# Solutions for Hazards & Quality Defects in Fish Processing Industry

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**With the support of CIFT and Govt. agencies like IFP, EIA and MPEDA, the Indian Seafood Industry is on equal footing or better than any other similar industry in the developed countries.**

Fishery products occupy a unique position as food material for man. A variety of nutrients both major and minor are available in almost all fish and fishery products from marine and fresh water bodies. The good taste, high nutritional quality and easy digestibility of fish make it a favorable food of almost all living organisms including bacteria and animals. As a result all organisms compete to consume fish and fishery products and if handled carelessly fish and fishery products can become a source of different kinds of hazardous public health organisms like *V. cholera, S. typhi, L. monocytogenes, V. parahaemolyticus, S. aureus* etc. and cause various kinds of infectious diseases and food poisoning in man.

The variety and species of aquatic organisms used as food are too many. Some of these organisms by virtue of their genetic make up or food habits are found to contain some toxic substances. Thus ciguatoxin, paralytic shellfish poison (saxitoxin), diarrhetic shellfish poison (okadaic acid), amnesic shellfish poison etc are species related toxins, which are health hazards encountered in sea food. Similarly scombroid or more generally fishes with red meat on temperature abuse produce histamine and cause the commonly reported scrombro toxin poisoning. Some species, particularly bivalves are known to accumulate certain heavy metal residues from the eco system to toxic levels. The cephalopods, squid and cuttle fish are found to accumulate Lead and Cadmium depending on pollution of the environment as well as age of the organism. On a similar fashion large fishes like tuna, marlin etc are known to accumulate mercury to toxic levels with increase in age and size.

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*Above: a typical algal bloom in Arabian Sea Coast.*

*The impact of an algal bloom on some fishes- mass mortality of a species.*

Fish and shellfish raised by farming are likely to concentrate environmental contaminants and aquaculture drugs like pesticide residues, antibiotic residues, hormone residues etc. All these residues pose various kinds of health risks to consumers of these fish and fishery products. Thus with various kinds of human activity the occurrence of pathogens, pollutants, toxicants and other undesirable compounds in fishery products is fast becoming a common phenomenon in developed and developing countries.

In spite of all these health hazards fish and shell fish continue to be in great demand as a food material in the developed world on account of the better taste, nutritional quality and medicinal properties. To avoid public health problems in using fish and shell fish as a food for mass consumption, several quality assurance programmes were evolved and enforced from time to time. Today various kinds of quality standards like Codex standards, US FDA standards, EU Norms, BIS standards etc are in operation at national and international levels. To achieve these standards several quality assurance programmes were also developed and practised in different parts of the world. The HACCP system of USA, the European Council directives, the QMP of Canada and TQM of Japan are such quality assurance programmes aimed to ensure safety and quality of fish and fishery products consumed in these countries.

With change of time all these quality standards and quality assurance programmes became more and more stringent and mandatory and posed severe challenges to the developing countries, which used to export a major share of their fish and fishery products to these developed countries. As a result many developing countries including India had to face trade ban on fish exports. The imposition of HACCP in the early nineties by US FDA, the EU ban of fishery products from India in 1997 on account of sanitation and hygiene and recent rejection of several consignments on account of antibacterial substances, antibiotic residues, heavy metal residues, muddy moldy flavour etc by USA, EU and Japan played havoc in Indian seafood industry. Even though TQM of Japan aimed total quality management, it failed to ensure both safety and quality, probably due to certain lacuna like calibration, good laboratory practice, good personnel policy etc. There were several attempts to improve the TQM concept of Japan to make it suitable to tackle all problems of safety and quality of a given product.

Today Total Quality Management (TQM) is a widely used technique for quality assurance in a wide range of production industries. The use of TQM is gaining more and more importance in Indian seafood industry perhaps due to the higher incidence of health risks/hazards in fish & fishery products as well as to tackle the challenges in the name of quality and safety posed by major importing countries like the European Union, the USA and Japan. In India the Central Institute of Fisheries Technology, Kochi played the key role to equip the Indian Sea Food Industry to squarely face these formidable challenges by introducing a total quality management concept. The action plan adopted by CIFT consisted of plant inspection,

identification of deficiencies, rectification of deficiencies, preparation of HACCP manual, validation, auditing, installation of GMP, SSOP, GLP and good personnel policy, and these combination procedures were termed TQM.

Even though TQM is widely used, depending on various factors the approach and concepts for implementation of TQM vary from industry to industry and from person to person. Obviously there is a need for consolidation of all relevant aspects to attain uniformly assured quality for products of mass consumption. What follows is an attempt to consolidate systematically all existing steps along with some modifications introduced by CIFT to prevent/eliminate health risks/hazards and quality defects from all possible sources in the processing activity in Indian sea food processing industry. All these steps put together can be called a Total Quality Management System for the Seafood Processing Industry.

The first step in deciding a procedure for TQM is to list out all possible sources of health risks/hazards in the processing procedure. In any system of food production the risks/hazards arise from one or a combination of following sources or processing steps.

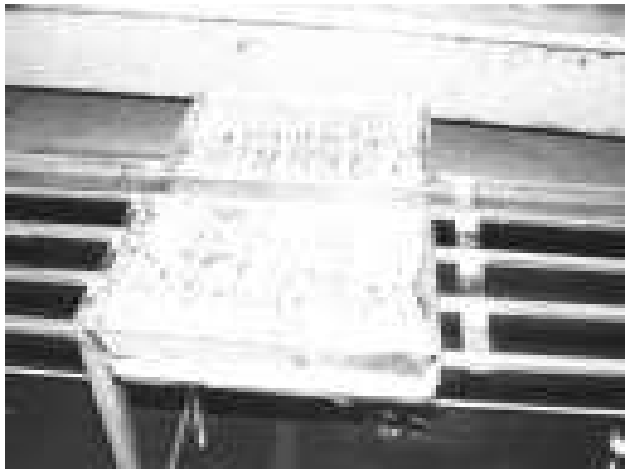
1. Raw material
2. Production Process
3. Production facility- Plant and Machinery
4. Personnel involved in Production.
5. Cleanliness of direct/indirect food contact surfaces.
6. Pests.
7. Risk/hazard monitoring facilities - Laboratory
8. Qualified/ trained personnel

Items at 1 to 8 above lists all the possible areas that can contribute physical, chemical or biological hazards into the food handled in a food processing plant. Therefore the best method to achieve TQM shall be streamlining and critically evaluating each one of the above sources to ensure that health hazards are not introduced at any of the above sources. This exercise needs the support and skill of a team of experts with a thorough knowledge of the raw materials, production processes, hygiene, and sanitation and quality assurance. A judicious selection of persons responsible for purchase, production, quality, etc can take up this responsibility. The team shall have the skill and expertise to identify possible significant hazards like physical, chemical and biological that can be associated with the raw materials, processing steps, plant and workers. The team shall also be in a position to provide suitable remedial measures to exclude possible hazards from each and every source. A brief description of possible hazards at the eight locations above and preventive measures recommended by CIFT for their control are discussed below.

