as the bulk of the water in the product begins to freeze. This is the most critical period and to produce a good quality frozen product, fish should pass through the thermal arrest period as quickly as possible. More than 50% of the energy is expended for passing the fish through the second stage.
3. In this stage, nearly 75% of the water in the muscle turns into ice, leading to a further drop in the temperature.

2.1.2 Quality Changes Due To Freezing and Frozen Storage

2.1.2.1 Glass Transition

A phenomenon, known as “glass transition” has been observed in foods during freezing, which occurs at varying temperatures depending upon the food product. The glass transition has been related to product stability during frozen storage. A glass is an amorphous solid that has a liquid structure with a greater viscosity. As the temperature falls during

freezing, the liquid viscosity increases and the transition movement of the molecules becomes slower. When molecular transition cannot occur within the experimental time scale, the variations of enthalpy and volume with temperature will resemble those of a solid, even though the molecules are not ordered, as in a crystalline structure.

2.1.2.2 Textural Changes

As a consequence of frozen storage and associated denaturation of proteins, the texture of fish gradually changes from the usually soft, springy, moist succulent of fresh or recently frozen fish to unacceptably firm, hard, fibrous, woody, spongy or dry ones.

2.1.2.3 Changes in Flavor

Generally, fresh fish has fresh sea weedy odor, which can be retained even after freezing and frozen storage. During frozen storage, off-odors and off-flavors gradually develop, which become noticeable as the storage period advances.

2.1.2.4 Changes in Appearance

The pigments of fish and shellfish tend to fade and become duller or change in hue during frozen storage. Some fish, like tuna, develop discoloration during frozen storage, reportedly due to oxidation of myoglobin to metmyoglobin in the blood.

2.1.2.5 Microbial Changes

As the temperature is reduced to cause a large portion of water to freeze, the growth of most microorganisms stops except for some psychrophilic bacteria, yeasts, and molds. At -20°C most cells will have lethal or sub-lethal injury.

2.1.2.6 Dehydration

Dehydration and weight losses are the major problems in frozen fish and shrimp trade. “Freezer burn” is a defect that develops on the surface of exposed frozen fish, particularly unwrapped or in glazed steaks and fillets after a few weeks of frozen storage.

Table 2.1.2.1: Reasons for quality loss in frozen fishery products during storage

PARAMETER	EFFECT
Protein cross-linkage, denaturation	Tough and spongy texture
Breakdown of TMAO into dimethylamine(DMA) and formaldehyde(HCHO)	Tough and spongy texture, loss of juiciness and succulence.
Oxidation of lipids	Flavor changes
Loss of calcium dependent ATPase activity	Dry and cottony on first bite
Loss of flavor causing compounds	Bland or neutral flavor
Development of off flavor compounds	Loss of natural flavor
Concentration of minerals	Lipid oxidation, protein denaturation, changes in pH and ionic strength.
Ice Crystal Formation	Rupture of cells, release of cell constraints.
Sensory changes	Loss of consumers value
Nutritional changes	Leaching of nutrients in drip. Loss of nutritional quality.
Functional properties	Water-holding capacity, emulsification capacity.

Source: FAO

2.2 Control of Quality Changes

It is difficult to completely control quality changes during prolonged frozen storage, but the intensity of such changes could be reduced by several means. These include measures to be taken:

- ❖ At the product level: - By use of fresh fish, incorporation of certain additives known as cryoprotectants, by glazing, through coating & packaging of the product.
- ❖ During the freezing operation: - Mainly through a quick freezing process employing a technique to suit the product.
- ❖ At the storage level: - Prevention of weight loss can be achieved by ensuring a lower product temperature during freezing and maintenance of ideal storage temperature.

2.2.1 Cryoprotectants

Cryoprotectants are the compounds that are added to the meat system to protect the protein and prevent loss of their functionality during frozen storage. Cryoprotectants improve the quality and extend shelf life of frozen foods by preventing deleterious changes in the myofibrillar proteins caused by freezing, frozen storage, and thawing. Some of these additives are sucrose, sorbitol, sodium lactate, and phosphates, all of which have been found useful to protect the functional quality of frozen muscle foods. In addition to the above cryoprotectants, recently, antifreeze proteins have been found to protect fish muscle during frozen storage.

2.2.2 Glazing

Glazing is an effective and economic means of protecting frozen fish and shellfish during storage and transport. Glazing forms a protective film or coating over the frozen product, which retards moisture loss and prevents oxidative rancidity. Glazing is done by spraying cold water over the product or sometimes by dipping in water, which freezes almost instantly, with slight increase in temperature of the product. The product takes up

water to the extent of 5-10% of its weight, or sometimes more, providing a coating of ice of 0.5-2 mm thick.

2.2.3 Edible Coating

In recent, years, there has been interest in development of edible coatings from poly-saccharides, proteins, and also lipids to extend shelf life of foods. Such coatings can retain quality of fresh, frozen, and processed muscle foods including fish by retarding moisture loss, reducing lipid oxidation and discoloration, enhancing product appearance in retail packages, and also as carriers of food additives such as antimicrobials as well as antioxidant agents. Edible films based on fish myofibrillar proteins have been developed.

2.2.4 Packaging:-

In addition to glazing, packaging is essential for obtaining optimal frozen shelf life at a specific temperature. Packaging performs essentially four functions-

- Control of the local environmental conditions to enhance storage life.
- Presentation of the product in an attractive manner to the potential buyer.
- Protection of products during transit.

2.2.5 Thawing

Thawing is the application of heat to frozen fish until all the ice present is reverted to water. Thawing takes longer time because of poor conductivity of the frozen products. Frozen products are thawed either in air, water, or in a microwave oven.

2.3 FREEZING TECHNIQUES

There are mainly three types of freezers which are in general use:

- Surface-contact freezers.
- Direct-contact freezers.
- Immersion freezers.

Table 2.3.1 Comparison of Different Quick-Freezing Techniques for Fishery Products:-

Contact plate freezing	Air blast freezing	Cryogenic freezing
Low capital investment	Economic to construct and operate	High capital investment costs
Low operating cost	Higher operating cost	Higher operating cost
Controlled heat transfer	Efficient heat transfer	Efficient heat transfer
Generally bulk freezing	Flexible product line	Flexible product line
Large floor space	Large floor space	Less floor space
Refrigeration plant required	Refrigeration plant required	No refrigeration plant required
Low maintenance cost	Low maintenance cost	Minimum maintenance cost
Higher dehydration loss	Higher dehydration loss	Minimum dehydration loss
Reasonably good product quality.	Good product quality	Superior product quality

Source: Handbook of seafood processing

For freezing, the fish for freezing may be in direct contact with the refrigerant such as nitrogen, carbon dioxide, or “Freon” substitutes, or in surface-contact freezer, by contact with refrigerated surfaces such as plates, belts, drum, or shelves. In these freezers, the material is frozen by a secondary medium such as chilled air or brine, which is recirculated and recooled by a refrigerated coil. Plate freezers, probably, are the most common contact freezers used in the fish industry.

2.4 Individual Quick Freezing (IQF)

IQF, also known as Individually Quick Frozen, is defined as the latest process of quickly freezing individual pieces of almost all food stuffs.

IQF process tends to preserve all the properties of most foodstuffs. IQF allows the ultra-rapid freezing to very low temperature conditions of about -40 to -30 degree Celsius which in turn halts the decaying activities of microorganisms. IQF technology can be employed for preserving and storing raw food and vegetables as well as meat products for more than a year with same texture, color, flavor, nutrient value and freshness. The IQF process utilizes the technique of fluidization for preserving within 10 to 12 minutes time period which may otherwise takes around 3 to 4 hours in blast freezers. The applications of IQF technique include preservation of fruits and vegetables, oysters, berries, sea food, pork bangers, mushrooms and many more.

2.4.1 Manufacturing Process

Oxidation (rancidity) can occur during freezer storage causing off flavors through exposure of frozen product to air. Using high quality plastic bags or containers designed for freezing can prevent rancid flavor development as well as protect against freezer burn which is a result of moisture loss.

The process of freezing involves freezing the water in the cellular spaces of fruit tissue. As this water freezes it expands forming ice crystals that rupture cell walls resulting in softer texture once fruit is thawed. To reduce cellular damage chill and freeze fruit quickly so that the ice crystals formed are smaller.

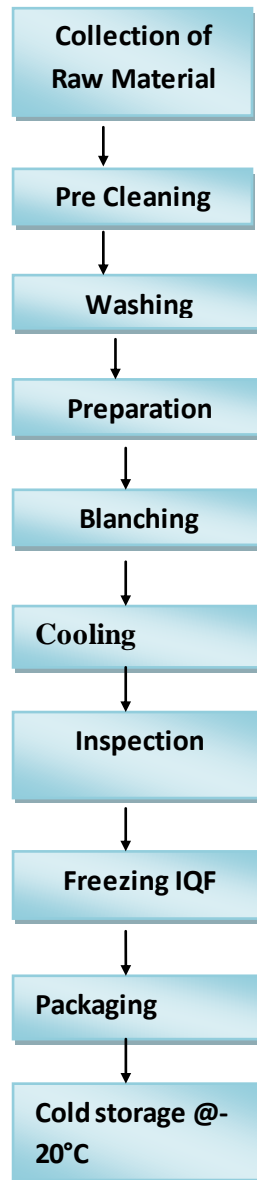


Fig. 2.4.1 Process flow of IQF

The IQF process allows the processor to supply customer with seafood in small, ready-to-cook quantities instead of large solid blocks, which have to be cut or thawed prior to packaging or use. High-value products like

shrimp and certain seafood such as fish fillets are the favorite raw material for this technology. The global demand for quality seafood in a competitive market is the driving force behind the demand of IQF products.

Advantages of Individual Quick Freezing:-

- ✓ Best freshness close to natural freshness.
- ✓ Better taste.
- ✓ Better flavor & aroma.
- ✓ Better color and appearance.
- ✓ Higher nutritive value.
- ✓ Less dehydration loss during freezing.
- ✓ Minimal drip formation during thawing.
- ✓ Require less time for cooking.
- ✓ Greater convenience in handling.
- ✓ Less fuel required.

Disadvantages:-

- ✓ Requirement of larger storage space.
- ✓ Possibility of thawing and freezing in case of wide temperature fluctuations during storage.

Major seafood items of export by using IQF technology:-

- 1) Frozen shrimp
- 2) Ribbon fish
- 3) Leather jacket
- 4) Frozen cuttle fish
- 5) Frozen squid

III. METHODOLOGY

3.1 Methodology

Methodology of the study refers to the methods used to collect and analyze the required data to meet the stipulated objectives. This study is based on secondary data.

3.1.1 Nature of Data

➤ Secondary Sources:

“Any data which has been gathered earlier for some other purpose are secondary data in the hand of researcher”.

Data pertaining to import and export of frozen seafood were collected from the following sources.

1. Records of the companies visited.

2. Government Reports

3. Websites:-

- FAO Stats website

- USDA website

- MPEDA websites

- MOFPI website

- COMMTRADE website

- Tradeseafood.com

3.1.2 Data Analysis:

To meet the objectives of the study tabular analysis and graphical presentation were employed as analytical tools.

3.2 Scope of the Study

India is the third largest fish producer in the world and second in inland fish production. It has huge potential to become a basket of seafood of the world. The government of India had declared food processing as priority sector and is aggressively pushing reforms in this sector. The processing level of seafood in India is 13.4 %; 10 % unorganized sector and 3.4 % organized sector. There are around 8-10% post- harvest losses in fisheries industry. Thus there is huge potential in this sector.

The topic has thus been selected in compliance with the company's strong desires to introduce its products in the market of European countries, Japan & South pacific countries, North American countries, Gulf countries, etc. To introduce the products in these markets it is necessary to know how much product wise potential exists in these markets. Hence, the present study.

The project will help the company as well as the exporter of frozen seafood (IQF) to know the scope of export of frozen seafood (IQF) in these countries and opportunity for India in frozen seafood (IQF) market.

3.3 Limitations of the Study

The project was done with all possible accuracy and honesty. However, there were some limitations of the project due to which there may be some deviation in findings.

- ❖ This project is mainly based on the secondary data, so it is lacking some data which was not available in the website or any other references. So reliability is the major limitation of this project.
- ❖ The data obtained through secondary research may be outdated.

IV. RESULTS AND DISCUSSION

4.1 Government Policies

4.1.1 For Special Economic Zone (SEZs)

India was one of the first in Asia to recognize the effectiveness of the Export Processing Zone (EPZ) model in promoting exports, with Asia's first EPZ set up in Kandla in 1965. With a view to overcome the shortcomings experienced on account of the multiplicity of controls and clearances; absence of world-class infrastructure, and an unstable fiscal regime and with a view to attract larger foreign investments in India, the Special Economic Zones (SEZs) Policy was announced in April 2000.

This policy intended to make SEZs an engine for economic growth supported by quality infrastructure complemented by an attractive fiscal package, both at the Centre and the State level, with the minimum possible regulations. SEZs in India functioned from 1.11.2000 to 09.02.2006 under the provisions of the Foreign Trade Policy and fiscal incentives were made effective through the provisions of relevant statutes.

To instill confidence in investors and signal the Government's commitment to a stable SEZ policy regime and with a view to impart stability to the SEZ regime thereby generating greater economic activity and employment through the establishment of SEZs, a comprehensive draft SEZ Bill prepared after extensive discussions with the stakeholders. A number of meetings were held in various parts of the country both by the Minister for Commerce and Industry as well as senior officials for this purpose. The Special Economic Zones Act, 2005, was passed by

Parliament in May, 2005 which received Presidential assent on the 23rd of June, 2005. The main objectives of the SEZ Act are:

- (a) Generation of additional economic activity.
- (b) Promotion of exports of goods and services.
- (c) Promotion of investment from domestic and foreign sources.
- (d) Creation of employment opportunities.
- (e) Development of infrastructure facilities.

It is expected that this will trigger a large flow of foreign and domestic investment in SEZs, in infrastructure and productive capacity, leading to generation of additional economic activity and creation of employment opportunities.

The SEZ Act 2005 envisages key role for the State Governments in Export Promotion and creation of related infrastructure. A Single Window SEZ approval mechanism has been provided through a 19 member inter-ministerial SEZ Board of Approval (BoA). The applications duly recommended by the respective State Governments/UT Administration are considered by this BoA periodically. All decisions of the Board of approvals are with consensus.

4.1.1.1 The SEZ Rules provided for

- Simplified procedures for development, operation, and maintenance of the Special Economic Zones and for setting up units and conducting business in SEZs.
- Single window clearance for setting up of an SEZ.
- Single window clearance for setting up a unit in a Special Economic Zone.

4.1.1.2 General application process to set up a SEZ

An SEZ may be set up in the public, private or joint sector or by the State Government. The minimum size of a SEZ shall not be less than 1,000 hectares. The promoter of SEZ is required to submit an application to the Chief Secretary of the State Government, indicating name and address of the applicant and status of the promoter along with a project report covering the following particulars:

- Location of the proposed zone with details of existing infrastructure that is proposed to be established.
- Its area, distance from the nearest sea port, air port, railway terminal, etc.
- Financial details, including investment proposed, mode of financing the project and viability of the project.
- Whether the SEZ will allow only certain specific industries or will be multi- product zone.

4.1.1.3 Incentives for SEZ Developers

The SEZ developer will be entitled to the following facilities:

- Freedom in allocation of developed plots to approved SEZ units on purely commercial basis.
- Full authority to provide services like water, electricity, security, recreation centers, restaurants on commercial lines.
- Facility to develop township adjacent to SEZ, with residential areas, markets, play grounds, clubs, recreation centers, etc.
- Income Tax exemption (for the specified number of years) under sector 80 - IA of the Income Tax Act.

- Import/procurement of goods without payment of Customs/Excise Duty.
- Exemption from Service Tax.
- Exemption from Central Sales Tax.

4.1.2 For Export Oriented Unit (EOU)

The EOU scheme was introduced in the year 1980 vide Ministry of Commerce resolution dated 31st December 1980. The purpose of the scheme was basically to boost exports by creating additional production capacity. It was introduced as a complementary scheme to the Free Trade Zones/ Export Processing Zone (EPZ) Scheme introduced in the sixties which had not attracted many units due to location restrictions. The exporters showed willingness to set up units with long term commitment to exports under Customs bond operations provided they had the freedom to locate them in places of their choice and given most of the benefits as provided to units set up in the Zones.

The EOU scheme is, at present, governed by the provisions of Export and Import (EXIM) Policy, 1997-2002. Under this scheme, the units undertaking to export their entire production of goods are allowed to be set up. Under the EOU scheme, the units are allowed to import or procure locally without payment of duty all types of goods including capital goods, raw materials, components, packing materials, consumables, spares and various other specified categories of equipments including material handling equipments, required for export production or in connection therewith. However, the goods prohibited for import are not permitted.

4.1.2.1 Benefits under EOU Scheme

- Units are exempted from payment of Income Tax up to the year 2010.
- All the imports to units are customs duty free.
- Exemption from Central Excise Duty for the procurement of Capital Goods and Raw Materials from domestic market.
- Units are entitled to sell the product in local market up to 50% of the products exported in value terms.
- 100% of foreign equity is permissible.
- Reimbursement of Central Sales Tax paid on domestic purchases.
- Full Freedom for sub-contracting.
- Exemption from the payment of Electricity duty.
- EOU unit can be set up at any of over 300 places all over India
- The unit can import capital goods, raw materials, consumables, packing material, spares etc. without payment of customs duty. Similarly, these can be procured indigenously without payment of excise duty. Second hand capital goods can also be imported.
- They have to achieve positive NFE (Net Foreign Exchange Earnings).
- Minimum investment in plant and machinery and building is Rs 100 lakh for EOU. This should be before commencement of commercial production.

4.1.3 Sea freight Assistance Scheme

4.1.3.1 Sea freight assistance for import of raw material for processing and export of specified value added products.

Assistance at the rate of 100% of the freight differential per container for the first three years and 50% for the fourth year will be given to the units for import of raw material for processing and export of specified value added products provided there is at least 25% value addition on such

material. For this purpose, freight rates as applicable in India and China should only be taken into account and assistance should not exceed 50% of the total freight from India. The maximum eligible assistance would be Rs. 100 lakh per year per exporter.