### 1. Raw materials

In a food processing plant raw materials can be the raw food material as well as materials like food additives, food preservatives, packaging etc. Each one of these can contain hazards arising out of contamination, genetic origin, stage of harvest etc. Sea caught fish and shellfish are generally free from indicator organisms and other pathogens. But if the fish is landed on unclean surfaces and handled by personnel with poor hygiene these organisms will find their way into the fish and pose health risk. Similarly PSP (paralytic shell fish toxin) and DSP (diarhetic shell fish toxin) in bivalves, Lead and Cadmium in cephalopods and Histamine in scombroid fishes are commonly encountered health hazards in raw fish and shellfish. In case of fish from inland water bodies and culture systems there is not only the possibility occurrence of pathogens but also pollutants and drug residues like pesticide residue

*Fresh raw materials a precondition for food safety- live tiger prawns harvested from farm.*



*Clean pre-processed materials essential for food safety-cleaned beheaded tiger prawn ready for block freezing.*

*An example of gross neglect of fish & shellfish by ignorant fishermen-a threat to food safety and public health.*

and antibiotic residue. By judicious selection of raw materials and appropriate control measures like harvest area certificate, supplier guarantee and random analysis, hazards arising from contamination, location & stage of harvest, species etc. can be excluded. During harvesting, control measures like landing and sorting the catch on clean raised platform, quick chilling of the catch followed by chilled/ iced storage till it is delivered to the land based factories, following good manufacturing practice (GMP) and standard sanitation operation procedure (SSOP) can minimize many of the biological hazards. Certain problems of genetic origin can be excluded by appropriate preparation/ pre-processing methods such as removal of specific organs responsible for accumulation of toxic residues. (eg. Gutting of cephalopods to overcome heavy metal contamination.) Further to avoid temperature abuse and handling problems a code of practice for icing and fish handling on board, on landing and during transportation was drawn up and popularized among fishermen, landing center workers and transport operators so that all types of contamination are excluded.

### 2. Production Process

All seafood production processes will have a combination of different processing steps like washing, dressing, treatment with chemicals, cooking, freezing etc. of the raw materials to give finished products. At all these steps the food material will come into contact with different contact surfaces like tables, utensils, processing equipments, workers hand etc and in the absence of sanitation and hygiene all type of hazards can enter the food under processing. Certain processing steps are also known to reduce or eliminate certain hazards. Thus chilling or freezing is effective in preventing bacterial multiplication as well as histamine formation. Evisceration of cephalopods will reduce Lead and Cadmium toxicity. Similarly cooking and pasteurization are known for killing of pathogens. To ensure safety and quality, all these steps shall be evaluated properly to identify significant hazards introduced or controlled in each step and devise procedure for their control and monitoring. The thermal process validation for cooking and thermal processing, properly designed GMP and SSOP formulated by CIFT for all other processing steps tightened the entire processing operation and helped the Indian Sea Food Industry to ensure safety and quality assurance in the production process. This process closely follows the Hazard Analysis Critical Control Points (HACCP), which can be practised by following the seven principles of HACCP.

## The Seven Principles of HACCP

### a. Conduct a hazard analysis

Prepare a flow diagram of the steps involved in the processing of the raw material to the product. Identify and list the significant hazards if any for each processing step and specify control measures which will minimize or eliminate the identified hazard. Ultimately this will give us all the significant

hazards and then location in a process. CIFT has developed suitable HACCP work sheet for all the products both for raw and cooked products and passed on the same for the benefit of the industry.

**b. Identify critical control points (CCP) in the process.**

This is best done by following the CCP decision tree or based on the definition that CCP is that processing step which provides maximum control of an identified hazard. For each significant hazard there will be a CCP at some appropriate processing step arrived at as above. In case of aquatic food from India the most common significant hazards are PSP and DSP in case of bivalves and bivalve eating organisms like crab, octopus, rays etc, lead and cadmium in case of cephalopods, histamine in case of scombroid fishes, antibiotic and pesticide residues in case of aquacultured organisms, biological pathogen in case of cooked products etc. The CCP for all these hazards except biological pathogen is at raw material receiving and for biological pathogen it is at cooking.

**c. Establish Critical limits.**

In case of biological pathogens and physical hazards the critical limit is absence and incase of chemical hazards appropriate tolerance levels are prescribed based on Codex, US FDA, and EU Norms. Critical limits for certain seafood borne hazards arrived at in this style are listed in table 1. In a production process all the significant hazards identified shall have a critical limit.

**d. Establish monitoring procedure.**

These are procedures to ensure that the significant hazards at appropriate CCPs are always maintained within the tolerance limit established, by directly or indirectly testing or observing the significant hazards. In short for all significant hazards, there will be one or more monitoring procedures.

***e.* Establish corrective actions.**

These are control measures taken when monitoring indicates that a particular CCP is moving out of control, so that the significant hazard does not exceed the critical limit. Corrective actions are often remedial measures like adjusting cooking time and cooking temperature as per validated processing procedures to ensure proper cooking in case of under cooking/presence of biological hazard, gutting of cephalopods in case of lead & cadmium contamination or avoiding the particular source of supply in case of other kinds of chemical hazards.

**Table 1**

**Typical seafood borne hazards and their critical limits**

| Sl. No. | Significant hazards | Critical limit |
|---|---|---|
| 1. | PSP | 80ug/100g |
| 2. | DSP | 20ug/100g |
| 3. | Histamine. | 25-50mg/100g |
| 4. | Staphylococcus toxin | Absent |
| 5. | Botulinum toxin | Absent |
| 6. | Lead | 0.5mg/kg |
| 7. | Cadmium | 0.5mg/kg |
| 8. | Mercury | 0.1mg/kg |
| 9. | Pesticides | 0.5mg/kg |
| 10. | Antibiotics | Absent |
| 11. | Hormone residues. | Absent |
| 12. | Sanitizers & lubricants | Absent |
| 13. | Pathogens | Absent/ 25g |
| 14. | Parasites | Absent |
| 15. | Foreign matter- fish hook, metal fragments etc | Absent |

**f. Establish verification procedure.**

Verification involve checking of calibration tests, together with a review of actual analytical data (in case of indirect monitoring), which confirms that HACCP is working effectively and the products are safe for human consumption. In other words verification procedures are methods for effective cross checking of all control measures such as CCP monitoring, SSOP & GMP monitoring including relevant records by which the verification/audit team or any other interested party can conclude that HACCP procedures are working effectively and that the products are safe.

**g. Establish a documentation system.**

All data on CCP monitoring, verification procedures, deviations and corrective actions if any as well as details of GMP and SSOP shall be recorded for inspection and audit. These records

shall be preserved for a minimum of three years for review/audit in case of any complaints.

Operation as per seven principles of HACCP will ensure safety of the finished product from processing operations. CIFT initiated several training programmes on HACCP concepts and HACCP manual validation and plant audit from 1997. Till date 715 officials from Government agencies and food industries have undergone training on HACCP Concepts and Audit throughout India. About 130 seafood processing plants including freezer vessels were audited for HACCP, SSOP, GMP &GLP and approved to process seafood for exports.