4.1.3.2 Sea Freight Assistance for export of specified value added products to EU/USA/ Japan and other countries.

This aims to offset the adverse weight volume ratio of the value added products in containers and to offset the freight difference. Assistance will be extended under this component as follows:

Table 4.1.3.2.1 Sea freight Assistance by MPEDA

Year	Market	Rate of Assistance Rs./Kg
1 st and 2 nd implementing years	EU	4
1 st and 2 nd implementing years	USA	5
1 st and 2 nd implementing years	Japan	3
3 rd and 4 th implementing years	EU	2
3 rd and 4 th implementing years	USA	3
3 rd and 4 th implementing years	Japan	1.50

Source: MPEDA

Note: Freight assistance to other countries like South East Asia, Middle East, China and Korea will be applicable at the same rate as that of Japan. For countries like Canada, Mexico etc. the rate will be that of USA. For countries like Australia, Africa etc., the rate will be that of EU.

Table 4.1.3.2.2 Maximum assistance per exporter per year would be as follows.

Category	Export Value	Max. Eligible Assistance
I	Below Rs.1 Crore	Rs.5 lakh
II	Above Rs.1 Cr-Rs.5 Cr	Rs.10 lakh
III	Above Rs.5 Cr- Rs.15 Cr	Rs. 20 lakh
IV	Above Rs. 15 Cr-Rs.30 Cr	Rs.30 lakh
V	Above Rs.30 Cr- 50 Cr.	Rs. 40lakh
VI	Above Rs.50 Cr	Rs.50 lakh

Source: MPEDA

As the Scheme is to provide assistance to increase the export of value added products, after the first assistance the subsequent assistance would be dependent on a 10% increase of export in value compared to the year the assistance was availed of.

4.1.3.3 Necessary certificates for getting assistance for import of raw material for re-export of value added products.

- (a) Copy of the certified Commercial Invoice of import
- (b) Bill of Lading of Shipping Lines
- (c) Customs certified copy of the Bill of Entry
- (d) Freight Invoice issued by the Shipping Lines of import.
- (e) Freight rate from port of import to Shanghai (China) certified by the same Shipping Line.
- (f) Customs certified copy of the Commercial invoice of export
- (g) Customs certified export promotion copy of the shipping bill
- (h) Certified copy of the Bill of Lading of export
- (i) Freight invoice issued by the Shipping Lines for export
- (j) Certificate of realization of Foreign Exchange issued by the Bank in Form I.

4.1.3.4 Necessary certificates for getting assistance for export of value added products.

- (a) Customs certified copy of the Commercial invoice of export
- (b) Customs certified export promotion copy of the shipping bill
- (c) Certified copy of the Bill of Lading of export
- (d) Freight invoice issued by the Shipping Lines for export

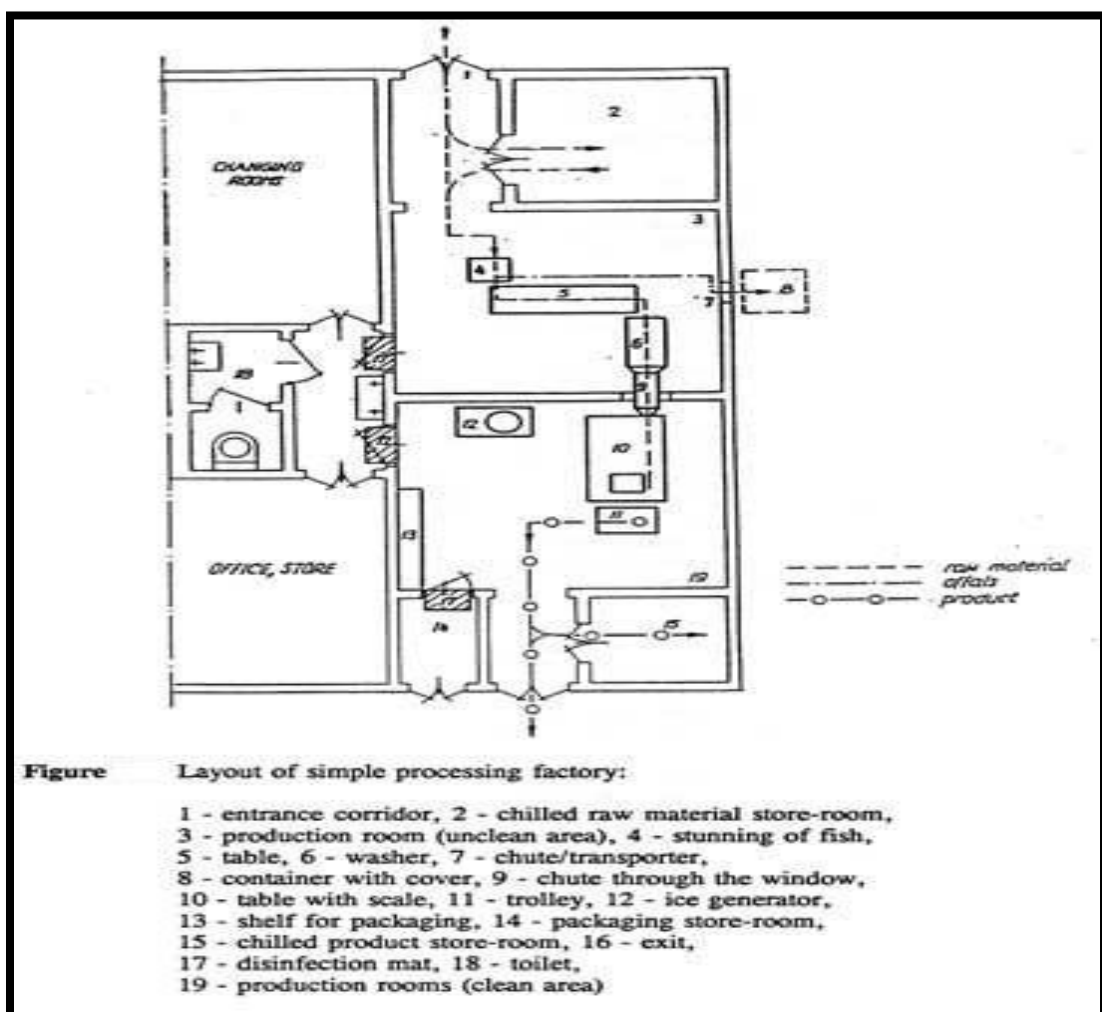
4.2 Crucial Requirements For Establishing Sea Food Processing Unit Using IQF Technology

4.2.1 Considering Points for the Establishment of Fish Processing Plant

4.2.1.1 Plant Location, Buildings and Layout

- 1) Before deciding plant location different factors should be analyzed. The most important is the plot which should be of adequate size for both present needs and future development. The plant should be close to public transport such as rail or road. Access to electricity, water, and steam is essential. Waste disposal should be considered when planning the plant location.
- 2) The owner should coordinate all the works with local competent authorities in order to avoid problems in the future.
- 3) The choice of plant location should also take into account the neighbouring surroundings, for example, location near to a waste dump could lead to microbiological contamination caused by birds.
- 4) There are many technical regulations concerning construction of buildings and processing halls, some of them are as -
- 5) Outside walls, windows and doors should be constructed such that they are water, insect- and rodent-proof.

- 6) The inside walls of the building should be painted white or other light color and their surface should be smooth, fall-safe, corrosion-proof and easy to clean.
- 7) Floors should be resistant to spillage of products, water and disinfectants.
- 8) Floors should be slip-proof and maintain their color.
- 9) Proper layout and designs should ensure an uninterrupted and "straight line" process flow.



Source: Handbook of seafood processing

Fig. 4.2.1.1.1 Layout of a simple seafood processing unit

4.2.1.2 Personal Hygiene

Personal hygiene is a most important element of health quality assurance in a fish processing plant. The essential requirements for personnel working in production area and stores are those mentioned below:

1. Protective clothing, footwear and headgear issued by the company must be worn and must be changed regularly. When considered appropriate by management, a fine hair net must be worn in addition to the protective headgear provided. Hair clips and grips should not be worn. Visitors and contractors must comply with this regulation.

2. Protective clothing must not be worn off the site and must be kept in good condition. If it is in poor condition the supervisor should be informed immediately.

3. Beards must be kept short and trimmed, and a protective cover worn when considered appropriate by management.

4. Nail varnish, false nails and make up must not be worn in production areas.

5. Hands must be washed regularly and kept clean at all times.

6. Personal items must not be taken into production areas unless carried in inside overall pockets (handbags, shopping bags must be left in the locker provided).

7. Food and drink must not be taken into or consumed in areas other than the tea bars and the staff restaurant.

8. Sweets and chewing gum must not be consumed in production areas.

9. Smoking or taking snuff is forbidden in food production, warehouse and distribution areas where 'No Smoking' notices are displayed.

10. Spitting is forbidden in all areas of the site.

11. Superficial injuries (cuts, grazes, boils, sores and skin infections) must be reported to the medical unit or nurse via the supervisor and clearance obtained before entering production areas.

12. Dressings must be waterproof and contain a metal strip as approved by the medical unit.

13. Infectious diseases (including stomach disorders, diarrhoea, skin conditions and discharge from eyes, nose or ears) must be reported to the medical unit or nurse via the supervisor. This also applies to staff returning from travel abroad where there could be a risk of infection.

14. All staff must report to medical unit on return from both certified and uncertified sickness.

4.2.1.3 Cleaning and Disinfection in Processing Plant

4.2.1.3.1 Water quality in processing and cleaning

- As a general rule, water used for all purposes in food production must meet drinking water standards. It is noted that a universal list of biological and physio-chemical parameters for drinking water does not exist. The WHO Guidelines for drinking water quality and the guidelines prepared by EU are similar with regard to microbiological contamination. The same situation applies concerning state regulations and only physio-chemical requirements for drinking water differ in particular countries.

- Disinfectant residues should be monitored where possible and the bacteriological quality periodically checked. Turbidity, color, taste and odor are also easily monitored parameters. If there are local problems with chemical constituents (fluoride, iron) or contaminants from industry or agriculture (e.g., nitrate, pesticides, mining wastes) these should (hopefully) be monitored and dealt with by the water suppliers.
- Very often water must undergo treatment disinfection prior to use. The following chemicals are used as disinfectants: chlorine, chloramines, ozone or UV irradiation. Chlorination is the cheapest form of treatment and monitoring of chlorine is relatively easy. According to WHO, the concentration of chlorine in water should be in the range 0.2-0.5 mg/l. For sanitation purposes it may reach 200 mg/l, but in order to avoid corrosion lower concentrations are advised (50-100 mg/l).

4.2.1.3.2 Quality Aspects of Fish Processing

1. Public health aspects

The term quality has many different implications, e.g., product excellence, value, nutrition, safety for consumer, etc. This section discusses quality requirements with respect to safety for the consumer and quality control principles.

In a free market economy the producers are responsible for food quality and they are controlled by the competent authorities according to approved procedures. Certain countries or groups of countries, e.g., European Union, formulate regulations specifying requirements concerning health quality, wholesomeness of raw materials and food/fish

products and concerning permissible limits for chemical contaminants (heavy metals, PCBs, etc.) or biological infectants (parasites, microbes, etc.). Other regulations concern quality of water provided for food processing. These regulations are of rather general character but there are others which concern health conditions for processing and placing of products on the market. Due to an almost complete lack of detailed standards for individual products, the regulations on labeling are of great importance, especially if the "fair trade" principle and consumer interest are to be taken into account. All these groups of obligatory regulations should ensure production of food which is safe for the consumer.

2. Quality control

Control is traditionally limited to control of the final product. Practice has proved that this is not sufficient and that quality control should be carried out during all stages of production, starting from a contract on supply of raw material, through all the phases of processing, to storage and distribution of final products. Such an approach is not quality control but constitutes quality assurance which covers the entire production chain. Below are some principles relating to quality control with regard to the main individual operations and procedures in fish processing.

A) Drawing up a contract for raw material supply

The contract for supply of raw material should cover all specific requirements, for example: size of fish, closed seasons, level of chemical contaminants in fish and in the water from which the fish comes, and chemical measurements should be made by an institution which deals with monitoring of environment. Sometimes, especially in the case of export, the buyer/customer may have additional demands, e.g., an

indication of the level of chemical contaminants other than standard ones. The buyer should ensure that he will receive the health certificate for his raw material and that the certificate was issued by the official control authorities. He should also obtain confirmation that the fish was stored properly prior to sale (for example, that fish was iced with a proper amount of ice and that the quality of the ice was satisfactory; that it was stored in cool store rooms and that it was transported by appropriate means). The contract may specify that some of these demands be passed to the receiver.

B) Receiving and storage of raw material

This control step determines the quality of the final product and should be carried out extremely carefully. In general it consists of three elements:

- Temperature control of fish during transportation (temperature record).
- Temperature control of fish and control of icing.
- Quality control of purchased fish.

C) Quality control during the production process

- ✓ The quality control programme during the production process depends on the profile of production carried out in the processing plant. Each processing plant must draw up a flow chart of the entire process starting from the raw material through every individual operation and process to the final product and with all quality control points indicated. Criteria for selection of control points depend on potential hazards which, in the case of lack of proper handling, can cause a risk for both the food and the consumer. For example, control of temperature during individual operations, their duration, concentration of food additives, etc., are typical and critical parameters measured at control points.

- ✓ Technological supervision is responsible for use of adequate processing parameters. Quality control personnel are responsible for monitoring these parameters and in the case of deviation they should undertake proper corrective action.

D) Storage and distribution of fish products

The fish products directed for the storage or for the purchaser are random checked by the internal quality control staff. This control concerns:

- Proper packaging materials and labeling (according to official requirements).
- Duration and temperature of storage.
- Proper conditions of storage, for example adequate ice, temperature, etc.

4.3 Financial & Other Aspects for Setting of an IQF Processing Unit

4.3.1 Scope for establishing IQF units

At present more than 50 IQF units are operating in India. The scope for establishing more number of IQF units is bright. At present only 15% of the total shrimp products exported out of India are in IQF form. Shrimp products are the major item among the marine products exported from India. Since the preference in importing countries is towards IQF products and also there is value addition if the products are IQF, it can be assumed that scope exists for establishing new units. A large number of brackish and fresh water prawn farms have been established. The additional quantity of prawns produced by these farms may also require IQF facility.

4.3.2 Variety of IQF Seafood exported from India

The major varieties of IQF products which are exported include shrimp, cuttle fish, lobsters and fishes as per details given below :-

I) Marine shrimp

- (a) Head-on white/brown/tiger
- (b) Headless white/brown/pink/flower/tiger
- (c) Peeled and deveined
- (d) Peeled and un-deveined

II) Head on scampi

III) Lobsters

- (a) Rock lobster tail
- (b) deep sea lobster tails
- (c) Sand lobsters/slipper tails

IV) Cuttle Fishes

- (a) Whole cleaned
- (b) Fillets (flat or rolled)

V) Squids

- (a) Stuffed squid tubes
- (b) Squid tubes with tentacles

VI) Fishes

Red snappers, millets, pomfrets, seer fish etc.

VII) Crabs

- (a) Cooked whole mud crab
- (b) Raw whole mud crab

4.3.3 Location of the project

The site for location of the IQF units has to be selected carefully after conducting a proper survey of the existing IQF units, their capacity utilization, need for further units, etc. It will be useful if the assistance of MPEDA offices is taken for selection of the suitable site.

4.3.4 Borrower's profile

Complete details of the entrepreneurs, partnership firm like registered company or qualification and experience of the promoters, net worth of the borrowers, other activities undertaken by them etc. have to be furnished.

4.3.5 Physical and financial outlay

Details of the physical and financial outlay involved for setting up of an IQF unit of 2500 metric tones capacity is furnished in Annexure I.

4.3.6 Margin money and bank loan

The entrepreneur has to bring in 25% of the project cost out of his own resources and the balance of 75% will be provided by banks as bank loan. However, NABARD could consider providing margin money assistance in suitable and eligible cases as per the guidelines contained in circular No.DPD.67/92-93 dated 24/02/1993.

4.3.7 Rate of refinance

NABARD refinance is available for setting up of IQF processing unit provided the same is technically feasible and financially viable.

4.3.8 Financial viability

For working out the income and expenditure from the IQF unit the following assumptions has been made (It is assumed that there will be 4 operating cycles in a year.):-

Table 4.3.8.1 Financial viability

1	Number of working days	250
2	Number of shifts per day	3 shifts (each shift of 6 hrs operation with one hour for defrosting)
3	Capacity utilization	1st year - 60% 2nd year - 70% 3rd year - 80% Onwards
4	Product composition at 80% utilization (2000 tones of end product)	1. Prawns (60%)-1200 tones 2. Fishes (25%) 500 tones 3. Cuttle fish/squids (10%) 200 tones 4. Lobsters (5%) 100 tones

4.3.9 Marketing

At present the Indian exports in IQF products comprising mainly shrimps are exported to EUC, USA etc. With proper product diversification it would be possible to explore other world markets.

4.3.10 Interest rate for ultimate borrowers

Banks are free to decide the rate of interest within the overall RBI guidelines. However, for working out the financial viability and bankability of the model project we have assumed the rate of interest as 12% per annum.

4.3.11 Interest rate for refinance from NABARD

As per the policy circulars of NABARD issued from time to time.

4.3.12 Working capacity

Banks sanctioning term loan for setting up the unit should also make arrangements for availability of working capital loan to enable the borrower to run the unit smoothly.

ANNEXURE I

Estimated physical and financial outlay involved for setting up of an IQF unit of 2500 MT capacity.

A. Capital cost

Sr.No	Items of Investment	Rs.lakh
1	Plant and Machinery IQF unit (10 tons per day)	
	i) Spiral belt freezer (double belt)	150
	ii) Refrigeration system (Kirloskar compressor 150 HP)	10
	iii) Other accessories	40
2	Cold storage-300 ton capacity (3 compartments of 100 ton capacity each)	50
3	Civil construction - Plantroom, anteroom, processing room, labour room, lab, office, changing rooms, labour quarters etc., as per EU norms.	180
4	Diesel Generator (380 KVA)	35
5	Miscellaneous equipment's like washing, grading table, filleting machine, air curtain, air conditioning, lab equipments, jet washers, packaging unit etc.	20
6	Refrigerated Van (2 refrigerated vans of 5 ton capacity each)	25
7	Electrification	20
8	Fresh water and water conveyance structure like pipe, piping pumps etc.	10
9	Water treatment plant 10000 lit per hour	15
10	Miscellaneous	10
	Total	565

B. Recurring Expenses

	Assumptions	
1	Cleaning & Processing loses for	
	a) Shrimp	20% by weight
	b) Quality fishes	10% by weight
	c) Lobsters	40% by weight
	d) Cuttle fish / squid	25% by weight
2	Average drop loss for IQF product	5% max

➤ Computation of recurring expenses (Rs. in lakh)

1	Cost of Raw material	
	i) Shrimp - 1600 ton @ Rs.300/kg	4800.00
	ii) Fish - 600 ton @ Rs.80/kg	480.00
	iii) Cuttle fish/squids -145 ton @ Rs.90/kg	130.50
	iv) Lobsters- 185 tonnes @ Rs.180/kg	333.00
2	Power, Refrigerant/Fuel @Rs. 20 lakh per month (avg. for 12 months)	240.00
3	Salary and wages for skilled and unskilled workers	50.00
4	Administrative expenses (establishment & salary)	4.0
5	Packaging & marketing expenses @ Rs.700/ton(approx.)	18.00
6	Repair and maintenance (10% of the cost of plant and machinery)	56.50
7	Miscellaneous expenses (1% of items 1-5)	60.55
	Total	6233.1

C. Income of maximum production (Rs. in lakh)

1	Sale of 1300 ton of shrimp @ Rs.400/kg	5200
2	Sale of 500 ton of fish @Rs.140/kg	700
3	Sale of 100 ton of Cuttlefish/squids @ Rs.225/kg	225
4	Sale of 150 ton of lobsters @ Rs.400/kg	600
	Total	6725

Total Project Cost = Capital cost + Recurring Cost for the first operating cycle

565+1559= Rs.2124 lakh

Margin money @ 25% = Rs.531 lakh

Total financial assistance = Rs.1593 lakh

ANNEXURE II

Statement Showing Financial Analysis for an IQF Unit Of 2500 M.T. Capacity. (Rs. lakhs)

		I Year	II Year	III to X Year
	Financial Analysis			
A	Cost			
1	Fixed cost	565		
2	Recurring cost	3740	4363	4986
	Total cost	4305	4363	4986
B	Sales	4035	4708	5380
C	Net Benefits	-270	345	394

4.4 Cold Storage

4.4.1 Introduction

Refrigerated storage which includes cold storage and frozen food storage is the best known method of preservation of food to retain its value and flavor. Preservation of perishable food is a matter of vital importance and the loss due to the lack of proper storage facilities is very high.

Preservation of food by proper storage assumes great importance in a country like India where food shortage is a perennial problem. Several kinds of fruits and vegetables are cultivated seasonally depending on rainfall and other climatic conditions. Also the preservation is much needed for the marine sector for storing the semi-finished as well as finished products. These have to be preserved both at producing centers as well as consuming centers, and by employing correct storage practices it is possible to store them for periods ranging from two weeks to over eight months.

Table 4.4.1.1 Storage self life of different products

Product	Storage Temp.(°C)	Product Life (Weeks)	Storage Season
Potato	2-4	32-36	March to October & October to January
Tomatoes	7	4-5	April to May & September to October
Cauliflower	0-1.5	8-10	February to April & August to October
Cabbage	0-1.5	10-12	February to May & August to October

Orange	7-8	8	February to April
Apples	0-15	16-20	October to March
Mango	8-10	4-6	May to June
Frozen Sea Foods	-18 to -20	24 or more	Year round

Source: Handbook of freezing technology

4.4.2 Temperature-wise there are two of cold stores used for different applications:

4.4.2.1 Medium temperature cold stores

These are generally designed for storing a variety of products at 0 to 8°C. Commodities include various types of fresh fruits and vegetables, dry fruits, spices, pulses, milk products etc. Most cold stores in U.P. Bihar, Punjab, West Bengal and M.P are designed for single commodity storage such as potatoes. Units in Maharashtra and parts of Gujarat and the Southern states are of multipurpose type designed for storage of various commodities. The occupancy levels in the multi commodity stores are much better than those used for single commodity storage. However, the chambers in multi commodity stores have to be designed for maintaining different temperatures and sometimes relative humidity to suit different products.

Construction practices vary largely, in different parts of the country depending on the type of usage. The bulk commodity stores have chambers of large sizes whereas the multi-purpose units have many chambers of smaller sizes to suit the customer needs. These medium temperature cold stores are generally constructed with 2 to 6 floors. The capacity range is from 500 M.T. to 10,000 M.T. or more. However, in

case of cold stores attached to pre-cooling plants the capacities are much smaller and the units are designed with single floor construction.

4.4.2.2 Frozen food stores

There are a number of commodities which have to be processed and frozen for preservation over long periods of time. These include green peas, corn, okra, mixed vegetables, mango pulp and tomato puree. The other items are ice cream, butter, **fish** and meat products. Frozen food stores are designed for a temperature of $-20\pm 2^{\circ}\text{C}$ for most foods.

4.4.3 Construction Aspect

The conventional construction includes brick walls with RCC frame and a roof with RCC slab. In U.P. Bihar and M.P. the roofs are truss type with G.I. / A.C. Sheet covering. Internal floors are constructed with RCC columns and beams or with steel frame work with wooden batten flooring as a normal practice. In some of the recent units RCC battens and steel grating have also been used.

4.4.4 Thermal Insulation

In some old units cheaper material like rice husk was used as the thermal insulation. For over three decades now the better designed cold stores have been insulated with materials like Expanded Polystyrene, Fiberglass or Polyurethane. Whereas the insulation on walls and ceilings is finished with cement sand plaster in conventional cold stores, the latest trend is to use sheet metal cladding. The cladding materials are aluminium sheet or pre-coated galvanized steel sheet.

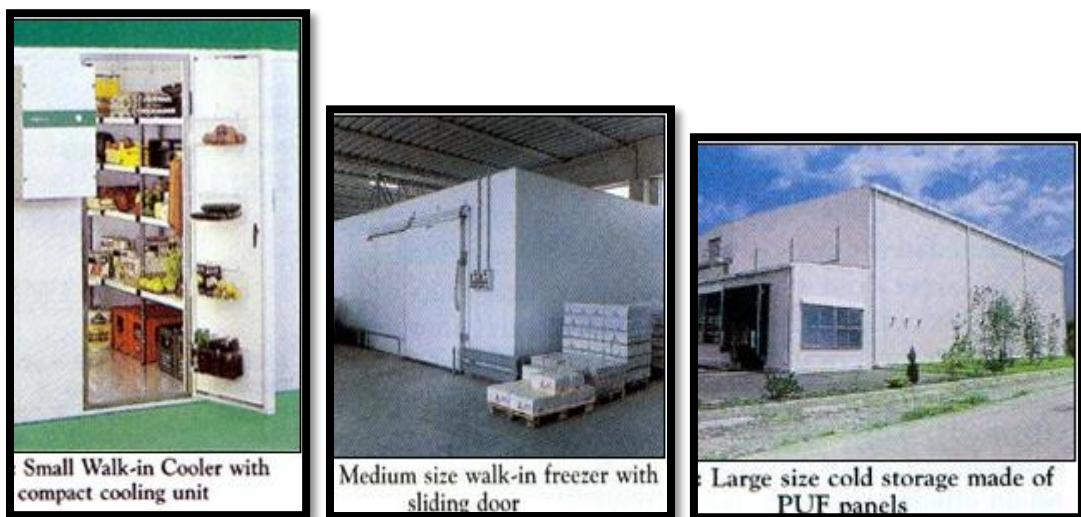
A vapour barrier is provided in all cases to arrest moisture migration to the cold store. Barrier material (such as steel, aluminum, reinforced

plastic sheets, metal foils, mastic type hot or cold application paints) is provided on the warmer side of the insulation.

4.4.5 Prefab insulated panel structure

The development of pre-insulated panels has brought in a revolution in cold storage construction the world over. Although, these panels have been in use for cold storage construction for over tow decades in the developed countries, in India, modern prefab panels have been introduced around 15 years back. Prefab panels, also called sandwich panels, are mainly available in two types:

- EPS panels with expanded polystyrene insulation bonded to sheet metal skins by using a special adhesive.
- PUF panels using polyurethane as insulation material foamed between two metal skins. These panels are structurally strong and have a better insulation value as compared to EPS panels for a given thickness.



Source: FAO

Fig. 4.4.5.1 Different types of cold storage

Insulate DX panels are used for making cold stores, right from the small walk-ins to very large cold stores. In fact the application of panels has gone beyond the cold store sector and such panels are also used for the construction of processing plants, prefabricated housed, warehoused, clean rooms, etc. Similar construction is utilized for fabricating doors for the cold stores that are light and strong compared to the conventional wooden insulated doors.

4.4.6 Refrigeration System

The refrigeration system in a cold storage is usually a vapour compression system comprising the compressor, condenser, receiver, air cooling units and associated piping and controls.

In smaller cold rooms and walk-ins the practice is to use air cooled condensing units with seal, semi-sealed or open type compressors. In the light of the CFC phase out the trend now is to use HCFC-22, HFC-134a or other substitute refrigerants. In the medium and large sized units say 500 M.T. And higher capacities, the practice in India is to use a central plant with ammonia as the refrigerant. It is estimated that almost 95% of the large cold store units in India have ammonia refrigeration systems.

However, in some present day medium and large sized units with pre-fab insulated panel construction the trend is to use modular HCFC-22/HFC units which are compact, light weight and easy to maintain. However, the selection of the system and the refrigerant is a matter of designer's choice for a particular application.



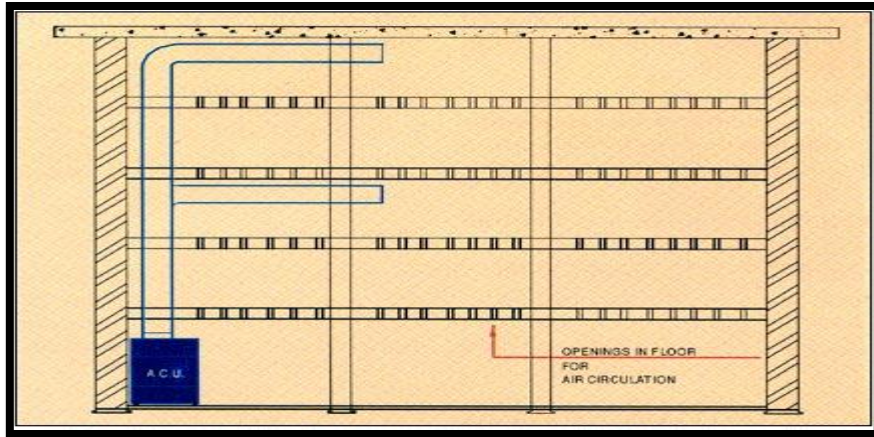
Source: FAO

Fig: 4.4.6.1 Self contained Air Cooled Refrigeration unit

Reciprocating compressors of slow speed type have been used on a large number of cold store units in the past. The medium speed reciprocating compressors with speeds ranging from 750 to 1450RPM, with a better energy efficiency and built-in capacity control have been installed in most of the recent units.

For very large cold stores and frozen food stores, screw compressors are being preferred. Screw compressors have very few moving parts and offer advantage of steeples capacity control in the range of 10 to 100%.

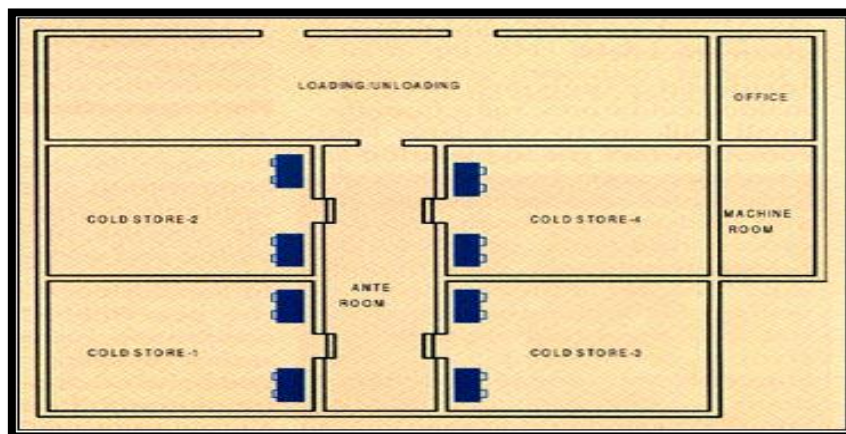
The halocarbon condensing units are mostly air cooled type although water cooled units with shell and tube condensers find application in a few of the large sized systems. In ammonia plants the types of condensers used are the atmospheric or the evaporative. The evaporative condensers consume less quantity of water for plant operation and are generally preferred on large cold sore units. Adjoining figure shows that finned coils have also been used on these units in some cases.



Source: FAO

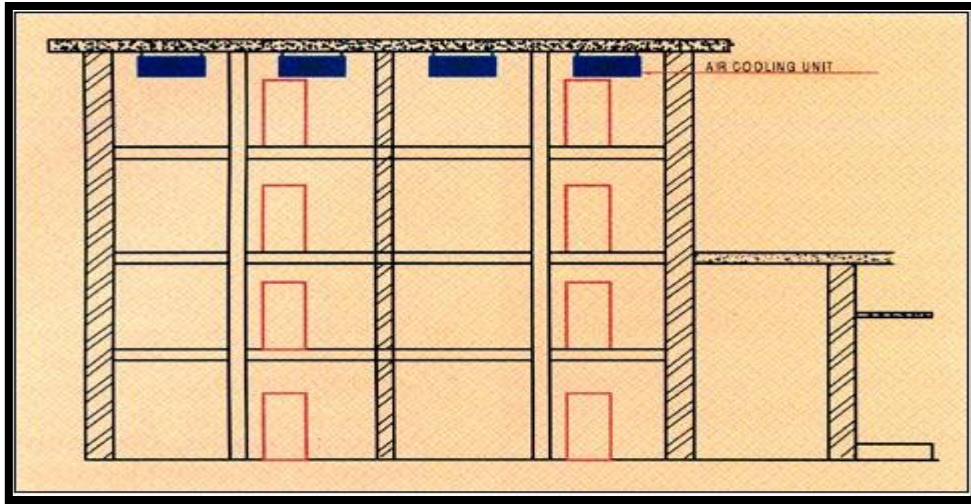
Fig: 4.4.6.2 Section through a Typical Multi Floor Bulk Cold Store with Floor Mounted A.C Unit with Ducting

However, the recent trend is to use ceiling mounted units with finned coils and axial flow fans with aluminium or stainless steel impellers and adjustable pitch. These units are compact and occupy less space. Ammonia refrigeration plants mostly employ gravity fed systems with flooded coil evaporators, where a certain level of refrigerant is maintained in the evaporator coil.



Source: FAO

Fig: 4.4.6.3 Typical Multi Floor, Multi Purpose Cold Store with Ceiling Mounted A.C Units



Source: FAO

Fig: 4.4.6.4 Section of Typical Multi Purpose Cold Store with Ceiling Mounted A.C. Units

4.4.7 De-frosting Systems

Frost formulation on evaporator coils due to sub-zero evaporating temperature is an inevitable phenomenon in cold storage plant operation. Timely defrosting of coils is important as the frost build-up reduces heat transfer and affects the plant capacity. The most common defrosting methods are:

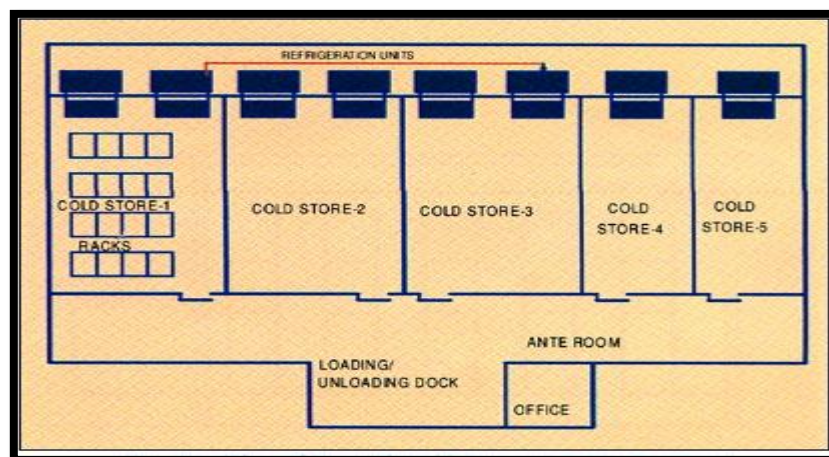
- Water defrosting.
- Hot gas defrosting and
- Electric defrosting.

Water defrosting is the most practical and simple and can be done manually or through a timer. It is commonly employed on a majority of cold store units working on ammonia.

Hot gas defrosting involves a more complicated circuitry and controls and is usually eliminate employed on HCFC-22 / HFC plants which are normally designed for automatic operation. In case of ammonia systems it

is common practice to provide hot gas defrosting on plants designed for liquid recirculation and having multiple evaporators rather than on plants with flooded evaporators.

Electric defrosting involves provision of electric heating elements fixed in the evaporator coil section. Although it is a convenient way of defrosting, additional power consumption and maintenance problems on heater are the factors which do not find favour with most users.



Source: FAO

Fig: 4.4.7.1 Plan of Typical Cold Store with Pre-Insulated Panel Structure and Modular Refrigeration Units

4.4.8 Automatic Control

The control system in cold store plants incorporates:

- Compressor capacity control
- Room temperature control (and RH control, if required).

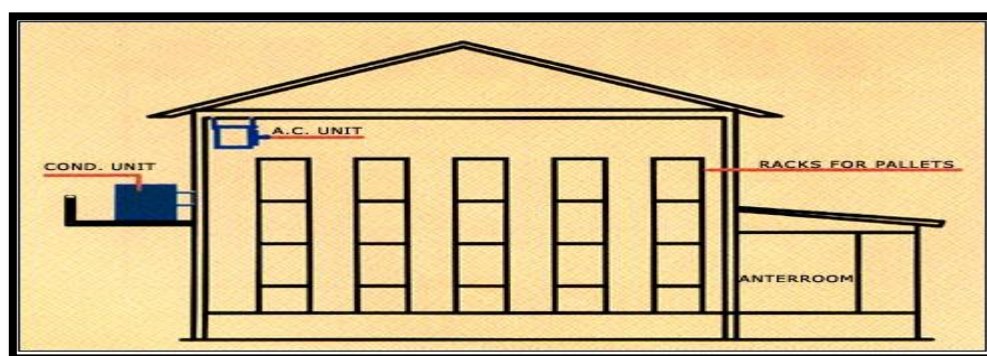
Modern micro processor based control systems are now available for these applications in stand alone and integrated designs.

Digital temperature indicators cum controllers are also being used in recent installations replacing the conventional stem/dial type thermometers and thermostats.