## 3. The Production Facility

Plant, machinery and other facilities are an important factor, which if not properly selected and laid out can lead to safety risks. Good Manufacturing Practice (GMP) is largely the procedures laid down for achieving safety from plant, machinery and other infrastructure used in the production. The important elements of Good Manufacturing Practice are listed below.

### Plant design, construction & layout

In any production plant there will be raw materials and finished products as well as one or many intermediate products. The plant design shall be such that the movement of edible materials from raw materials stage to the finished products stage is unidirectional and opposite to the movement of waste materials like solid wastes and liquid effluents. Another aspect of the plant design and construction is the nature of the materials used for the construction and the type of construction. All materials used shall be water resistant, washable and with a smooth surface. Further the construction shall be such that there is no sharp corners and that all wall to wall, wall to floor and wall to roof joints are round and smoothened. The design shall take care to provide fly proofing of all external openings like doors, windows, ventilators, chute doors and drain outlets. In fact the safety at drain outlets shall be such that there is no chance for any solid particles to go out as well as no fly can enter into the food handling areas. The plant will also need several electrical & mechanical fittings. All such items shall be washable and laid out in such a way that there is no scope for pest/ microbial harborage. To achieve these objectives the CIFT has come up with sea food processing plant lay out for Pre Processing, Processing of raw and cooked products. Plans for Water purification for process water needs, effluent treatment system, common cold storages were also prepared and popularized in the industry.

*A well designed & laid out interior of a high risk processing unit in Retnagiri, India.*

### A. Machinery design, construction and layout.

Like plant, machinery too shall be designed, constructed and installed to facilitate unidirectional movement of food materials and that the machinery is water resistant, washable and sanitisable. All the machinery shall also be in a position to achieve criteria for good manufacturing practice. To cite an example, the machinery for quick freezing shall be in a position to freeze the food in such a way that the core of the food attains -18-+2°C in 90 minutes. Similarly equipments for cooking shall be able to attain the validated cooking temperature and time with out causing under/ over cooking. Selection and installation of processing machinery in this way will exclude all possible health risks from machinery.

### B. Provision for pest control.

The provision for pest control is often a neglected item. Pest can be the cause for both filth and contamination with microbes of public health significance. Exclusion of pests is best done by providing fly proof netting for all windows and ventilators as well as providing automatic air curtain and self closing shutters for all doors and chutes, directly opening to outside. There shall also be fly proof netting for drain outlets. Further to take care of any pest by passing these facilities there can be

electrical fly catchers and rodent traps at strategic locations. Effective operation of these facilities will make food handling areas free from pests.

For pest control there shall not be any chemical based pest control procedures. In rodent traps the baits shall be only food items like dried and baked coconut or fish. Poison baits shall never be used for rodent control in food processing plants. In case there is any unusual fly population fumigation with formaldehyde followed by defumigation with ammonia can be followed. However there shall not be a regular schedule for fumigation as it may introduce unwanted chemical residues into the food material handled in the plant. Typical layouts for Pre Processing Centers, Processing Centers, Common Cold storage and pest control measures provided to the industry by CIFT are available for adoption by interested parties.

## 4. Personnel involved in production.

Workers or plant personnel are the most dynamic source of various type of microbial contamination in any food processing establishment. In case of food materials from land and inland water bodies there is every chance of occurrence of organisms of public health significance. But in case of seafood the occurrence of Public Health Indicator organisms is a sure indication of poor hygiene and sanitation. To exclude such contamination from workers all personnel in the production unit shall follow good hygiene practice. Important elements of Good Hygiene Practice recommended by CIFT are:

### i. Medical Fitness of workers

Medical examination to certify the workers is an exercise to be done with out failure once in a year. To certify a worker to be fit to handle food actually involve three important steps. The first step involves examination of the worker by a qualified medical practitioner to rule out that the worker is not suffering from any disease. This the Doctor can do by physical examination and certain investigations on blood urine and stool. The second step is to exclude the possibility of the worker as a carrier of certain pathogens especially salmonella. This can be ensured only by conducting a stool culture test for salmonella. These two tests will ensure that the worker is fit to handle food materials. These tests are normally done once in a year. During this period there is no guarantee that the worker will not contract any disease or become a carrier. The third step is to guarantee that the worker will remain fit until next examination. This is ensured by immunization of workers against typhoid and other target diseases. Medical fitness of workers following the above steps will ensure exclusion of pathogens from workers.

### ii. Use of clean uniform including gumboots, head cover, face mask and gloves.

Medical fitness is only a guarantee against contamination with pathogens. The body of the workers is still prone to various types of contamination and a sure source of different kinds of bacteria of public health significance. To avoid such contamination from workers there shall be proper isolation of workers body in such a way that directly or indirectly body of workers does not come into contact with the food or food contact surfaces. This is effectively done by providing clean uniforms including gumboots, head cover and face masks. While head cover prevent falling hair and subsequent contamination face mask will prevent spillage of saliva/ nasal secretion and introduction of *Staphylococcus aureus*, which is a hygiene indicator as well as a food poisoning organism. Wherever high risk products are handled use of sterile disposable gloves is compulsory for all personnel entering high risk areas.

### iii. Removal of ornaments & other beauty aids.

Ornaments and certain beauty aids offer lot of gaps and crevices which are very difficult to clean and so form easy home for various kinds of bacteria,

*Good hygiene practices – an essential requirement for food safety.*

which will be extremely difficult to eradicate. So removal of all type of ornaments by all employees is essential before they enter the food handling areas for achieving safety of the food processed.

**iv. Scrubbing of hands**

Use of single use sterile gloves by all fish handling personnel is ideal to prevent contamination from workers. Whether the workers use gloves or not it is very essential that they scrub their hands with soap and clean water. The hands shall then be dried with a clean towel before the workers enter the food handling area with or with out gloves. This practice will make the hands of the workers safe.

**v. Sanitizing foot wear**

The bottom of the gum boot the workers wear in change room may cause some contamination. This is prevented by allowing the workers with gum boot or other factory provided foot wear to pass through a foot dip containing 100 ppm available chlorine, which will sanitise the bottom portion of the foot wear and prevent contamination of floor of the food handling area.

**vi. Hand sanitizing**

Once the workers enter the food handling area, they shall sanitize the hands before starting the work by dipping the full palm preferably from elbow down of both hands in 20 ppm chlorine water. This procedure will enable the removal of significant bacterial load from the palms of workers and they will be safe for food handling. The above steps will take care to prevent all sorts of contamination from workers.

## 5. Cleanliness of Direct/Indirect Food Contact Surfaces

Another factor responsible for contamination is the cleanliness of direct and indirect food contact surfaces. There shall be identification and listing of all food contact and non contact surfaces followed by a cleaning procedure and cleaning schedule. All these operations are popularly known as Standard Sanitation Operation Procedure (SSOP). The following are the main elements of SSOP. The available chlorine content recommended by CIFT for different types of sanitizing operations is detailed in table 2.