4.4.9 Safety Measures

Like any other industry, safety measures are important in the cold storage field also. Refrigeration systems have to be built as per proper specification to ensure that refrigerant leakage does not occur. It is essential to have proper emergency measures in case of any accidental leaks.

The building structure has to be designed with adequate safety factors and the thermal insulation has to be protected properly from any possible occurrence of fire. Emergency arms are provided in the cold store with switches in each chamber Battery operated alarm systems are now available which ensure the operation of any alarm system even during a power failure.



Source: FAO

Fig: 4.4.9.1 Section of Typical Pre-Insulated Panel Type Cold Store with Split Type Refrigeration Units

4.5 Environmental Issues Related To Seafood Processing

4.5.1 Environmental issues in fish processing industries primarily include the following:

- 1) Water consumption and wastewater generation,
- 2) Solid waste generation and by-products production,
- 3) Emission to air and energy consumption.

➤ Water Consumption

Most seafood processors have a high baseline water use for cleaning plant and equipment.

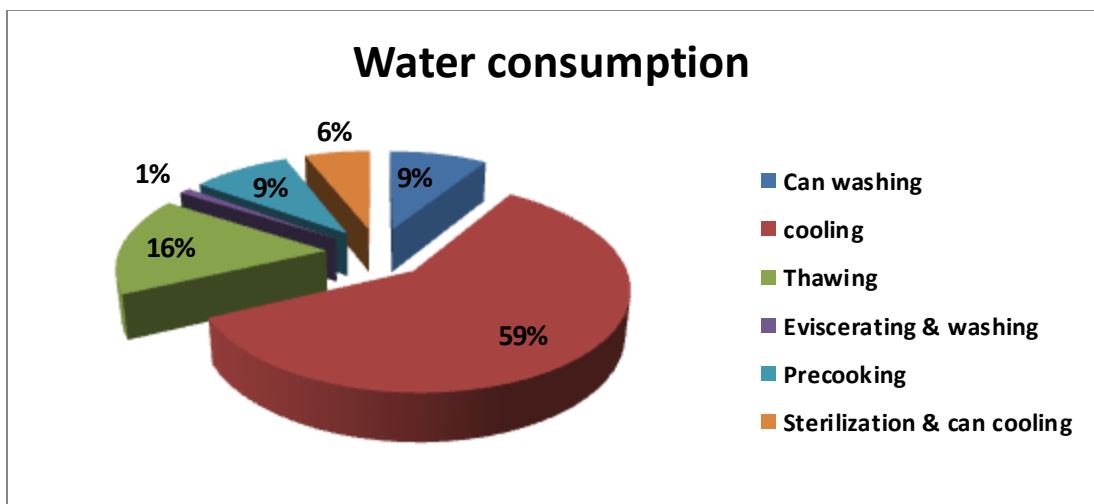


Fig: 4.5.1.1 Water consumption in Seafood processing unit

Therefore, water use per unit product decreases rapidly as production volume increases. Major sources of water consumption include: fish storage and transport; cleaning, freezing and thawing; preparation of brines; equipment sprays; offal transport; cooling water; steam generation; and equipment and floor cleaning. Water consumption in fish processing operations has traditionally been high to achieve effective sanitation. Several factors affect water use, including: the type of product processed, the scale of the operation, the process used, and the level of water minimization practices in place. General cleaning contributes

significantly to total water demand so smaller-scale sites tend to have significantly higher water use per unit of production.

➤ **Energy Consumption**

Seafood processing industries consumes large quantities of electrical energy. Most of the power is used for magnetic induction equipment, such as electric motors (compressors for freezers, cold stores, ice-making machines, water pumps, etc.) and lighting that requires magnetic ballasts, air conditioning. For fish and fish meal processing energy is required for cooling, cooking, sterilizing, drying, evaporation, can cleaning, fork-lifting. For wastewater treatment energy is applied for pumping and aerating. Energy consumption depends on various factors like age and scale of plant, the level of automation and the range of products. Processes which involve heating, such as canning and fishmeal production need more energy than other processes.

Table 4.5.1.1- Amount of energy consumption per ton of product for canning

Process	Energy Consumption(kWh)
1. Unloading of fish	5.7
2. Grading of fish	0.3
3. Nobbing & packing in cans	1.4
4. Precooking of fish to be canned	1.3
Steam: 100kg	132.4
5. Draining of cans	0.3
6. Can seaming	5.8
7. Washing of cans	7.4
8. Can sterilization	242.1

Source: Handbook of Seafood processing

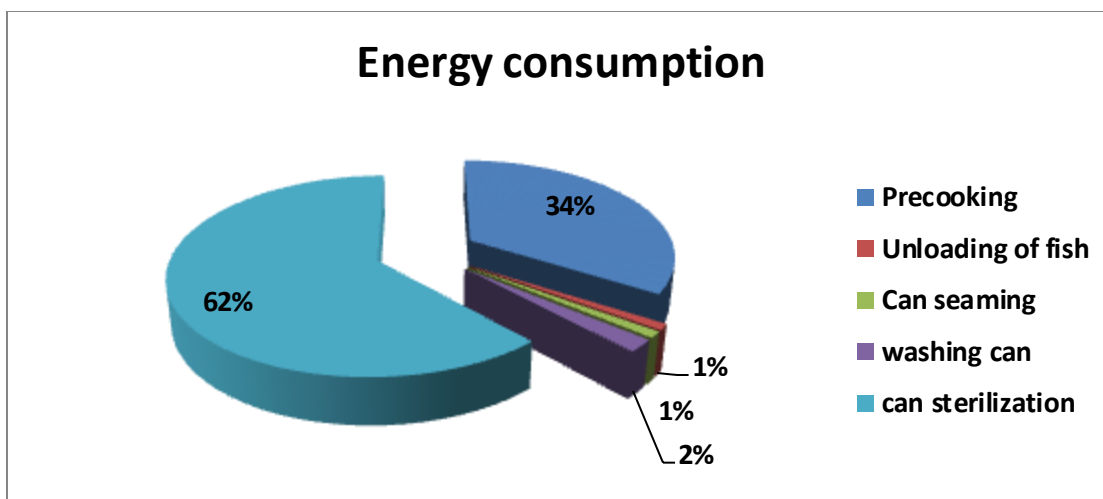


Fig: 4.5.1.2 Amount of energy consumption per ton of product for canning

From the above table and pie-chart, it can be said that for the fish canning process the major energy consumption is for fish precooking and sterilization process. Energy is utilized to produce steam from boilers. The capacity of boiler depends on the steam requirement. Fuel oil is generally used to produce steam in most factories. Besides, LPG and coal are also used.

➤ Effluent Discharge

Sources of effluent from fish processing include the handling and storage of raw fish prior to processing, fluming of fish and product around the plant, defrosting, gutting, scaling, portioning and filleting of fish and the washing of fish products. Effluent streams generated from seafood processing contain high loads of organic matter due to the presence of oils, proteins and suspended solids. They can also contain high levels of phosphates and nitrates. In canning operations, effluent is also discharged from the draining of cans after precooking, from the spillage of sauces, brines and oil in the can filling process, and from the condensate generated during precooking. Effluent quality highly depends on the type of fish being processed and type of processing undertaken. Pollution

loads generated from the processing of oily fish species are much higher than from white fish species, due to the high oil content and the fact that these species are usually not gutted or cleaned on the fishing vessel.

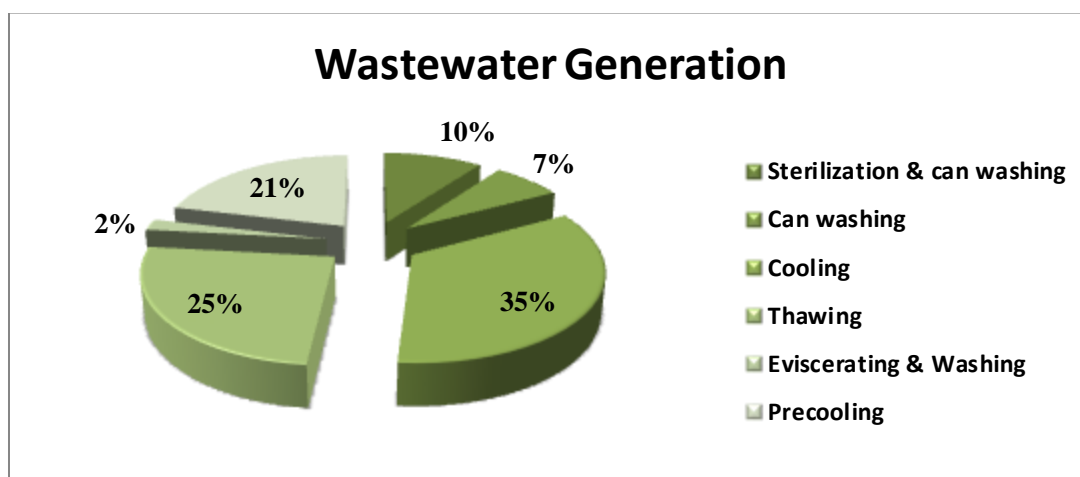


Fig: 4.5.1.3 Wastewater generation from a seafood processing unit

If the effluent streams described above are discharged without treatment into water bodies, the pollutants they contain can cause eutrophication and oxygen depletion. In addition, fish processing industries have been known to pollute nearby beaches and shores by releasing wastewater containing oils. Since oil floats on water, it can end up on the surrounding coastline.

➤ **Solid waste generation**

Solid waste is mainly in the form of organic wastes generated in the production processes. It consists of fish shells and heads from the seafood processing. The majority of captured species are ground fish and it is estimated that only 25-50% of the raw material is utilized for primary products. The remaining 50-75% of the raw material is considered processing waste and is utilized for low-valued products or disposed. Seafood processing activities generate potentially large quantities of

organic waste and by-products from inedible fish parts and endoskeleton shell parts from the crustacean peeling process. The waste generation depends on the species and the process. If coal is used as a fuel in the boiler, ash will be generated depends on the ash content of the coal. Generally, 80% of the ash becomes fly ash and the remaining 20% will be bottom ash.

Table 4.5.1.2 Source and quantities of solid waste

Process	Waste generation(kg/ton)
Eviscerating	240
Cleaning	400
Seaming	50
Total	
Organic	640
Inorganic	50

Source: Handbook of seafood processing

4.5.2 Waste Treatment Practices

4.5.2.1 Wastewater treatment

Seafood processing facilities typically employ a combination of primary and secondary wastewater treatments, depending on the degree to which organic materials are collected separately or mixed into the effluent stream. Wastewater from seafood processing facilities typically has a very high organic and nitrogen load which can be effectively treated in aerobic or anaerobic systems, including lagoons. However, care should be taken to reduce odors including those from extended biological and/or chemical phosphorus removal.

4.5.2.2 Pre treatment

The pre treatment of the seafood processing wastewater generally includes screen, grit chamber, oil & grease remover or flotation unit & equalization tank.

- ✓ **Screening** is used to remove large objects, such as stones or sticks, which could clog lines or block tank inlets. This is one of the treatments most commonly used by food processing plants as it quickly reduces the amount of solids being discharged. Removal rates may vary from 40 to 75 %.
- ✓ **Grit chamber** is used to slow down the flow to allow grit to fall out from the effluent wastewater. The grits are removed to prevent abrasion of mechanical parts of equipments, deposits in pipelines and in the digesters. The removal efficiency varies between 75 – 95%.
- ✓ Fisheries wastewaters contain variable amounts of oil and grease which depend on the process used, the species processed, and the operational procedure. The main objective of this unit operation is to protect downstream treatment processes such as biological process and air diffusers from blocking.

4.5.2.3 Primary treatment

Primary Sedimentation is used to remove suspended solids present in the wastewaters. In fisheries wastewaters these include fish scales, portions of fish muscle and offal, and the relative proportions varying with the particular process being used. If the BOD of the seafood processing wastewater is nearly 1000mg/L we can use this unit operation to reduce the suspended solid & BOD loads in the aerobic biological process followed. Treatment efficiency of the primary sedimentation tank is 40 – 60 % suspended solids removal and 30 % BOD removal.

4.5.2.4 Secondary treatment

The secondary treatment of seafood processing wastewater is basically a biological treatment as wastewater contains high load of organic matters and high nutrient contents. There are two basic biological processes namely, aerobic and anaerobic. These two processes have wide varieties of options available such as activated sludge process, up flow anaerobic sludge blanket process, anaerobic lagoons, etc.

4.5.2.5 Sludge treatment & Disposal

Sludge treatment includes, sludge thickening, sludge digestion & sludge dewatering and finally safe disposal of the treated sludge.

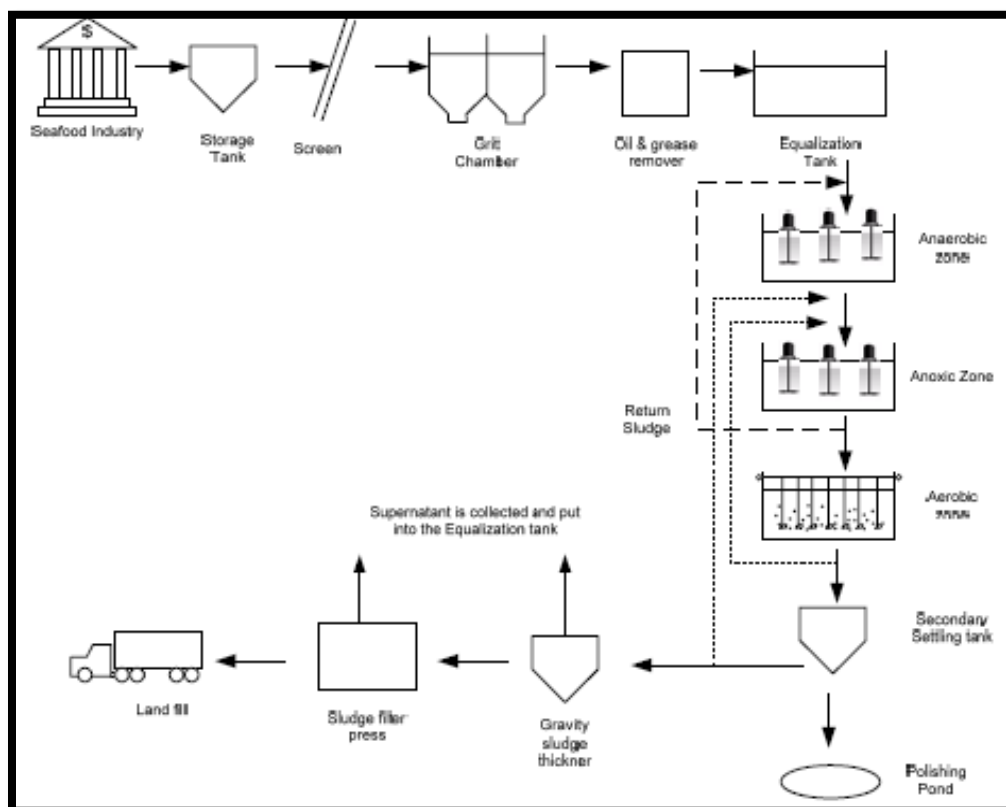


Fig: 4.5.2.1 Typical Seafood processing wastewater treatment process

4.5.3 Solid waste management:

Fish waste is a rich source of essential amino acids and others. Thus all inedible fish waste should be utilized rather than disposed. Options for using fish wastes are listed below;

1. To extract biochemical and other pharmaceuticals.
2. To extract color additives.
3. To Produce gelatin from skin and bones.
4. Use of solid waste in fishmeal and oil production.
5. Use of solid waste in silage production.
6. Use of solid waste in compost production.
7. Use of solid waste directly as fertilizer.
8. Use of solid waste for fish bait or chum.
9. Use of solid waste for animal feed.

4.6 Competitive Analysis of the IQF seafood processing segment, Nationally and Internationally.

4.6.1 The Global Seafood Supply Chain

The supply chain for seafood can involve a large number of intermediaries between the fisherman and the consumer, as depicted in the example in Figure 4.6.1.1, loosely based on Knapp, Roheim and Anderson (2007). Most seafood is traded internationally, particularly the high-valued species most commonly associated with IUU fishing (e.g. tuna, toothfish, cod, abalone).

In the simplified supply chain presented in Figure 4.6.1.1, there are four possible routes fish caught by a foreign fleet may make its way to the consuming nation:

- 1) It may be exported directly after harvest.

- 2) It may be exported after only primary processing occurs within the foreign harvesting nation.
- 3) It may be exported after both primary and secondary processing occurs within the foreign harvesting nation.
- 4) It may be exported after harvest to a third country processor which will then re-export the product to the consuming nation.

A relatively new feature of the global supply chain is the emergence of a third country processor – a country to which nations export unprocessed products simply to become processed, only to have those products re-exported. The primary nation serving this role is China. A growing and significant amount of fish is exported to China post-harvest, processed, then re-exported around the globe. This has significant implications for IUU (Illegal, unreported & unregulated) fish, in particular, as if one is successful in getting illegal fish into China, the product is essentially laundered, as it re-emerges as legal ‘product of China,’ if it does not remain in the domestic market for consumption there.

The supply chain presented in Figure 4.6.1.1 masks the presence of middlemen (brokers, traders and others) which may be found within virtually every link in the chain. Direct sales without middlemen are certainly prevalent, however, one should not think that because middlemen are not depicted in the simplified flowchart that they are not present. Even a simplified supply chain makes it clear that following seafood as it moves from harvest to the consumer is difficult. It is in the early stages of the supply chain, as the vessel brings product to port and processor, that IUU fish finds its entry into the supply chain. Thus, as chain of custody programs rely on traceability systems.