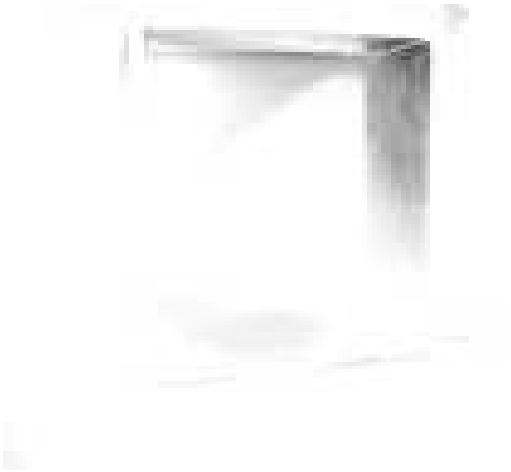
**a. Cleaning/maintenance of water source, storage & supply lines including prevention of cross contamination.**

Quality of water can be ensured by providing certain minimum treatment for raw water such as filtering through sand bed, chlorine dozing followed by filtration through activated carbon column. Water treated in this fashion shall be tested for conformity to appropriate standards for achieving safety of

**Table 2**
**Recommended levels of available chlorine for different sanitation purposes**

| Sl. No. | Purpose. | Recommended levels of available chlorine content. |
|---|---|---|
| 1. | Process water, glaze water and ice production.* | < 2 ppm for EU approved Plants and < 5 ppm for National Standard Plants. |
| 2. | Hand dip water. | < 20 ppm. |
| 3. | Foot dip water. | 100 – 200 ppm. |
| 4. | Water for sanitation of Utensils, processing table, processing machinery etc. | 100 ppm. |
| 5. | Water for sanitation of floor and wall. | 100-200 ppm. |
| 6. | Water for sanitation of drain. | 250-500 ppm. |

* In case of process water and water for ice production higher level of chlorine to the tune of 10-15ppm is recommended for water disinfection, provided the chlorine level shall be reduced to recommended residue level before water/ice is used for food processing.



*Clean flake ice and water another important factor for food safety.*

water. The supply lines and storage tanks of treated process water shall be cleaned as per the cleaning procedure for food contact surfaces once in a month.

**b. Surface finish, water resistance and cleanability of all direct & indirect food contact surfaces.**

All food contact surfaces shall be made of water resistant, smooth and washable material. This will ensure proper cleaning and prevention of dirt accumulation.

**c. Regular cleaning procedure & cleaning schedule.**

The direct and indirect contact surfaces shall be cleaned as per the cleaning procedure before and after each shift of production. The best cleaning procedure will be wetting with water, removing all solid wastes, application of a nonionic detergent by scrubbing with the help of a clean brush, washing with potable water, sanitizing with chlorine water containing 50 ppm chlorine for 30 minutes and finally washing with potable water. Cleaning of all contact and indirect contact surfaces will prevent bacterial build up and contamination of the food handled. Disinfection of water, contact surfaces, and hand sanitation can be also achieved by using appropriate levels of ozone or hydrogen peroxide, which will not leave any chemical residue and at the same time provide a better flavour for the treated water.

**d. Personal hygiene practice.**

The use of factory provided uniforms, scrubbing of hands, sanitizing of footwear, hand sanitizing etc as outlined under the provision for personal hygiene shall be followed to avoid contamination from workers.

**e. Regular cleaning and sanitizing of uniforms.**

Uniforms for all the workers such as the dress, head cover; face mask etc shall be washed and ironed on a single use basis. On no account dress used in one shift shall be used for another shift even if it is items like apron. All such used dress shall be washed and ironed before a second use. There shall be adequate facility in tune with the number of workers for hand scrubbing, sanitizing, uniform washing & ironing, utensil washing etc. in the plant.

**f. Protection of all contact surfaces from lubricants, Chemicals, sanitizers (other than chlorine) etc.**

The production personnel shall see that all the food contact surfaces are not contaminated with inedible materials like lubricants, detergents and other chemicals. This is very essential to ensure safety of the food handled in the plant, and the same is achieved by

i. Separate storage areas for food additives and sanitizers

ii. Approved procedure for use of chemicals and display of the same in areas of use.

iii. Use only food grade chemicals or chemicals approved by CIFT/ competent authority.

iv. Chemicals to be used only by trained and authorized personnel.

**f. Exclusion of poisonous and toxic chemicals in processing areas.**

In any food processing plant there shall not be storage or use of any type of toxic or poisonous chemicals in food handling areas even for pest control. For pest control in food handling areas the permitted procedure is fumigation with formaldehyde followed by defumigation with ammonia only when there is an unusual fly population and there shall not be fumigation schedule.

**g. Exclusion of infected workers.**

Daily the entire workers shall be monitored for any kind of disease or open wounds. The workers

shall also be taught to report to the management any such disease condition. Infected workers or workers with open wound shall be isolated from handling the material till they are cured of the problem.

**h. Adequate toilet facilities**

There shall be sufficient number of toilets and bath rooms in the factory commensurate with the number of workers. Standards say that there shall be one toilet for each fifteen workers. All such toilets must be made fly proof.

**i. Direction and procedure for movement of waste and edible materials.**

In all food processing plants the direction of movement of edible materials and waste generated shall be opposite to prevent cross contamination. Solid and liquid wastes are often neglected and are a cause for various kinds of pest and microbial build up and consequent contamination. Where ever possible the solid and liquid wastes must be collected separately for treatment and disposal. All waste water generated should be collected through proper pipe lines into the drain, with out any chance to spill on the floor as waste water on the floor will be a cause for microbial build up. All drain inlets and outlets shall be fitted with fly proof netting to prevent outflow of solid waste into the effluent treatment plant as well as preventing entry of pests into the processing facility. There shall be suitable receptacles for collection of solid wastes with a procedure for their periodic removal and disposal. To take care of sanitation and hygiene a package of practices have been developed by CIFT and the same was offered as training to thousands of fish handling people working onboard fishing vessels, in fishing harbours and fish processing plants.

## 6. Pest Control- Exclusion of Pests

Common pest like flies, cockroaches, lizards and rodents find their way into the food processing area, even though birds and pets are rarely seen. Often these pests introduce hazards and filth into the material handled in the plant. To overcome this there shall be effective pest control. All doors and chutes in the plant shall be fitted with self closing devices.

All externally opening doors / chutes are to be fitted with automatic air curtains. Fly proofing of all windows, ventilators, drain outlets or all holes more than half a square inch with fly proof netting. To take care of isolated flies and rodents there shall be electronic fly catchers and rodent traps located at strategic points. However the fly catchers must be positioned away from food handling points. In case of visible fly population, fumigation with H-CHO, followed by defumigation with ammonia can be adopted.

## 7. Risk/ Hazard Monitoring Facilities- Good Laboratory Practice

The raw material quality, the process monitoring as per HACCP, The GMP the SSOP, Personal hygiene etc depend heavily on monitoring certain physical, chemical or microbiological parameters. Consequently the success of all the above processes and procedures will depend on the facilities of the laboratory in the plant. In fact the laboratory shall have all test methods and testing equipments in tune with the following requirements.

**i. Use of approved methods / Standard Operating Procedures (SOPs).**

All the methods used by the lab shall be methods approved by national or international agencies like BIS, EU Norms, US FDA, US EP, Codex, AOAC, APHA etc. Under no circumstances unapproved procedures shall be used for monitoring any process/ quality parameter.

**ii. Use only calibrated instruments for measurements.**

In case of measurements like volume, weight, time, temperature, pressure etc the measuring instruments shall be subjected to periodic calibration with reference to national or international standards, before they are used for actual measurements. In case of weights and measures the Legal Metrology Dept and in case of other physical measurements calibration with reference to the standards whose accuracy can be traced back to the standards maintained at National Physical Laboratory, New Delhi or the international standards kept at Paris.

**iii. Use of CRM as standards.**

All labs will be using various chemical standards for estimation of several chemical parameters by different methods like titration, chromatography, spectrophotometry etc. All such standards shall be certified reference materials (CRM) or certified

analytical reagents. This will ensure accuracy and reproducibility of test results.

**v. Accreditation of labs by National / International agencies**

All labs attached to food processing plants must be accredited by qualified assessors appointed by agencies like National Accreditation Board for Laboratories or International Laboratory Accreditation Conference to ensure that these labs have necessary facilities in terms of equipments, chemicals including certified reference materials, qualified personnel etc and necessary methodology to perform stipulated tests so that the results generated by the lab is dependable as well as acceptable to the consumers.

**vi. Participation in proficiency testing programmes.**

Laboratories interested in generating dependable results shall undergo proficiency testing in appropriate testing fields under the guidance of nodal laboratories authorized by ILAC or NABL. The relevant testing fields for seafood testing laboratories are microbiology, biochemical, organoleptic and chemical residues. A list of authorized nodal laboratories including CIFT is available with NABL, New Delhi on request. Proficiency testing involves preparation of homogenized test samples and testing the same in the nodal lab to ensure homogeneity followed by testing the same samples in participating laboratories. The results obtained by the participating labs are compared with the results of the nodal lab to arrive at a rating for each of the participating labs, which will indicate the accuracy and authenticity of the analytical results generated by that lab. CIFT is a nodal laboratory identified by NABL and under supervision of CIFT several laboratories including EIA laboratories and MPEDA laboratories had undergone proficiency testing.

**vii. Inter Laboratory Calibration (ILC).**

This is again a procedure for checking the accuracy and capability of a testing laboratory in comparison with the results of a reputed laboratory. For purpose of ILC the European Union and Export Inspection Council of India has identified CIFT as a competent lab for testing antibacterial substances, antibiotics, total volatile basic nitrogen, lead, cadmium, mercury and microbiological parameters. The results generated by different Export Inspection Agencies in India are thus periodically compared to identify deviations and inaccuracies in test procedures. Any lapses detected will be rectified then and there to make the test results accurate and acceptable to both exporters and importers.

**viii. Record Keeping.**

The lab shall keep all the records relating to production and quality assurance as per HACCP, SSOP, GMP etc and these records shall be available for review and audit for at least three years. Generally the records insisted are those outlined in HACCP plan form (CCP monitoring records, corrective action records and calibration records.), Hygiene and sanitation monitoring records, GMP records, ETP (Effluent Treatment Plant) records, raw material and finished product testing records. All these records shall be supported with appropriate procedures and schedule for ensuring as well as to counter check their adequacy.

GLP is relatively new area and CIFT has implemented several programmes for achieving good laboratory practices. Conducting proficiency testing, interlaboratory calibration etc. for testing laboratories and laboratories attached to factories are being done periodically. CIFT is also giving the much needed assistance for equipping the labs for accreditation from agencies like NABL, BIS etc. To meet the requirements of sophisticated and expert analysis of various parameters CIFT also has set up facilities for calibrating weights and measures and temperature monitoring equipments along with several instrumentation facilities for chemical residue monitoring. The industries are using all these supports periodically to make the data generated by their laboratories accurate and dependable. All these facilities are operated and maintained by standard operating procedures by qualified and well trained personnel.

## 8. Qualified and Certified Personnel- Good Personnel Policy

All major events in a food manufacture like sanitation, hygiene, processing and quality checks heavily rely on modern methods in science and technology. However all the production and quality checks are performed by specific personnel, whose knowledge and skill will ultimately decide the safety of the product. So the personnel required for all

**Table 3**
**Training programmes imparted by CIFT since 1997.**

| Sl. No. | Topic | Duration No. of working days | No. of candidates admitted | |
|---|---|---|---|---|
| | | | Per batch | Total trained |
| 1. | "Seafood Quality Assurance". | 12. | 15. | 610. |
| 2. | "HACCP Concepts". | 5. | 15. | 445. |
| 3. | "HACCP Audit"(in collaboration with CII** & BIS***). | 1. | 60-100. | 400. |
| 4. | HACCP Audit. | 3. | 20. | 20. |
| 5. | HACCP for Hatchery & Farm personnel.@. | 4. | 25. | 25. |
| 6. | ISO 22000 FSMS Audit. | 4. | 20. | 20. |
| 7. | "Evaluation of Biological Hazards" (for Govt. officials). | 6. | 15. | 200. |
| 8. | "Evaluation of Chemical and Physical Hazards" (for Govt. officials). | 6. | 8. | 124. |
| 9. | "Microbial quality of food. " | 6. | 5-10. | 170. |
| 10. | "Mineral water and potability analysis." | 12. | 10. | 65. |
| 11. | "Hygiene and Sanitation" for factory workers and fishermen | 1. | 50. | 500. |
| 12. | "Chemical Residue Analysis" | 12 | 5 | 25 |

**Confederation of Indian Industry. *** Bureau of Indian Standards. @In collaboration with CIBA (ICAR), Chennai.

these activities shall be suitably qualified and certified for the job assigned to them. Any lacuna in this respect will amount to compromising on safety of the products.

In fact there shall be qualified & certified personnel to monitor processing and quality checks in every production shifts with a stand by person to take over during unexpected personal emergencies. Products of a plant with such qualified, certified and alert personnel will never be a source of health hazards. This can be ensured by a good personnel policy consisting of recruitment of suitably qualified personnel in sufficient number, providing them periodic training necessary to upgrade and update their skill to meet growing demands in production, quality and marketing. The employees shall also be given a good service condition to keep them alert, active and responsible.

Realizing all the above needs CIFT has designed several training programmes in all aspects of seafood industry such as Seafood Processing, Value Addition, Seafood Quality Assurance, HACCP Concepts, HACCP Audit, Hygiene and Sanitation, SSOP & GMP, Fundamentals of Microbiology etc. The syllabi of each of these training modules are suitably designed and periodically updated to meet the dynamic requirements of growing seafood markets. The details of such training programmes are indicated in table 3. Besides, CIFT is also conducting academic programmes like M.F.Sc, and PhD in fish processing technology to provide the much needed technocrats for manning the country's fisheries.