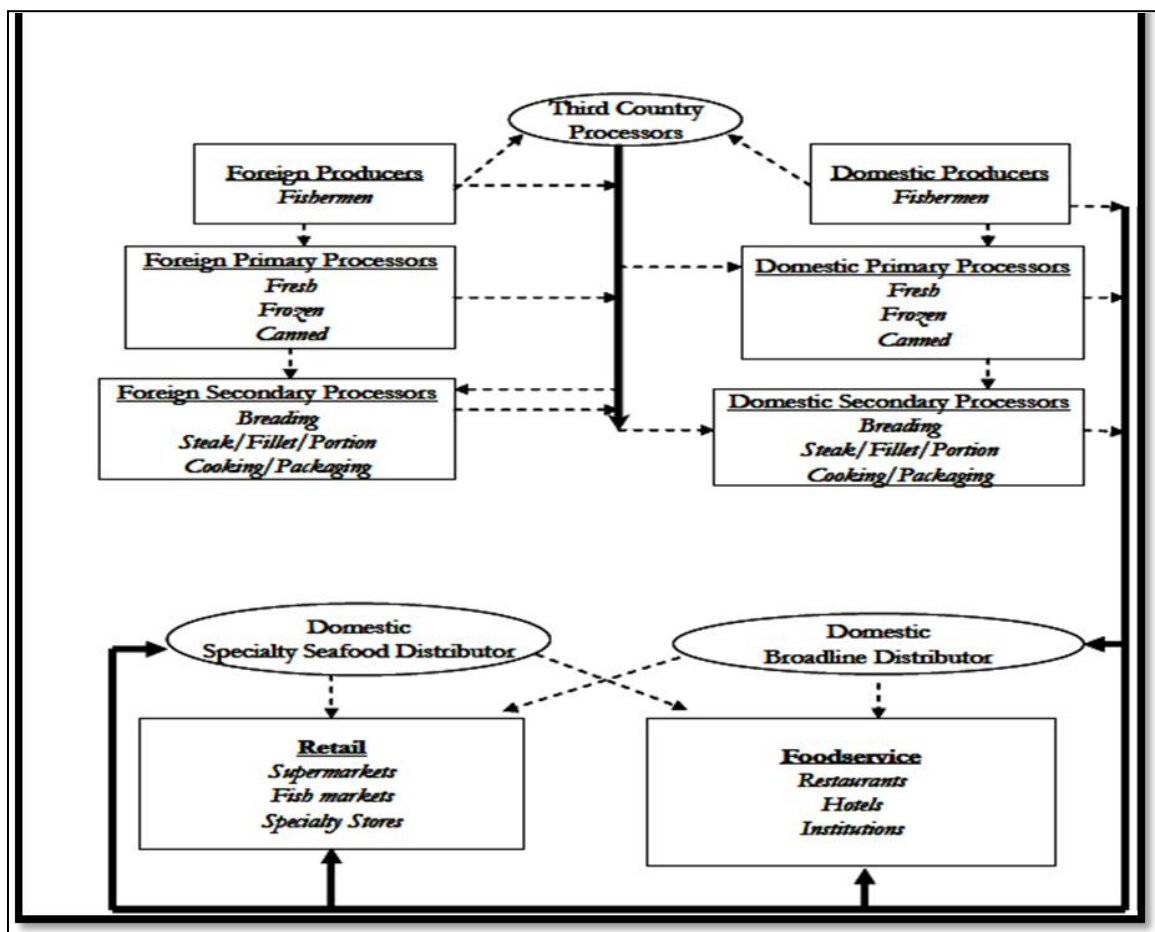


Fig: 4.6.1.1 Simplified global finfish supply chain

4.6.2 Common Supply Chain of Seafood in India

A number of middlemen move seafood from harvest to the buyer's outlet, be it a foodservice operation or a retail store. This product flow requires a series of processing, packaging, transporting and marketing functions performed by middlemen who provide customers with a range of services, from manufacturing and distribution to financing. These intermediaries are known as channels of distribution for the trade. Channel functions commonly recognized by the seafood industry and their different functions are listed below.

4.6.2.1 Primary Processor

Either owns fishing vessels, cultures fish or shellfish or purchases them from others through auction, fishermen's cooperatives, directly or on a contract basis. Primary processors "take title" to seafood, meaning that they own the product until it is received by the buyer. The primary processor handles the seafood in some way, either by re packing, as with shellfish, or by cutting finfish into various product forms and packing to customers' specifications. Primary processors sell products either through in-house sales staff or through brokers. Processors arrange for transportation to the buyer's destination, and many extend credit for the purchase.

4.6.2.2 Secondary Processor

Purchases fillets or blocks and prepares them in some way for sale as ready-to-cook items, like breaded and battered portions, chowders, frozen entrées or other prepared products. Companies involved in secondary processing (also known as "converters") usually generate large-volume sales, which are made by in-house staff or brokers.

4.6.2.3 Wholesaler/Distributor

Often inter change able terms, as many wholesalers distribute. They generally purchase large amounts of processed seafood from primary processors and sell them in smaller amounts to a number of customers. Primary processors can be wholesaler/distributors. Wholesalers may carry a wide variety of products and product forms. They take responsibility for quality control and often provide marketing support, such as point-of-sale materials and promotional pricing.

4.6.2.4 Trader/Broker

Sources and sells large volumes of commodity seafood, usually by the container load. Quantity and high volume are the traders' keys. They may or may not take title to the products they sell, but they rarely take physical possession. Brokers sell seafood as independent representatives of a number of products processed or manufactured by others. Quantity is not so important, and a large brokerage may handle a variety of products other than seafood. Brokers almost never take title to the products they sell and are compensated by commissions on sales.

4.6.2.5 Importer

Processors, wholesalers, traders or brokers may all be importers. These middlemen source seafood products outside the United States and make arrangements for shipment of these products to U.S. buyers. Arrangements for which they take responsibility include all import regulations and duties. Since a large percentage of the seafood consumed in the United States is imported, many intermediaries perform this function.

4.6.2.6 Exporter

Exporters sell products that have been processed or manufactured in the United States to buyers outside the country. Any of the intermediaries may be involved in exporting.

4.6.3 Fish and fishery products market analysis

On average, the latest trade information indicates that two years after the drastic fall at the end of 2008, prices in September 2010 were only 1 per cent below the peak of September 2008, with aquaculture prices 11.6 per cent higher whereas prices of wild species were 10 per cent lower.

According to the FAO Fish Price Index, prices over January to September were, on average, 8.5 per cent higher year-on-year.

Aquaculture producers of many of the exported commodities responded to the economic crisis in late 2008 and throughout 2009 by reducing stocking levels, thus affecting future production. Since then, demand in many developing countries has rebounded, especially in Asia and South America. Developed country demand for farmed products is picking up, and prices for products such as shrimp, catfish, tilapia and salmon have risen significantly in 2010.

	2008	2009 <i>estim.</i>	2010 <i>f'cast</i>	Change 2010 over 2009
	<i>million tonnes</i>			%
WORLD BALANCE				
Production	142.3	145.1	147.0	1.3
Capture fisheries	89.7	90.0	89.8	-0.2
Aquaculture	52.5	55.1	57.2	3.8
Trade value (exports USD billion)	102.0	95.4	101.9	6.8
Trade volume (live weight)	55.2	54.9	55.3	0.7
Total utilization				
Food	115.1	117.8	119.5	1.5
Feed	20.2	20.1	20.1	-0.1
Other uses	7.0	7.2	7.4	2.8
SUPPLY AND DEMAND INDICATORS				
Per caput food consumption:				
Food fish (kg/year)	17.1	17.2	17.3	0.3
From capture fisheries (kg/year)	9.3	9.2	9.0	-1.7
From aquaculture (kg/year)	7.8	8.1	8.3	2.6
FAO Fish price index	2008 Sept.	2009 Sept.	2010 Sept.	Change Sept. 2010 over Sept. 2009 %
	128	117	127	8.5

Source: FAO

Fig: 4.6.3.1 World fish market at a glance

4.6.4 Export Performance of Indian Seafood Industry during 2009-10

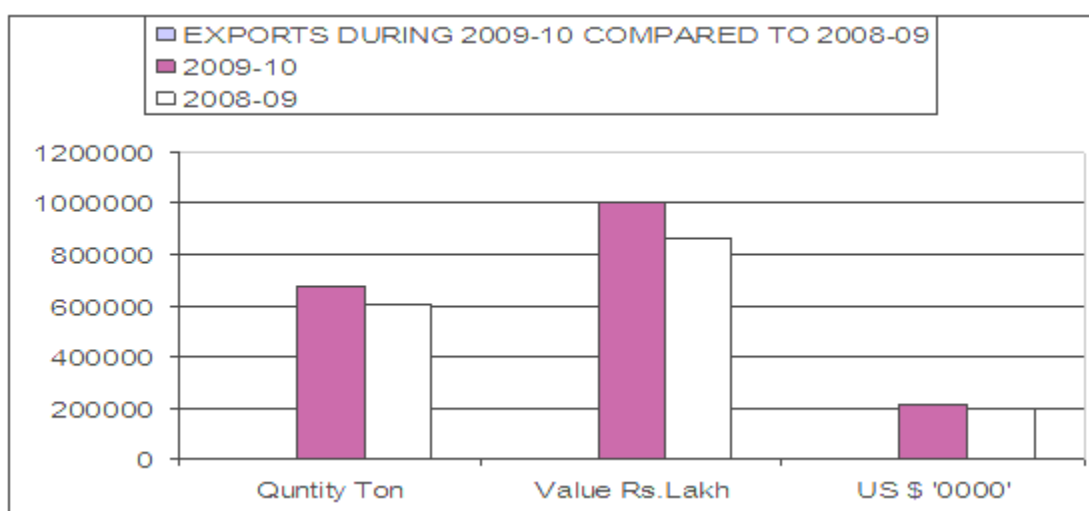
4.6.4.1 Introduction

During 2009-10 for the first time in its history of Marine product export the export earning has crossed 2 billion US dollar and Rs. 10000 crore mark. Export has crossed all previous records in quantity and in value. Export aggregated to 678436 tonnes valued at Rs.10048.53 crore and US dollar 2132.84 million. Compared to the previous year, this recorded a growth of 12.54% in quantity, 16.74% in Rupee earning and 11.75% growth in US \$ earning as shown below:-

Table 4.6.4.1.1 Export during 2009-10 compared to 2008-09

Export details	2009-10	2008-09	Growth %
Quantity Tonnes	678436	602835	12.54
Value Rupees crore	10048.53	8607.94	16.74
\$ Million	2132.84	1908.63	11.75

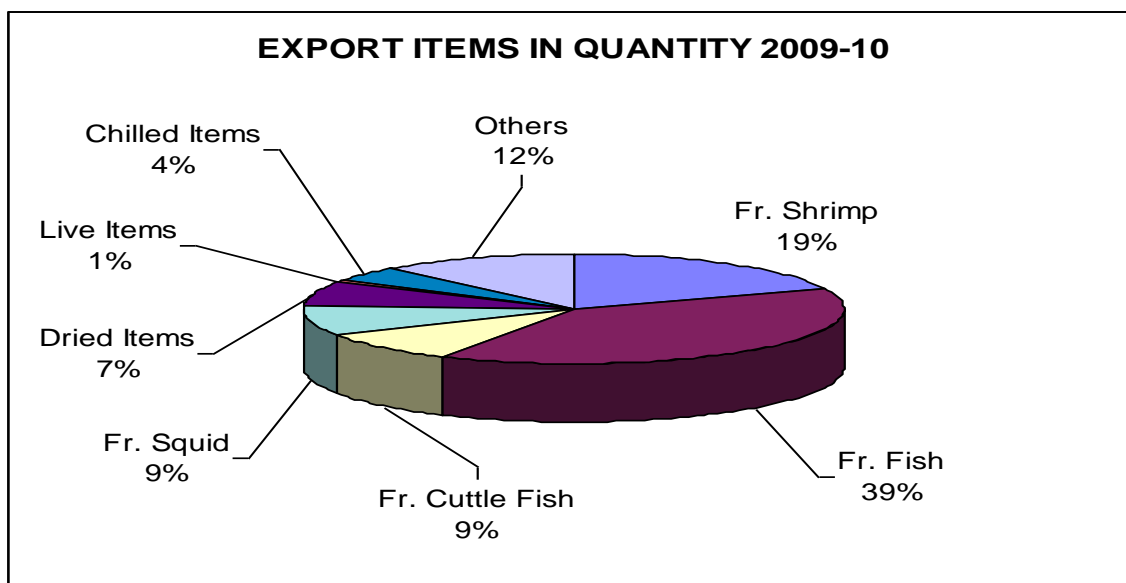
Source: MPEDA



Source: MPEDA

Fig: 4.6.4.1.1 Export during 2009-10 compared to 2008-09

4.6.4.2 Major Item of exports



Source: MPEDA

Fig: 4.6.4.2.1 Major Items of export

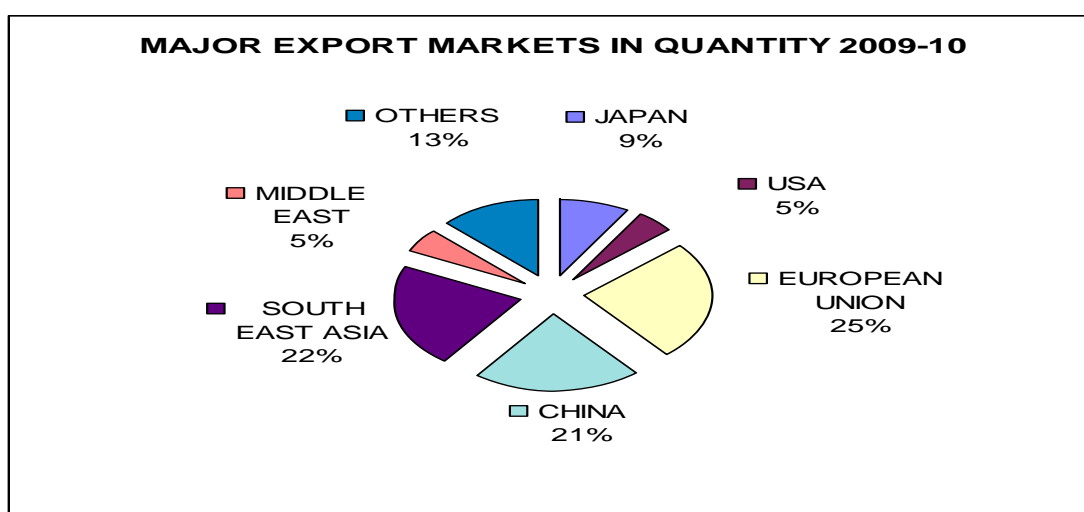
Frozen & IQF shrimp continued to be the major export item accounting for 41.40% of the total US \$ earning. Shrimp export during the period increased by 3.58%, 10.65% and 5.21% in quantity, Rupee value and US \$ value respectively. There is a slight increase in unit value realization of 1.57%.

Fish, the principle export item in quantity terms and the second largest export item in value terms, accounted for a share of about 38.47% in quantity and 20.21% in US\$ earning. There is an increase of value realization for Ribbon Fish inspite of the short fall in quantity by 12.45%. There was also good landing of Leather jacket. Frozen mackerel, Anchovy, Kati Fish etc., also showed a positive growth where as Tuna export has decreased considerably.

Frozen Cuttlefish recorded a growth of 25.13%, 21.39% and 16.30% in quantity, rupee value and dollar terms respectively. However there is a

decline in the unit value realization (-7.06%). Items like dried items, live and chilled items also showed a substantial growth compared to previous year. Export of Frozen and IQF squid showed an increase in quantity but there is a fall in Rupee and US \$ realization. Unit value realization also declined by 13.95%. Export of live lobster, live crab and Baigai showed an increase in exports where as the export of Ornamental fish showed a decline in US \$ terms.

4.6.4.3 Major Export Market



Source: MPEDA

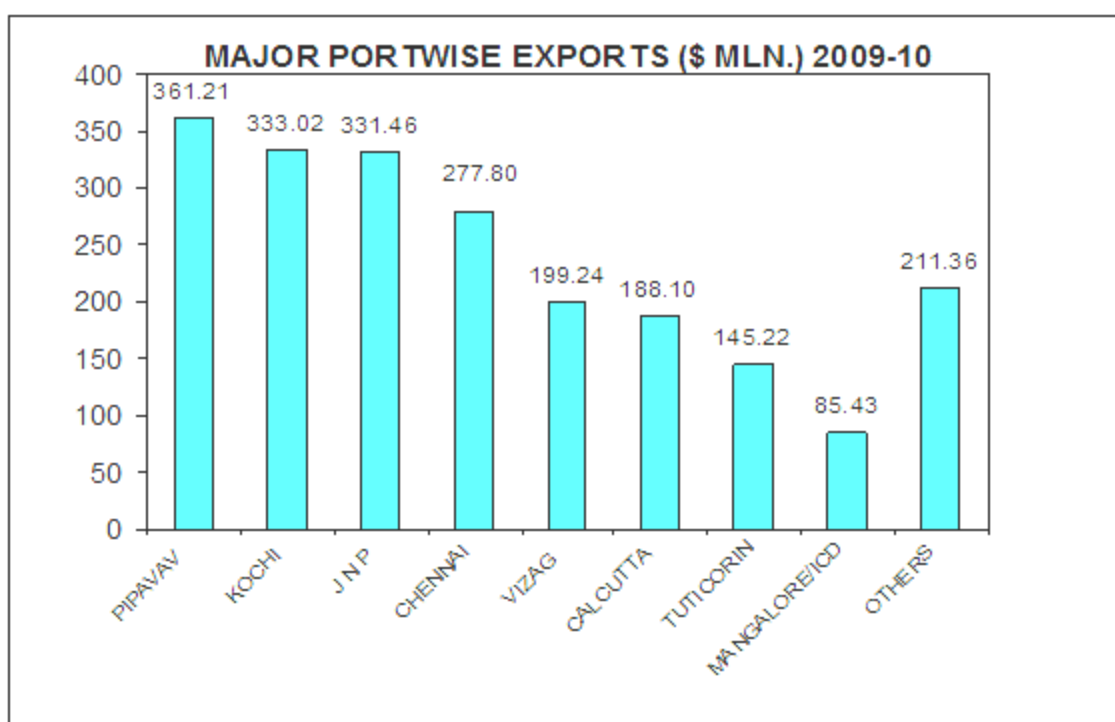
Fig: 4.6.4.3.1 Major Export Market

European Union (EU) continued to be the largest market with a share of 29.89% in US \$ realization. China maintained the second place with a share of 17.80%, followed by Japan 13.06%, USA 10.01%, South East Asia 14.76%, Middle East 5.49% and other countries 8.99%. Export like Libya, Reunion Islands, Australia, Puertorico, Dominican Republic, Kenya, Tanzania, Ukraine, Brazil etc. registered a positive growth.

4.6.4.4 Port Wise Exports

Exports were done from 19 land/air ports handled marine cargo. The major ports in the order of US \$ earnings were Pipavav (19.94%), Kochi

(15.61%), JNP (15.54%), Chennai (13.03%), Vizag (9.34%) Calcutta (8.82%), Tuticorin (6.81%), Mumbai (4.59%), Mangalore (4.01%) etc. Port like Pipavav, JNP, Chennai, Kolkata, Mumbai, Mangalore, Goa, Ahmadabad, Trivandrum and Agarthala have shown an increase in the export compared to the previous year while port like Vizag, Tuticorin, Hill land Customs , Karimganj etc showed a decline trend. Export from Kochi port showed an increase in quantity, as well as in rupee realization where as a decline in US\$ terms by 0.69%. Export from Mundra port also showed an increase in terms of quantity and rupee value however there was a short fall in US \$ realization. There was no export from ports like Kandla, NSICT and Port Blair.