Thus there are streamlined procedures for HACCP, GMP, GHP, SSOP, GLP and Good Personnel Policy, for any food processing plant to achieve Total Quality Management thereby safety and quality of the products. With the support of CIFT and Govt. agencies like IFP, EIA and MPEDA, the Indian Seafood Industry is on equal footing or better than any other similar industry in the developed countries. l

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# Importance of Human Resource Development for the Fishing Industry

G.H. Manikfan*

India is only second to China in the case of human population in the world. We have immense human resource potential in the country if we analyse the population statistics of other countries. Comparing to European countries we have more young human resource which can be developed and trained for the specialised task. Outsourcing the resource at cheaper rate is the modern approach of the developed countries that do not have enough human resources for specific works. In India, we have witnessed giant growth in IT sector because of the outsourcing tendencies adopted by the developed countries. Induction of trained/ skilled manpower in IT field has been done more than any other sector in the country. There are other fields where trained manpower is required for manning and the operations of the sophisticated equipments and machineries to optimize the returns. Technically competent human resource has been proved the vital factor in any field.

**The requirement of trained manpower for the fishing industry will increase in the coming years...**

In ancient times, people were jack of all trades doing every work. There was no specialist for a particular work in any field. Every human being was supposed to learn and do all the works required in normal life. When time changed and new inventions taken place in the world the concept of everybody becoming the master of all trades was changed. Specialization of subjects in all fields has started with the sophistication of machineries and equipments. The fishing industry was not an exemption as the field is with very special features and witnessed many changes after the IInd World War.

**Director, Central Institute of Fisheries Nautical and Engineering Training (CIFNET) Cochin.*

It is easy to recruit and train an individual with qualification and aptitude for a job at shore. But there is a difference in the attitude of the individual towards a job out at sea. Developing the manpower for fishing industry is done to meet the requirement of two branches. First is the human resource requirement for maintaining infrastructure facilities and management of activities at shore, second is the manpower required for manning the fishing vessels, which is comparatively a difficult field of work. Human resource developments for catering to the requirement of fishing vessels have a number of problems such as,

(i) Availability of willing and suitable personnel

(ii) Imparting proper training in different subjects

(iii) Adequate training in practical field

(iv) Creating a friendly attitude towards the sea life

(v) Creating a mental state to face the hazards in sea life

(vi) Inculcating discipline in the individuals

Organized training in fisheries sector in India was started in 1945 with two all India training programmes, one on marine fisheries at Mandapam Camp in Tamilnadu State and another one on Inland fisheries at Barakpur in West Bengal. But, no training centre was established for developing the manpower for manning the fishing vessels and the operation of the craft. Later realizing the requirement, the Government established a chain of fishermen training centers in all maritime States

**Main Courses offered in CIFNET in the past and present**

| | | |
|---|---|---|
| (i) | BFSc. (Nautical Science) | Four year degree course |
| (ii) | Vessel Navigator Course | 24 months trade course |
| (iii) | Marine Fitter Course | 24 months trade course |
| (iv) | Shore Mechanic Course | 12 months duration |
| (v) | Teachers Training Course | 6 months duration |
| (vi) | Advanced Diploma in Fishing Gear Technology Course | 12 months duration |
| (vii) | Elementary Fishing Technology Course | 2 months duration |
| (viii) | Advanced Fishing Technology Course | 2 weeks duration |
| (ix) | Fishing Technology for Coast Guard Officers | One week duration |
| (x) | Special Training Course for National & Overseas candidates | (Tailor made) |
| (xi) | Mate Fishing Vessel course | 18 months duration (Discontinued) |
| (xii) | Engine Driver Fishing Vessel Course | 18 months duration (Discontinued) |
| (xiii) | Boat Building Foreman Course | 12 months duration (Discontinued) |
| (xiv) | Gear Technician Course | 12 months duration (Discontinued) |
| (xv) | Radio Telephone Operator Course | 12 months duration (Discontinued) |

which trained a number of fishermen. But these centres developed human resource for meeting the need of small crafts.

After independence, the fishing sector was also given importance in the Five Year Plans of the country. Indian fisheries was given importance by increasing outlay in the successive Five Year Plans. In the meantime, the Merchant Shipping Act had also stipulated statutory requirement of competent certified hands for manning large ocean going fishing vessels. The Government realizing the need for developing fisheries sector and fishing industry and also considering the requirement of trained manpower constituted a Committee in 1957 on 'Fisheries Education' for assessing the manpower requirement and to suggest measures for providing trained manpower for developing the activities in fisheries sector. The Committee conducted detailed studies on the requirements of the fisheries sector and submitted its report to the Government of India.

Based on the recommendations of the Committee, Central Institute of Fisheries Education (CIFE) at Versova, Mumbai was established in 1961 for developing fisheries Managers and Executives and Central Institute of Fisheries Operatives (CIFO) at Cochin in 1963 for developing trained manpower for manning the ocean going fishing vessels and establishments of fishing industry. CIFO which was renamed as Central Institute of Fisheries Nautical and Engineering Training (CIFNET) is the only National Institute of its kind in South-East Asia to train and develop technical manpower to meet the requirements of Skippers and Engineers for the ocean going fishing vessels and also manpower to operate the shore installations.

The above courses offered by CIFNET are practical oriented and tailor made to suit the requirement of the fishing industry. Majority of the courses have practical training on board fishing vessel, marine workshop and craft and gear workshop. Fisheries industry being a specialized field the manpower trained for the sector shall be familiar with the equipments and environment. Hazardous nature of work, unfriendly weather conditions at sea and isolated life make great difference for a person employed in a vessel from the life of shore based employees. The person for sea life must be trained physically and mentally to withstand the conditions on board a vessel and in the sea. CIFNET was imparting specialized training to develop the manpower for manning the ocean going fishing vessels for more than four decades. During the period more than 4000 candidates have been trained to take up their career on board the ocean going fishing vessels. Majority of the candidates have acquired competency certificate as Skipper (Fishing Vessel) and Engineer (Fishing Vessel) and are employed as Skippers and Chief Engineers in the large ocean going fishing vessels in India and abroad. Some of the alumini of CIFNET are employed as foreign going Masters and Mates in Merchant ships after acquiring the competency certificates in the field.

CIFNET has trained officers from other Departments, Universities and sister organizations on the subjects related to fisheries and marine engineering. Training programmes have been conducted for fishermen even in the fishing villages on various subjects in fisheries sector. More than 4,500 persons have been trained from the Departments and fishermen community under training programmes designed for Departmental employees and fishermen.

Short term courses for the students from professional colleges and for students of MSc and BFSc are also conducted to impart practical training which is not provided in their colleges. About 3,000 students have undergone the short term courses conducted by this Institute during the recent years. Many colleges conducting the professional graduate and post graduate degrees do not possess the adequate facilities for providing exposure to these students with relevant machinery and equipment.

During 70's graduate and post graduate degree courses in fisheries have been started in India. Later, these degree courses were introduced by different Universities, colleges and ICAR institutions all over the country. But the students who have completed

these courses could not get adequate exposure to the practical part of the field. Most of the candidates were trained to take up shore based career as Middle Level Managers, Scientists, Technologists, etc. They are not the category of the people required for manning the vessels of fishing industry or suitable for sea based career. The fishing industry cannot thrive depending only on inland or culture fisheries and shore based manpower. Marine and inland resources and manpower for shore and vessels are equally important for the industry for future development and expansion. Properly trained human resource is the backbone of the fishing industry for sustainable development and exploitation of the resources. The Institutes offering the courses on fisheries should include enough practical training and other elements required to develop manpower to strengthen the fishing industry.

The requirement of trained manpower for the fishing industry will increase in the coming years. Now the industry has started to explore the possibilities of exploiting the resources which are underexploited or unexploited. Conversion of existing vessels to suit the requirement and acquiring vessels on charter and lease are also explored for the exploitation of resources in our waters. The training Institutions in the country should be in a position to accept the demand of the fishing industry for the trained human resource. Training facilities, infrastructure and quality of the training have to be improved to meet the challenge of the hour. Therefore, it is the responsibility of the Institutions to supply properly trained and suitable manpower to fishing industry for the sustainable development.

1

I'm happy to come I.F.P to see it covers a narrow field in Fishary. And also glad to know that I.F.P has a good activity in operating vessels. I hope 2 Fishing vessels which goverment of Japan has funded will be utilized effectively so that it will make a great contribution to the development of Indian Fisheries.

KATSUTOSHI HAMA
(Embassy of Japan)

23rd June, 1986

Katsutoshi Hama
Embassy of Japan
India

# IFP: Upgrading and Updating with Changing Needs and Time

S. Girija*

**IFP, or any organisation for that matter has to readjust itself to the changing needs of changing times. We are quite aware, however, that we will be adjudged based on how far we could foresee changes to which we should redefine ourselves.**

**Indo-Norwegian Project,** the forerunner of the **Integrated Fisheries Project** was established in the year 1952 at Quilon as the offspring of a tripartite agreement among India, Norway and the UNDP and in 1963 the Headquarters of the Project along with the Norwegian Experts was shifted to Cochin. The subsequent years witnessed the setting up of similar units of the Project at Kannur in Kerala, Karwar in Karnataka and Mandapam in Tamilnadu which taking the cue from the flagship Project continued their activities till 1972, when these units were handed over to the respective state governments.

The administration of the Project at Cochin was taken over by the Government of India renaming it as Integrated Fisheries Project and it continued the programmes as a Central Government scheme under the Ministry of Agriculture. The Government of India, after realizing the positive impact of the activities of the Project on the development of Indian fisheries and its enduring need for the developmental activities in the various realms of the fishing industry, declared Integrated Fisheries Project as a permanent organization with effect from 26-12-1974. Thereafter the programmes and policies of the Project were framed and implemented under the various Five Year Plans.

### 2.0 Milestones in Achievements

The Project played spearheading role in the all round development of the fishery economy of India, particularly of South India in the following fields. Only outstanding milestones are pointed out for brevity's sake.

**Director i/c, Integrated Fisheries Project, Kochi.*

(i) Introduction of mechanized boats.

(ii) Diversified fishing gear for exploiting different fish resources.

(iii) Introduction of deep sea fishing like long lining, purse-seining, deep-sea lobster trawling, gill netting etc.

(iv) Surveyed and located fishing grounds in southwest coasts of India with deep-sea research vessels of the Project.

(v) Developed diversified value added marine products and processes.

(vi) Standardisation of aluminium can packings indigenous as well as imported.

(vii) Popularised the diversified fishery products in rural and urban markets in different parts of the country and created an awareness among processors and consumers.

(viii) Achievement of ISO 9002 certification for Liferaft Servicing Station.

(ix) Provided consultancy services in erection and commissioning of tunnel freezers and cold storages for Lakshadweep Development Corporation Ltd.

(x) Provided consultancy services in processing of fin fish such as filleting, production of steaks, development of IQF fin fish products and fin fish drying was undertaken by the Project for exporters as a promotional measure.

(xi) Led the Antarctic expedition in the polar vessel **Sagar Sampada** for the exploration of the krill resources. About 2 tons of Antarctic krill were brought to IFP and subjected to various product development research studies.

(xii) Conducted training programmes on harvest technology, repairs and maintenance of fishing gears, On the job training on fishing gear fabrication, repairs & maintenance, On the job training for under graduates from various universities on different dimensions of post harvest technology. Also imparted In-plant training on refrigeration, marine engineering and acoustics.

### 3.0 Attuning to Changing Needs

The aforesaid achievements in the national service not withstanding, the need for revalidating the Project's mission and mandate tailoring to suit to the needs of the changing times can hardly be over emphasized. Accordingly in pursuance, the Ministry of Agriculture through appropriate administrative measures has remodelled the Project's mandate and mission.

Technology and skill upgradation is a continuous process in the post harvest sector of fisheries and there is an ever growing need for these with orientation towards a large scale demonstration. Sea food industry is predominantly comprised of small scale units which can not afford international grade R&D for:

(i) Technology upgradation.

(ii) Product diversification.

(iii) Process diversification.

(iv) Market surveys and consumer response studies.

(v) HRD and appropriate dissemination of all the above.

Keeping an ear to the ground, IFP has been performing the above for and on behalf of the domestic as well as export industry through adaptive research and hence can claim a substantial credit for the export promotion and direct involvement in domestic market promotion. This needs to continue and hence in pursuance of Government policy decision, IFP has been reoriented with new mandate and mission to focus on the changed techno socio economic situation of the fisheries post harvest sector.

### 4.0 The current objectives

1. Value added product development by way of process and product diversification from all varieties of fish including low value,

unconventional species and seasonally abundant fishes.

2. Technology development and transfer to beneficiaries consisting of rural fishermen community, small scale industries and Export Processing Houses through consultancy and job work.
3. Imparting training in the field of post harvest technology, refrigeration technology, Quality control and value added products.
4. Providing consultancies and training for rural development programmes / women empowerment programmes in fish processing, supporting local fish farmers, self help groups of fisher community, fishermen's cooperative societies functioning under Panchayath Raj Institution.
5. Popularisation and test marketing of value added products of all fish varieties including low value, unconventional species and seasonally abundant fishes.
6. Extension of the activity of popularization and test marketing of value added products to new areas and develop markets in all states in a phased manner with added attention to rural areas and enthusing entrepreneurs to enter into sea food processing industry.

Fishery Section and Gear Section of IFP were transferred to CIFNET and Marine Engineering Section, Slipway, departmental canteen to Fishery Survey of India during May 2005.

*The following divisions were retained with IFP.*

1. Processing & Marketing Division.
2. Refrigeration Section.
3. Training Section and
4. Civil Engineering Section.

## 5.0 Landscaped to the Future Fishery Economy

The Project has been functionally and technologically upgraded and revamped to take up head on the new challenges and opportunities in the fisheries sector. Post harvest technology upgradation for achieving value addition to suit the ever increasing and fast changing consumer needs is the key function of the Project now. Appropriate dissemination of the upgraded technology is achieved through consultancy, training, popularisation of products and consumer response surveys.

IFP is conducting adaptive research in the utilization of new and unconventional varieties of fish. New processes, products and packagings are developed on a pilot scale and popularized by inducting the same into the ramifying net work of IFP's marketing channels. To support the above, our processing facilities have been refurbished with state of the art equipments, processes and infrastructure.