Source: MPEDA

Fig: 4.6.4.4.1 Major port wise exports

4.6.5 Shrimp Market Analysis

4.6.5.1 Shrimp prices recovered strongly

The general economic recovery led to brisk shrimp trading in the year 2010. Generally demand exceeded supply, and prices moved up sharply. Shrimp importers and traders in the main markets were unable to build up inventories, as the product moved quickly. All main markets reported increased imports in the year 2010. The weakening of the EUR impacted the world shrimp market, and more shrimp was aimed at the US and the Japanese market instead. The Gulf of Mexico oil spill resulted in very low US shrimp production, leading to more demand for imported shrimp. The news on lower supplies from Viet Nam, Indonesia and Bangladesh also made prices move upwards. Prices are likely to increase to some extent in the coming months to stabilize at a high level during the last part of the year.

4.6.5.2 Supply situation continues tight

Some major cultured shrimp producers reported declining production in 2010, following the negative trend experienced in 2009. Viet Nam, Bangladesh and Indonesia will again have lower outputs. The cold winter delayed Chinese shrimp farming significantly in the opening months of 2010. In the overall climate of low aquaculture production, Thailand seems to be the only main player with a good production outlook. This country will thus be able to expand its dominant position in the US market and become the main supplier also to the Japanese market. Viet Nam reported lower shrimp production in 2010. Bangladesh will probably produce less shrimp in 2011 than in 2009 & 2010, as supply

shortage for black tiger shrimp is reported.

Indonesia's vannamei farming sector is yet to recover fully from the disease crisis experienced in 2009; hence supplies remain low from this source. Supplies of black tiger shrimp are also lower than expected keeping raw material prices high in the place of origin.

Shrimp farms in Honduras were seriously affected by a tropical storm and subsequent heavy rains. The crop losses are estimated to have exceeded USD 1.5 million. Serious damage to roads is affecting access to the farms. Low salinity of the water, caused by heavy rainfall is another cause for concern for future crops. In Peru shrimp supply is estimated to be 15% lower than in 2009 as many farmers did not stock their ponds because of low prices last year.

4.6.5.3 Japanese demand for shrimp is strong

In the year 2010, supermarkets in Japan were the major buyers of head-on black tiger shrimp during Spring sales. Demand was basically focused on two sizes: 30 and 35 pieces/kg. Japanese consumers preferred to eat at home rather than expensive dining out, thus restaurant demand was very limited.

Imports during January-March 2010 increased by 1.7% compared with the corresponding period of last year. Figures obtained from the total Custom's cleared quantity showed that the share of prepared and processed shrimp dropped to 25.4% from 26.5% in 2009, although imports of "sushi shrimp on rice", mostly supplied by Thailand, surged significantly. With a 68% market share, Thailand, Viet Nam, Indonesia and China were the top shrimp suppliers to the Japanese market.

Compared with the same period in last year, overall supply from Thailand also increased significantly to 17 600 tonnes (+31.5%) followed by Viet Nam at 9 900 tonnes (+7.4%). Imports from Indonesia and China fell.

The inventory situation in Japan was very tight for large sized shrimp in the second quarter of the year 2010. The strong yen also supported the market. Import prices softened temporarily in April but firmed up from May onwards following the oil spill incident in the USA. Prices increased by USD 0.60/kg in June for all origins.

But for the year 2011, perhaps the shrimp trading in Japan will be affected by the natural disaster like Earthquake & Tsunami.

4.6.5.4 US shrimp prices soar due to oil spill

The Gulf of Mexico oil spill problem is overshadowing the US shrimp market. In normal years, US domestic shrimp production is relatively limited with regard to total US shrimp consumption, contributing about 10% of total supply. The area affected by the oil spill represents some 6% of total US shrimp consumption. However, domestic US shrimp production normally influences the price level in summer months, the main production period for US shrimp from the Gulf of Mexico. As a result of the oil spill, important fishing areas for shrimp have been closed, which means longer fishing trips for shrimp trawlers to reach areas where shrimp catching is permitted, consequently production will probably decline sharply. As a result, traders are very cautious with existing inventories. In addition to lower domestic production, imports are also lower than in 2009. As a result of limited supply, prices are going up very quickly. Black tiger shrimp reported USD 1.10/lb higher prices in just two weeks in June 2010. These price hikes are based on limited supply

and fear of the impact of the oil spill, rather than actual consumer demand. The US stock market is quite weak at the moment and the unemployment rate is increasing, resulting in overall poor consumer confidence.

US shrimp imports declined by 4% in the first quarter of 2010, mainly owing to limited production in the main supplying countries, as mentioned above. Thus Thailand managed to expand its exports to the US market by 7%, now representing 35% of total US shrimp imports. In contrast, Indonesian shrimp exports declined by 30% as a result of the disease problems experienced in this country.

Imports Shrimp (frozen raw): Japan							Imports Shrimp: USA						
Jan-Dec		Jan-Mar					Jan-Mar						
2008	2009	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010		
(1000 tonnes)		(1000 tonnes)					(1 000 tonnes)						
Thailand	24.9	32.1	4.1	4.4	5.5	9.0	Thailand	31.6	34.1	39.7	35.0	36.3	39.1
Indonesia	37.4	34.8	8.1	8.3	8.5	7.5	Indonesia	12.8	17.1	12.5	20.7	20.6	14.6
Viet Nam	42.2	39.9	5.3	7.2	6.1	7.3	Ecuador	12.0	15.9	17.2	15.7	16.1	14.8
India	24.0	24.3	4.8	5.0	4.7	4.7	China	9.9	12.8	17.7	12.9	7.4	9.7
China	16.8	14.9	4.8	3.9	2.7	3.2	Viet Nam	10.5	8.3	5.9	8.6	6.6	6.3
Russia	7.8	7.1	2.3	2.6	2.2	1.8	Malaysia	2.9	4.4	4.6	7.1	2.9	4.8
Malaysia	4.5	5.1	0.7	0.9	1.1	1.4	Mexico	4.9	4.9	6.9	6.5	8.0	8.2
Canada	7.7	7.2	1.6	1.2	1.6	1.2	India	8.0	7.3	4.1	2.9	4.6	3.6
Myanmar	6.8	6.7	1.3	1.6	1.6	1.0	Bangladesh	2.0	3.4	3.1	2.8	2.6	1.2
Greenland	5.6	6.5	1.1	0.9	2.3	0.9	Guyana	2.0	2.4	2.6	2.5	2.4	1.9
Argentina	2.6	3.6	0.3	0.2	0.4	0.8	Venezuela	3.9	2.6	3.0	2.1	0.9	0.4
Bangladesh	3.1	2.4	0.6	0.8	0.8	0.7	Peru	1.0	1.1	1.5	1.7	2.6	2.0
Philippines	3.5	4.0	0.8	0.6	0.7	0.6	Others	10.8	10.3	7.3	5.3	5.1	4.3
Others	9.7	9.0	3.0	2.1	2.1	1.2	Total	112.4	124.6	126.2	123.8	116.1	110.9
Total	196.6	197.6	38.8	39.7	40.3	41.3	Source: NMFS						

Source: GLOBEFISH AN 10127

Source: Globefish

Fig:- 4.6.5.4.1 Import of shrimp in Japan & USA

4.6.5.5 Growth in all European markets

All EU markets reported strong trade in the year 2010, with imports increasing in all main markets. The economic crisis seems to be declining, and all indicators show an improved shrimp trade, both for supermarkets and restaurant sales. In the last two months, however, the decline in the value of the EUR has slowed the overall positive development. Price hikes have dominated the market, and some consumer resistance is expected to materialize.

Spain continues to be the main importer of shrimp in the EU. Despite the economic crisis last year, imports were strong and continued to increase during the year 2010 by 10%. Main suppliers to the Spanish market continued to be China and Argentina, while Thailand is increasing supply to this market, from a mere 200 tonnes to 1 200 tonnes. Further increases in shrimp imports are likely, even though prices are expected to go up further. Spanish traders of shrimp source the commodity worldwide, and are able to change quickly from one supplier to another. Prices offered by Spanish traders are generally competitive, making this country a good market for all shrimp producers world-wide. It is surprising, however, that coldwater shrimp is not playing any important role in this market.

UK shrimp imports grew by 5% in 2009, with the cooked and peeled sector (C&P) being mainly responsible for the increase. In the year 2010, UK shrimp imports grew further by a significant 10%. In the C&P tropical sector suppliers increased their presence, while the traditional coldwater shrimp suppliers lost ground.

The product split in UK imports seems to be in the process of changing, as processed shrimp (mainly C&P) now accounts for more than 52% of

total imports, a trend which is continuing. Tropical shrimp is now entering the UK market in C&P form, a development which has mainly favored Thai exporters.

The German shrimp market grew substantially in 2009. Total imports reached a record high of 56 700 tonnes in 2009, 8 400 tonnes more than in 2008. The increase in shrimp imports by Germany is not surprising as the big supermarket chains are all now offering shrimp products, and the discount chains have also recently included shrimp in their product range. The upward trend continued in the year 2010, when imports increased by 17%.

Thailand is the main supplier to the German market with 11 500 tonnes in 2009, followed by Viet Nam with 9 800 tonnes. Both countries expanded their exports considerably. Bangladesh managed to almost double its exports during 2009 to reach 6 500 tonnes. This country is exporting more value added frozen shrimp products such as easy peel shrimp and with sauces added to their shrimp products.

French shrimp imports were stable during the past 7 years at between 101 000 to 108 000 tonnes. Frozen shrimp are by far the main form of imports and in this category; frozen warm water shrimp are most popular. The supply comes from Latin America (Ecuador is the main supplier of shrimp to the French market), India (strong growth in 2009) and Madagascar (some decline last year). The French market pays a premium for high quality shrimp, for example Madagascan shrimp is priced at EUR 8.28/kg, while the Indian shrimp price is around EUR 4.69/kg(at present it is above EUR 6/kg). Overall, the unit value of shrimp imports by France declined from EUR 5.09/kg in 2008 to EUR 4.84/kg in 2009.

During the present year, however, prices have started to move up quite substantially.

4.6.5.6 Prices to increase in future

In June, the appreciation of the yen helped Japanese importers to conclude some solid deals even at higher prices. Price increases in the international market, however, are not positive for Japanese traders as they are afraid to pass on the higher price to end consumers. Under the tight supply situation, Japanese importers are not in a position to dictate market prices either. Therefore, depending on the strength of the yen, sporadic import deals are expected to replenish stocks, at least for summer holiday sales.

The US shrimp market, which for such a long time had been driven by buyers' interest, has now become a "sellers' market". Larger sizes of shrimp are in very short supply, with prices reaching the highest levels in two years. Importers and sellers of domestic shrimp, holding larger sizes, are expecting a further rise in price.

Countries of the EUR zone will have problems to stay competitive in the world market, in view of the declining value of the EUR with regard to the USD and the YEN. The impact might be strongest in the Spanish market, where the economic crisis is declining, but unemployment levels are extremely high now, and shrimp consumption is likely to be impacted. In addition, fewer tourists going to the Spanish resorts will result in lower demand for shrimp products.

4.6.6 Squid Market Analysis

4.6.6.1 Economic crisis impacts world cephalopod market

The world squid market is in a very difficult situation. Supply is sharply down in the Southwest Atlantic, which normally would lead to a substantial price hike, especially after the extremely low prices of the previous two years. However, the economic crisis is putting a brake on these price expectations, and even though prices are moving up somewhat, it is still far from what was expected, given the present supply situation. Demand for octopus is strong in Japan, while the European market is rather reluctant to offer higher prices.

4.6.6.2 Squid catches extremely low

The 2009 squid season in the Southwest Atlantic was a disaster. In the whole area, only 65 000 tonnes of squid were caught in the first five months of the year, which compares with 334 000 tonnes of squid caught in the area during the same period last year. Squid catches around the Falklands/Malvinas were extremely low, only 45 tonnes of *Illex* squid were caught in January to May 2009, which compares with 94 000 tonnes during the same period of 2008. For *Loligo* squid the decline was slightly less dramatic, down from 25 000 tonnes to 13 000 tonnes. Argentina Mainland reported squid catches during the first five months of the year of 53 000 tonnes, down from last year's 220 000 tonnes. Squid exports from Argentina were 28 700 tonnes in the first four months of 2009, almost half the amount exported one year earlier. While exports to Japan and Re-public of Korea were quite strong, shipments to Spain and China, usually the main markets for Argentinean squid, declined sharply.

4.6.6.3 Good demand in Japan

In the Japanese market, which had already started to weaken when squid supplies from the Southwest Atlantic first arrived, prices firmed again, once the disastrous catch situation there became apparent. Total squid imports into the Japanese market in the first quarter of the year were slightly lower than the corresponding 2008 figures. Further price hikes are likely before September when the domestic flying squid supply will enter the market. Overall, cold storage holdings are about 7 000 tonnes short of the last year's results, which also points to price increases in the market. Prices should be moving up, in reaction to this sharp decline in squid availability, but the impact of the economic crisis on demand for squid in Spain puts an effective brake on any major price increase.

Imports Squid: Japan						
	.....Jan-Dec.....			.....Jan-Mar.....		
	2006	2007	2008	2007	2008	2009
	(1000 tonnes)					
China	28.9	30.2	26.1	6.0	5.2	4.8
Peru	4.8	7.8	12.8	0.0	0.9	1.9
Thailand	7.6	8.1	7.1	1.6	1.4	1.3
Argentina	5.6	10.4	6.3	0.4	0.1	0.3
Viet Nam	7.0	6.8	5.5	1.3	1.0	1.0
USA	4.6	5.4	3.9	1.7	3.5	0.5
India	1.9	1.0	1.2	0.3	0.2	0.2
New Zealand	1.4	3.3	0.9	0.3	0.1	0.1
Korea Rep.	0.4	0.9	0.8	0.2	0.0	0.0
Morocco	0.8	0.2	0.2	0.0	0.0	0.2
Taiwan PC	0.3	0.4	0.2	0.0	0.0	0.0
Others	2.6	2.6	2.8	1.4	0.4	0.8
Total	65.9	77.1	67.8	13.2	12.8	11.1

Source: GLOBEFISH AN 10437, *) included under others

Source: Globefish

Fig: 4.6.6.3.1 Import of Squid to Japan

Spanish import statistics for the first three months of the year showed a moderate decline in imports, a trend that will become stronger in the second quarter of the year.

All main exporting countries reported lower exports. On the other hand, Spanish importers are reluctant to offer higher prices, in the view of the overall economic situation in the country.

Imports Squid: Spain						
	.....Jan-Dec.....			.....Jan-Mar.....		
	2006	2007	2008	2007	2008	2009
	(1000 tonnes)					
Argentina	83.6	61.3	54.4	8.0	4.2	4.9
Falkland/Malv.	42.4	40.3	45.6	7.0	3.5	3.8
India	18.2	12.8	15.5	3.1	2.3	2.5
China	8.1	6.4	6.7	1.8	1.9	2.3
Morocco	4.5	1.4	3.3	0.4	0.6	1.0
South Africa	4.0	3.5	4.5	1.0	1.2	0.7
USA	3.9	1.7	2.2	0.6	1.0	0.2
Korea Rep.	2.5	2.0	2.9	0.6	1.0	0.2
Peru	1.8	4.5	1.2	1.1	0.3	0.7
New Zealand	0.0	0.1	0.1	0.0	0.0	0.0
Others	12.2	11.8	14.0	1.7	4.1	2.0
Total	181.2	145.8	150.4	25.3	20.1	18.3
Source: GLOBEFISH AN 10450						

Source: Globefish

Fig: 4.6.6.3.2 Import of Squid to Spain

4.6.7 Groundfish Market Analysis

During all of 2009 and early 2010, groundfish prices declined as a result of good supply and strong market competition from other whitefish species, such as pangasius. Supply was very good for Alaska pollock

from Russia, but also for cod from the Barents Sea, a noteworthy return for a well managed species. In 2010, the new EU regulations attempting to curb IUU fishing created some supply difficulties for the groundfish market as not all the main supplying countries were immediately able to comply with the new regulations. Russia was one of these but has now been able to supply the EU with the list of competent authorities for IUU catch certification and is therefore once again able to export to the EU without delays. China also had some challenges, as processors were not aware of the documentation necessary to comply with the new EU regulation. In fact, reprocessors also need to provide evidence of the legitimacy of the original catch. Argentine and Chilean groundfish products were on offer at very low prices in the first months of 2010 and these were in competition with Alaska pollock coming from China. The South American countries were well prepared to comply with the new EU regulation and managed to provide all the necessary paper work well in time for the end of December 2009 deadline.

4.6.7.1 Pangasius replacing cod in UK

In the UK, the main groundfish market in Europe, the increased supply of pangasius from Viet Nam has had a marked effect on the market. Demand for this species grew in 2009 in spite of the adverse economic situation, and imports of frozen pangasius fillets by the UK market rose by 60%, even though the quantity (1 000 tonnes) is still quite limited. Increasing quantities of pangasius are used in traditional fish and chips restaurants, as this fish is available at very competitive prices and works well in the frying process. In contrast, sales of cod in the UK fell by 17% over the past year and plaice by 13%. However, sales of haddock have increased by 2%. At present price is the main factor in groundfish sales in

the UK market. Russia is currently the main provider of Alaska pollock to the European market. This country reported abundant groundfish catches in the first half of the year. In fact in the first five months of 2010, Russia caught 1 million tonnes of Alaska pollock, a 25% increase compared with the same period of 2009. McDonald's Europe is using haddock to replace Alaska pollock as one of the key raw materials for its Filet-O-Fish. With the 18.5% cut in the US Alaska pollock quota to 815 000 tonnes at the start of this year, McDonald's made a decision to reduce the quantities of pollock used in Europe because of the species' importance to its US operation, as a part of their sustainable sourcing policy.

Imports						
Cod-like groundfish: USA						
	.....Jan-Dec.....			.....Jan-Mar.....		
	2007	2008	2009	2008	2009	2010
	(1 000 tonnes)					
Fillets						
China	74.5	71.6	74.8	18.7	20.1	19.4
Iceland	11.1	7.9	6.5	2.5	2.9	2.9
Canada	5.5	4.2	2.4	0.6	1.4	1.4
Norway	0.2	0.8	0.8	0.3	0.4	0.3
Others	6.4	5.5	4.7	0.0	1.4	2.4
Total	97.7	90.0	89.2	22.1	26.2	26.4
Blocks/Slabs						
China	41.7	35.2	38.9	10.3	9.8	9.7
Russian F.	0.8	1.3	2.9	0.2	1.1	0.6
Argentina	2.0	2.3	1.4	0.6	0.2	0.2
Iceland	0.8	0.9	1.0	0.1	0.5	0.2
Norway	0.1	0.2	0.6	0.0	0.1	0.2
Canada	2.1	0.7	0.5	0.2	0.2	0.1
Others	1.7	1.4	1.4	0.8	0.3	0.4
Total	49.2	42.0	46.7	12.2	12.2	11.4
Gr. Total	146.9	132.0	135.9	34.3	38.4	37.8
Source: NMFS						

Imports						
Frozen Alaska pollock fillets: Germany						
	.....Jan-Dec.....			.....Jan-Mar.....		
	2007	2008	2009	2008	2009	2010
	(1 000 tonnes)					
China	78.5	89.7	85.9	20.8	24.2	24.7
USA	55.2	53.4	30.0	17.8	8.3	9.8
Russian.F.	25.4	28.9	25.9	4.9	8.5	4.0
Others	5.3	4.9	6.4	0.9	1.2	1.3
Total	164.4	176.8	148.2	44.4	42.2	39.7
Source: Statistisches Bundesamt						
Imports						
Frozen cod fillets: Germany						
	.....Jan-Dec.....			.....Jan-Mar.....		
	2007	2008	2009	2008	2009	2010
	(1 000 tonnes)					
Poland	3.8	2.2	2.3	0.6	0.5	2.2
China	12.2	12.1	4.6	3.8	3.0	2.1
Denmark	1.5	1.8	1.3	0.7	0.4	0.5
Russia	1.1	1.1	0.5	0.5	0.2	0.2
Iceland	0.3	0.2	1.0	0.1	0.1	0.2
Norway	0.6	0.2	0.3	0.1	0.0	0.1
Others	2.7	2.1	1.5	0.3	0.3	0.9
Total	22.2	19.7	11.4	6.1	4.5	6.2
Source: Statistisches Bundesamt						

Source: Globefish

Fig:-4.6.7.1.1 Import to USA & Germany

V. SUMMARY AND CONCLUSION

The frozen food market is one of the largest and most dynamic sectors of the food industry. Frozen food industry is progressively moving from bulk un-processed food market to manufactured and processed food market. In recent years, due to the changing consumer profile, the frozen food industry has changed significantly. The major trend in consumer behavior documented over the last half century has been the increase in the number of working women and the decline in the family size. These two factors resulted in the reduction in time spent preparing food.

The global frozen seafood market was around US\$388.9 billion in 2010 and is expected to grow with a 5.4 CAGR. Frozen & IQF shrimp continued to be the major export item accounting for 41.40% of the total US \$ earning. Shrimp export during the period increased by 3.58%, 10.65% and 5.21% in quantity, Rupee value and US \$ value respectively. There is a slight increase in unit value realization of 1.57%.

Fish, the principle export item in quantity terms and the second largest export item in value terms, accounted for a share of about 38.47% in quantity and 20.21% in US\$ earning. There is an increase of value realization for Ribbon Fish inspite of the short fall in quantity by 12.45%. There was also good landing of Leather jacket. Frozen mackerel, Anchovy, Kati Fish etc., also showed a positive growth where as Tuna export has decreased considerably.

Frozen Cuttlefish recorded a growth of 25.13%, 21.39% and 16.30% in quantity, rupee value and dollar terms respectively. However there is a

decline in the unit value realization (-7.06%). Items like dried items, live and chilled items also showed a substantial growth compared to previous year. Export of Frozen and IQF squid showed an increase in quantity but there is a fall in Rupee and US \$ realization. Unit value realization also declined by 13.95%. Export of live lobster, live crab and Baigai showed an increase in exports where as the export of Ornamental fish showed a decline in US \$ terms.

European Union (EU) continued to be the largest market with a share of 29.89% in US \$ realization. China maintained the second place with a share of 17.80%, followed by Japan 13.06%, USA 10.01%, South East Asia 14.76%, Middle East 5.49% and other countries 8.99%. Export like Libya, Reunion Islands, Australia, Puertorico, Dominican Republic, Kenya, Tanzania, Ukraine, Brazil etc. registered a positive growth.

Imports during January-March 2010 increased by 1.7% compared with the corresponding period of last year. Figures obtained from the total Custom's cleared quantity showed that the share of prepared and processed shrimp dropped to 25.4% from 26.5% in 2009, although imports of "sushi shrimp on rice", mostly supplied by Thailand, surged significantly.

With a 68% market share, Thailand, Viet Nam, Indonesia and China were the top shrimp suppliers to the Japanese market. Compared with the same period in last year, overall supply from Thailand also increased significantly to 17 600 tonnes (+31.5%) followed by Viet Nam at 9 900 tonnes (+7.4%). Imports from Indonesia and China fell.

The inventory situation in Japan was very tight for large sized shrimp in the second quarter of the year 2010. The strong yen also supported the market. Import prices softened temporarily in April but firmed up from

May onwards following the oil spill incident in the USA. Prices increased by USD 0.60/kg in June for all origins. But for the year 2011, perhaps the shrimp trading in Japan will be affected by the natural disaster like Earthquake & Tsunami.

US shrimp imports declined by 4% in the first quarter of 2010, mainly owing to limited production in the main supplying countries, as mentioned above. Thus Thailand managed to expand its exports to the US market by 7%, now representing 35% of total US shrimp imports. In contrast, Indonesian shrimp exports declined by 30% as a result of the disease problems experienced in this country.

All EU markets reported strong trade in the year 2010, with imports increasing in all main markets. The economic crisis seems to be declining, and all indicators show an improved shrimp trade, both for supermarkets and restaurant sales. In the last two months, however, the decline in the value of the EUR has slowed the overall positive development.

Spain continues to be the main importer of shrimp in the EU. Despite the economic crisis last year, imports were strong and continued to increase during the year 2010 by 10%. Main suppliers to the Spanish market continued to be China and Argentina, while Thailand is increasing supply to this market, from a mere 200 tonnes to 1 200 tonnes.

UK shrimp imports grew by 5% in 2009, with the cooked and peeled sector (C&P) being mainly responsible for the increase. In the year 2010, UK shrimp imports grew further by a significant 10%. In the C&P tropical sector suppliers increased their presence, while the traditional coldwater shrimp suppliers lost ground.

The product split in UK imports seems to be in the process of changing, as processed shrimp (mainly C&P) now accounts for more than 52% of total imports, a trend which is continuing. Tropical shrimp is now entering the UK market in C&P form, a development which has mainly favored Thai exporters.

The German shrimp market grew substantially in 2009. Total imports reached a record high of 56 700 tonnes in 2009, 8 400 tonnes more than in 2008. The increase in shrimp imports by Germany is not surprising as the big supermarket chains are all now offering shrimp products, and the discount chains have also recently included shrimp in their product range. The upward trend continued in the year 2010, when imports increased by 17%.

Thailand is the main supplier to the German market with 11 500 tonnes in 2009, followed by Viet Nam with 9 800 tonnes. Both countries expanded their exports considerably. Bangladesh managed to almost double its exports during 2009 to reach 6 500 tonnes.

French shrimp imports were stable during the past 7 years at between 101 000 to 108 000 tonnes. Frozen shrimp are by far the main form of imports and in this category; frozen warm water shrimp are most popular. The supply comes from Latin America (Ecuador is the main supplier of shrimp to the French market), India (strong growth in 2009) and Madagascar (some decline last year). The French market pays a premium for high quality shrimp, for example Madagascan shrimp is priced at EUR 8.28/kg, while the Indian shrimp price is around EUR 4.69/kg (at present it is above EUR 6/kg). Overall, the unit value of shrimp imports by France declined from EUR 5.09/kg in 2008 to EUR 4.84/kg in 2009.

During the present year, however, prices have started to move up quite substantially.

To increase the export of frozen seafood, India has to process more of them. For that government and private sectors have to establish more infrastructures for processing like increasing the capacity of cold stores, increasing the capacity of existing plants, starting new units, which ultimately reduce the post harvest losses and facilitate more processing for extended period. Government has to increase the central laboratories and company has to set up their quality assurance laboratory to facilitate and ensure the quality of their products.

Adopting the new technology for harvesting, developing a standard supply chain and encouraging the fishermen to adopt a good harvesting and handling process will give the positive trend in the export in future. India has to follow the high quality international standards to produce the processed products superior to other competent countries to enhance its export significantly. Companies may be encouraged to procure raw material from fish farmers through contract farming. Government should reduce the freight charges during export to make our product more competitive in the international market.

Understanding of the documentation process of export is prerequisite for the exporter. Exporter's operation starts with the receipt of enquiry. Based on the enquiry, exporter submits his offer giving complete details of products, technical specific, price, delivery, payment terms etc. After the process of negotiations importer sends a purchase order followed by letter of credit. The exporter manufactures the goods according to the specification given in purchase order. As soon as the goods are ready, the exporter invites the representative of Export Inspections Agency for pre

shipment inspection and obtains the certificate of inspection though not mandatory. After that, the exporter prepares necessary documents and sends to CHA. Based on these documents, CHA agent completes the customs formalities, obtain port permit and prepare shipping bill which is a customs documents. Custom department checks the export cargo on the basis of information provided on the shipping bill. If satisfied then cargo allow the loading of the ship. Documents required for export are: Proforma Invoice, Commercial Invoice, Packing List, Certificate of Origin, Shipping Bill, ARE-1 Form, Exchange Declaration Form, Bills of Exchange, Inspection Certificate, Bill of Lading and Insurance Certificate.

5.1 Recommendations

- 1) Company should establish the processing unit at veraval in Gujarat as:
 - There is an abundant availability of the raw materials compared to the Maharashtra & Kerala.
 - Availability of the raw materials throughout the seasons as compared with Maharashtra and Kerala (except the monsoon).
 - Nearby availability of the Pipavav port from veraval. Also the frequency of the shipping line is more as compared to other states.
 - The aquaculture production of cultured shrimp is also high as compared with Maharashtra and Kerala.
 - The labor problem is comparatively less in Gujarat as compared to Maharashtra and Kerala.
 - Work culture of the government institution is very cooperative so that getting the government assistance is easy here.

- 2) Company should go for the certification of atleast three raw material suppliers for successfully running the unit for atleast 250 days. Also the company would be in negotiation status if the number of certified suppliers will be three or more than that.
- 3) Company should avail the consultants' service for getting all the technical support as well as getting the right kind of machineries.
- 4) Company should make an agreement with some of the already existing seafood exporting companies so that in the state of not getting the buyer, company can act as a third party company.

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Appendix I

On Going Subsidy Assistance Schemes by MPEDA

S.No	Name of the Scheme	Objectives	Quantum of subsidy
01	Financial assistance for creating basic facilities for fish curing / drying / packing / storage for export	<p>To facilitate creation of adequate Facilities necessary and essential for dry fish handling, processing, packing and storage also to ensure quality product for export markets.</p> <p>To increase the share of dried fish items in the seafood export basket of India.</p> <p>To boost the export of dried fish items and to earn valuable foreign exchange to the country.</p>	<p>Scheme-A- Financial assistance for setting up of dried fish handling / curing / drying facility (with solar system with LPG back up).</p> <p>Maximum assistance shall be Rs.23.50 lakh per beneficiary @ 33% of the actual cost incurred.</p> <p>Scheme – B: Financial assistance for the setting up of dried fish packing and storage facility by dried fish processors / exporters registered with MPEDA.</p> <p>Maximum assistance shall be Rs.8.25 lakh per beneficiary @ 33% of the actual cost incurred</p>
02	Financial assistance for Basic facilities (new) for	To boost the export of chilled fish items and to earn valuable Foreign exchange to the country, to increase the share of	Maximum assistance shall be Rs.35 lakh per beneficiary @ 33% of the actual cost incurred. The financial assistance under the scheme

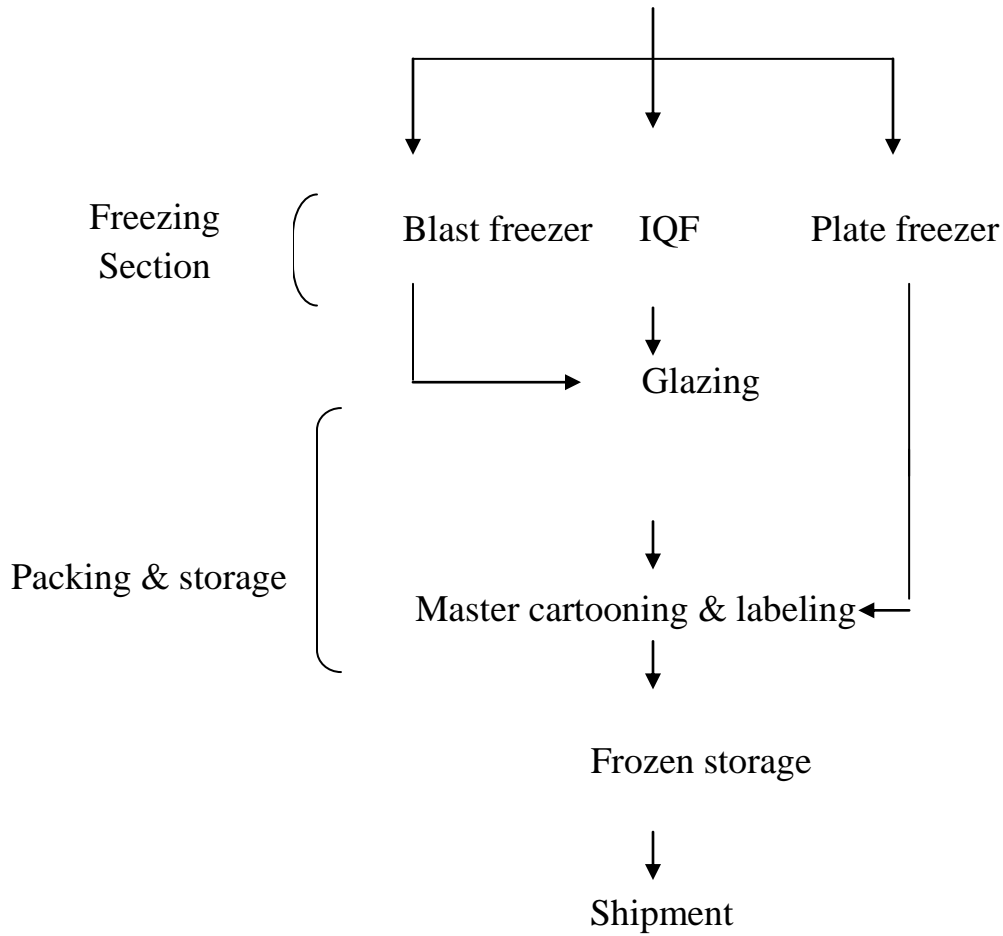
	Chilled fish /Chilled Tuna for export	chilled fish items in the seafood export basket of India and to facilitate creation of adequate facilities necessary and essential for chilled fish export and also to ensure quality product for export markets.	will be available only once to a beneficiary.
03	Technology Upgradation Scheme for Marine Products (TUSMP)	New Scheme for promotion of value addition in seafood processing. Financial assistance either in the shape of capital subsidy @ 25% and interest subsidy to the extent of 5 percentage points (subject to a ceiling) is envisaged in the scheme.	The rate of assistance in the case of capital subsidy will be @ 25% of the expenditure incurred for value addition subject to a maximum of Rs.100 lakh for new units and Rs.85 lakh for the existing units going in for value addition. The interest subsidy assistance proposed is 5% of the term loan availed from financial institutions for value addition subject to a maximum of Rs.150 lakh in the case of new units and Rs.125 lakh in the case of existing units. The beneficiary can avail anyone of the above scheme. Minimum investment:Rs.100 lakh for capital subsidy and Rs.200 lakh for Interest Subsidy (Minutes of 51st Technical committee dated 19/09/08)

04	Subsidy for setting up new modern ice plant / renovation of existing plant	Financial assistance to ice plants in order to upgrade themselves and develop the capacity to supply quality ice to fishermen, processors and Shrimp farmers.	Rs.31 lakh @25% of the cost for a new block ice unit.Rs.26 lakh @50% of the cost of renovation for existing unit. Rs.14 lakh @25% of the cost for Flake / Chip / Tube ice Unit
05	Financial support for acquisition of refrigerated Truck/ Containers	To encourage seafood processors to acquire Refrigerated Trucks/ containers for transportation of raw material/ finished products.	25% of the cost of Refrigerated Truck/ container, subject to a maximum of Rs.3.50 lakh
06	Financial assistance for setting up large Cold Storages	To encourage individuals to establish Cold Storages for keep the surplus seafood.	25% of the cost of cold storage subject to the maximum of Rs.60 lakh.
08	Subsidy for setting up Mini Laboratory.	For effective implementation of in process quality control.	25% of the cost of mini laboratory subject to a maximum of Rs.1,50,000/- per unit.
09	Assistance to seafood processors for construction /renovation of Captive Preprocessing centres with	To bring the pre-processing Activities under the control of processors and upgrade the facilities on par with HACCP/EU Regulations.	50% of the cost of eligible expenditure subject to a maximum of Rs.15 lakh for new construction and 45% of the cost of subject to a maximum of Rs.13.50 lakh for renovation of captive PPCs, which is again linked to the area of the pre-processing hall.

	upgraded facilities.		
10	Financial assistance to pre-processor for construction / renovation of independent preprocessing centres with upgraded facilities.	To upgrade the facilities on par with HACCP/EU regulations and thereby improve the handling practices in the entire preprocessing sector.	50% of the cost of eligible expenditure subject to a maximum of Rs.22 lakh for new construction and 45% of the cost subject to a maximum of Rs.19.8 lakh for renovation of independent PPCs, which is again linked to the workers and the area of the pre-processing hall. The subsidy is further restricted to maximum limits fixed for individual items.
11	Group Insurance Coverage for Workers Employed in the Pre-Processing and Processing plants	The Insurance coverage is arranged with the United India Insurance Co., Kochi for the Welfare of the workers employed in Pre-Processing and Processing plants. Policies shall be valued for a period of one year and are renewable. Benefits extended: a. Accidental death: Rs.50,000 b. Loss/ Damage to the dwellings/ contents due to fire, riot, strike, malicious	The premium of the insurance will be paid by the employer, employee and MPEDA in a ratio of 50%, 25% and 25%. The annual premium works out to Rs.200/- per worker. The present annual premium is Rs.200/-

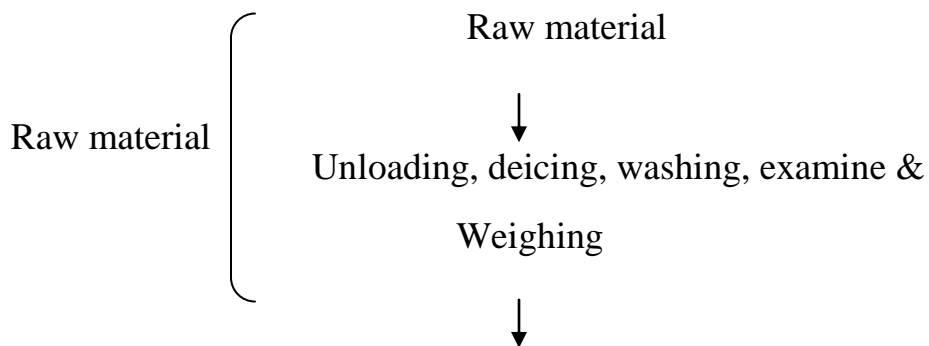
		<p>damage, landslide, flood, storm & earth quake: Rs.20,000</p> <p>c.Hospitalization, treatment expenses due to accident or disease for Beneficiary, spouse, and two dependant children, in the case of married employees, and Beneficiary and two dependent parents in the case of unmarried employees on floater basis:Rs.10000</p> <p>d. Emergency medical evacuation: Actual subject to a maximum of Rs.2000/-</p>	
12	Sea Freight Assistance For import of raw material for processing and export of specified value added products.	<p>To make India a Seafood processing hub and generate substantial employment opportunities.</p> <p>To encourage better utilization of installed capacity in the processing units and thereby improve their financial health.</p> <p>To give further thrust for increasing export of value added products</p>	Assistance at the rate of 100% of the freight differential per container for the first three years and 50% for the fourth year will be given to the units for import of raw material for processing and export of specified value added products provided there is at least 25% value addition on such material.

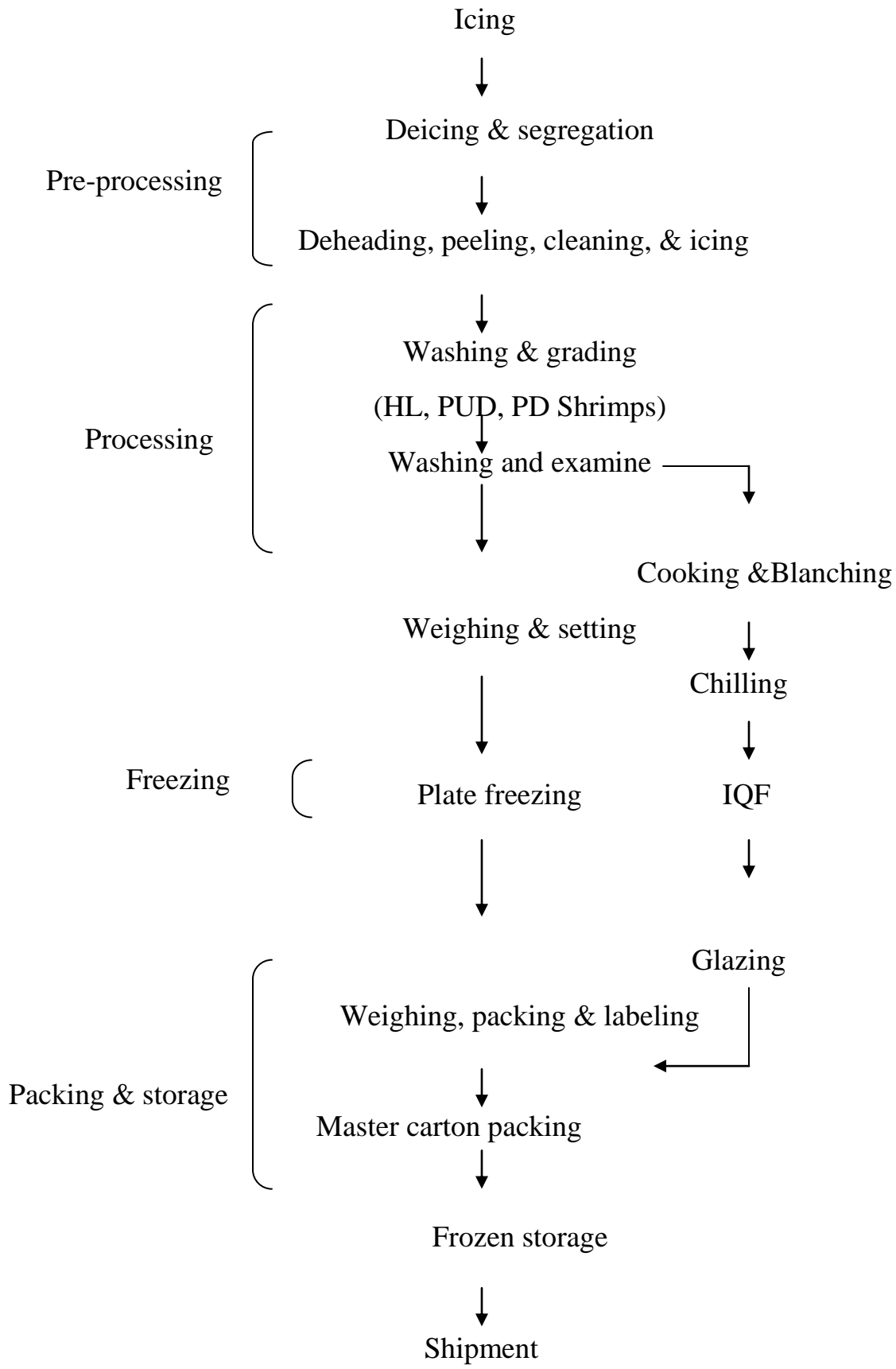
Source: MPEDA



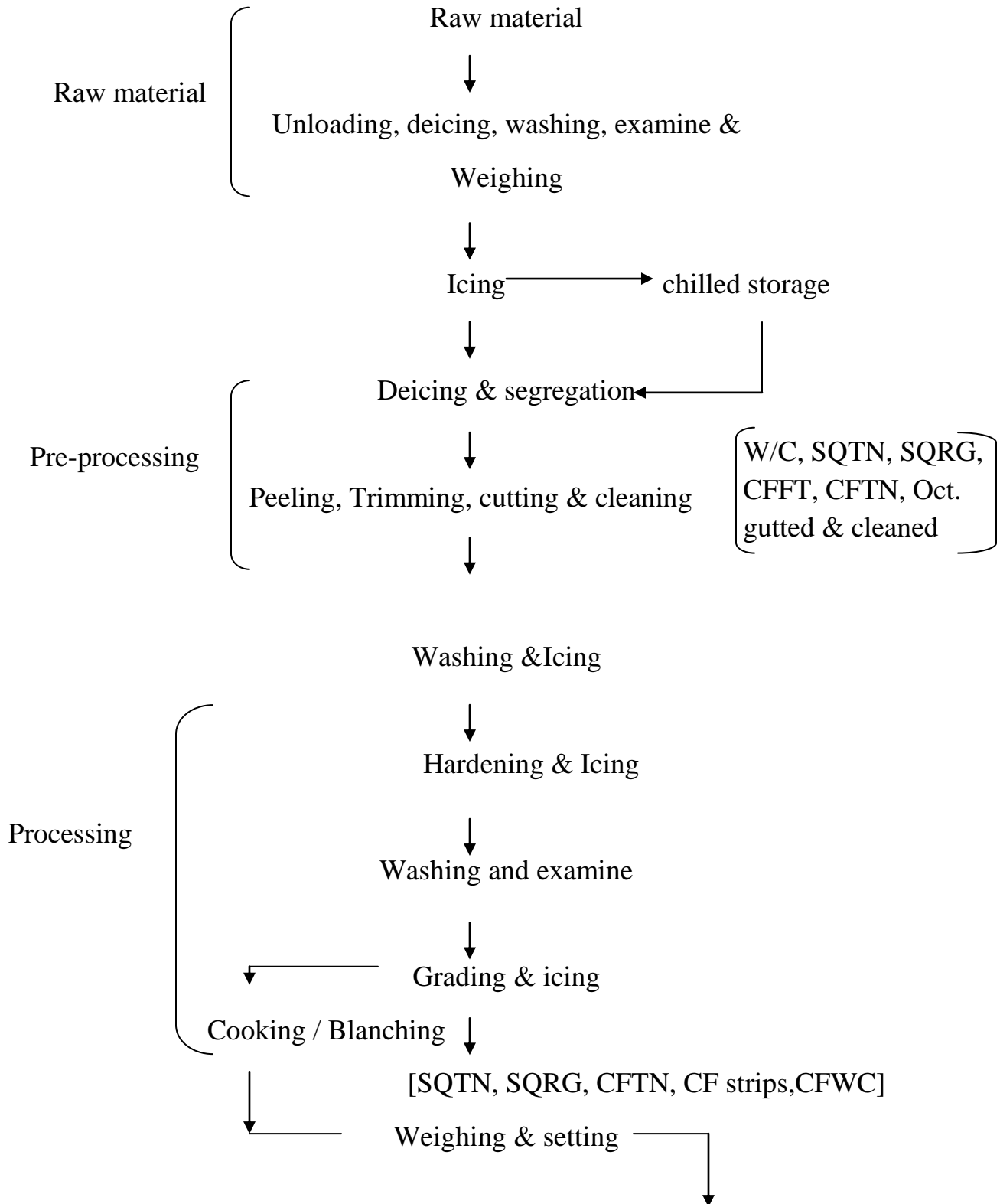
For Raw / Blanched / Cooked / Frozen Crustaceans (Shrimps)

(Head on / Head less / PUD / PD) block / IQF

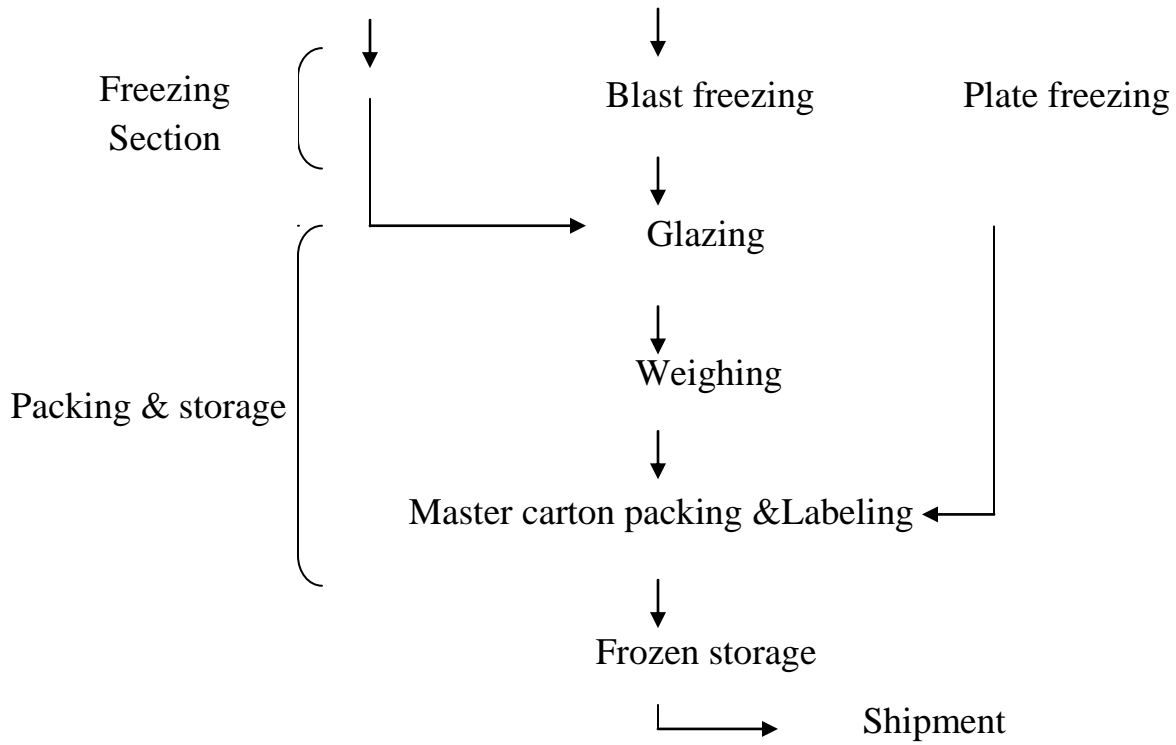




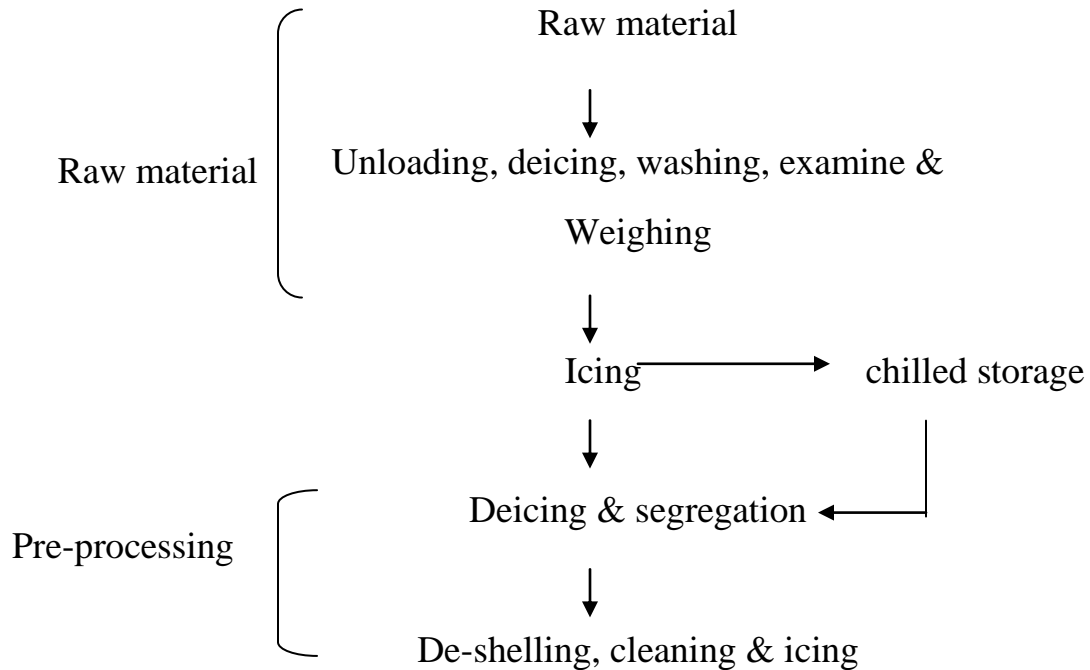
**For Raw / Blanched / Cooked / Frozen Cephalopods whole Cleaned /
Tentacles / Tubes / Fillet / Rings / Block / IQF**

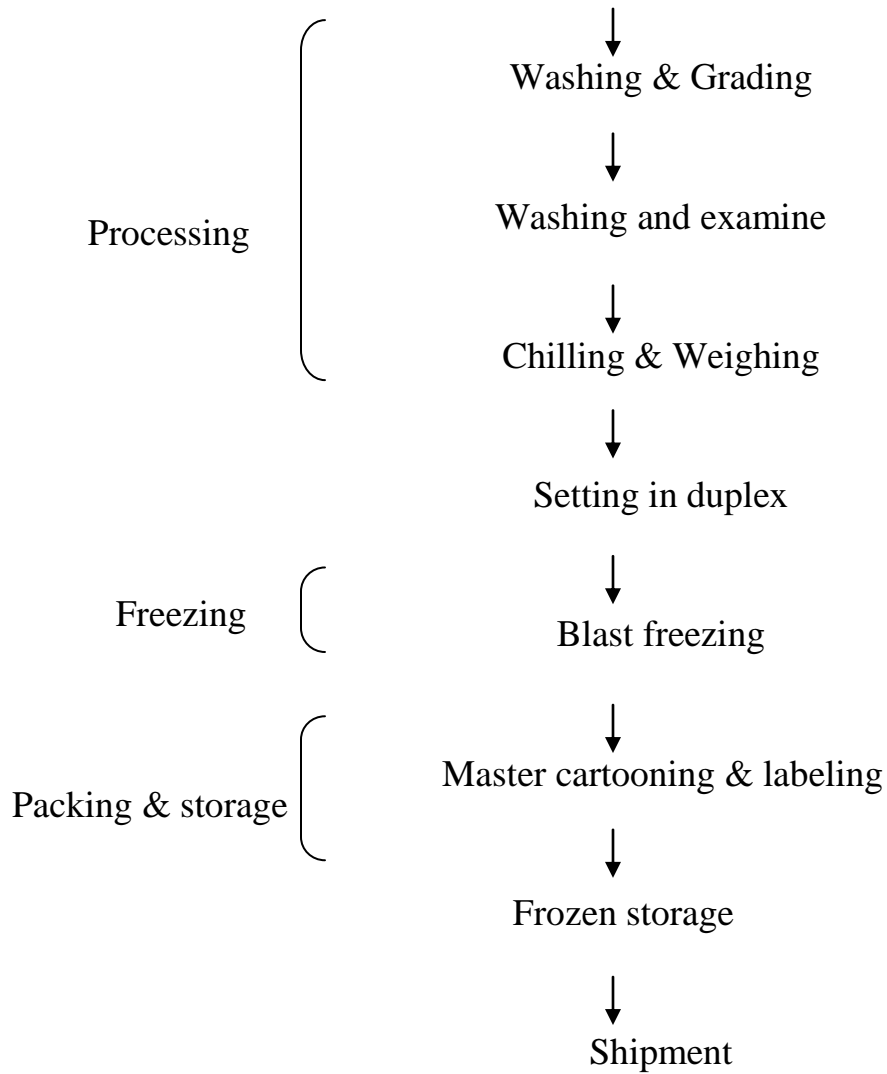


Chilling



For Raw Frozen Crustaceans crab (cut crab)





For Raw / Blanched / cooked / Frozen Crustaceans (Lobster)