### 5.1. Facilities

**5.1.1 Fish Processing Complex** with most modern fish processing & freezing plant canning plant, drying plant, tunnel freezer, plate freezers, chill rooms, flake ice plant and 3 cold storages.

**5.1.2 Quality Assurance Laboratory** with facilities for microbiological and biochemical quality assessment of frozen, dried, canned and value added products.

**5.1.3 Marketing wing** effects the procurement of raw materials from department vessels of sister organizations and the fishermen co-op. societies for marketing of products through retail outlets and Mobile units in rural areas and through a network of dealers in all metropolis. The Section also conducts consumer response surveys and creates market on test & trial basis for the novel products introduced by the Project from time to time.

**5.1.4 Training Section** with well-qualified & experienced faculty members, audio visual equipped class rooms and a well stocked library to cater to the training needs in Post Harvest Technology and related subjects.

*Rennovated processing complex*

**5.1.5 Refrigeration Section** with Cold storages, freezing plants & ice plant to support processing & marketing activities.

**5.1.6 Civil Section** for maintenance of the entire infrastructure and water front and for consultancy works in fisheries infrastructure.

**5.1.7 A regional base at Vizag** with freezing plant complex with tunnel freezer, cold rooms, plate freezers, machineries & equipments for processing and class rooms for conducting training.

### 5.3. Activities

**5.3.1 Product development**:

Quite a few ready to serve, ready to cook, heat & eat products have been developed and popularized by IFP including new generation products such as Retortable pouch packed fish. A few are enlisted in the following:

***Canned Products***

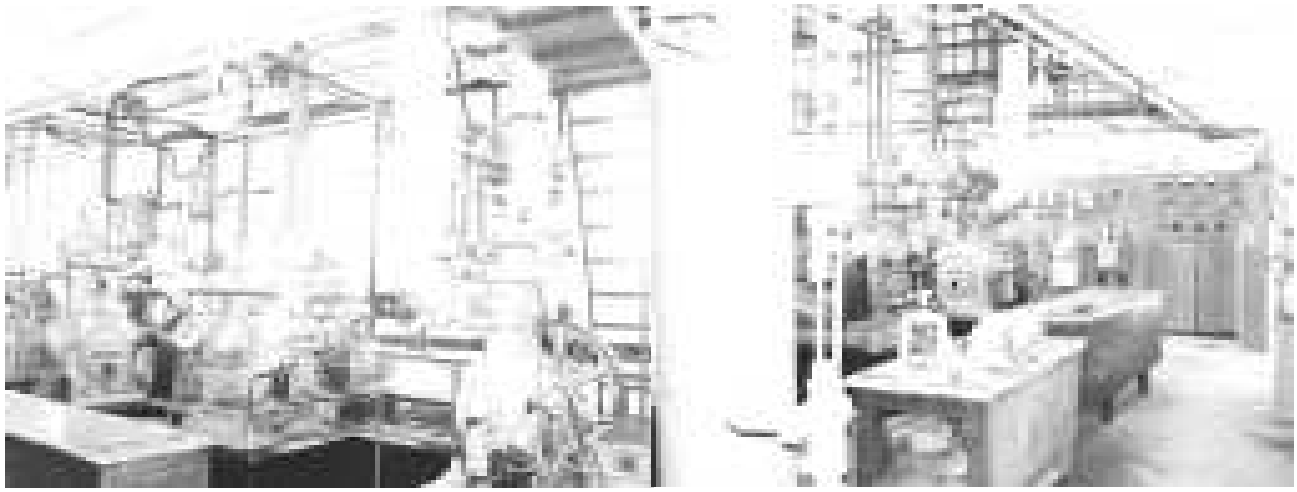
Canned Tuna Fillets in Oil
Canned Tuna Flakes in Oil
Canned Mackerel Fillets in Oil
Canned Sardine Spread
Canned Mussels
Canned Sardine in Oil
Canned Sardines in Tomato Sauce

***Frozen Products***

Blocked Fish
Individual Quick Frozen Products
Fish Steaks
Fillets, Fish kheema
Dressed fish

*Laboratory*

*Mobile Marketing*



*Refrigeration plant*

***Battered and Breaded Products***

Fish Cutlet
Fish Burger
Fish Fingers
Squid Rings
Frozen Breaded IQF Prawns
Frozen Breaded IQF Fish Fillets

***Dried and smoked Products***

Smoked Salmon
Dried squid wafer
Dried glass perch
Dried ray slice
Dried ribbonfish
Dried Sharkfin
Dried Lizard fish
Dried Anchovella

***Retortable Pouch Packed Products***

Instant Tuna Curry
Instant Mackerel Curry
Instant Sardine Curry

***Other value added Products***

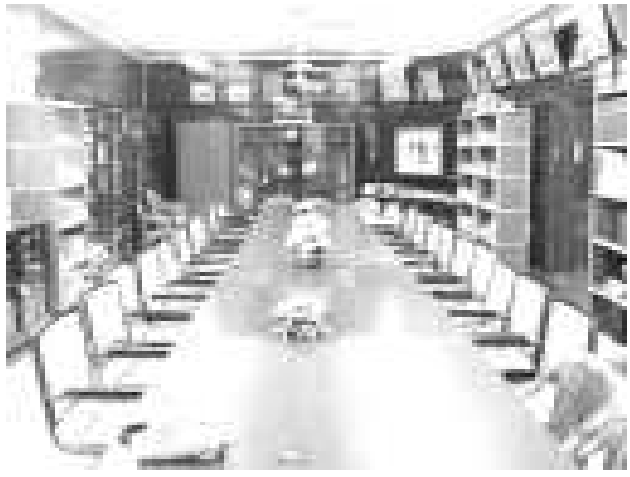
Fish Fritters
Fish Powder
Fish Pickle
Mussel Pickle
Fish Soups
Prawn Pickle
Clam Pickle
Fish Cakes

***Products developed from Antarctic Krill***

Krill Cutlet Frozen
Krill Burger Frozen
Krill Sauce Frozen
Krill Balls Frozen
Krill Pickle Frozen
Canned Krill Ball in Tomato Sauce

### 5.3.2 Market research and sensitizing through test marketing

Popularisation and test marketing of value added products of all fish varieties including low value, unconventional species and seasonally abundant fishes is one of the missions for the Marketing Section after reorganization of IFP. To achieve the same, schemes have been formulated for extending the reach of Project's marketing efforts commensurate with the augmented production process to reach larger segments of consumers.



*Library*

*Hands-on training session*

*Class Room session*

The Project's marketing network consists of stalls, mobile units plying in high ranges & rural areas and also dealership all over India especially metros like Goa, Calcutta, Mumbai, Chennai, Bangalore, Delhi and pockets in North Western States.

Surveys have been carried out across the coastal belts & cities, test & trial marketings have been carried out and necessary advices have been given to the fishermen & fishermen Co-op. societies as regards marketing of their produce as and when required.

### 5.3.3 Training Programmes:

Fisheries sector has gained wider acclaim in recent years. Therefore, for the efficient management of this multifaceted sector, it has become necessary to deploy true fisheries professionals in achieving the deemed goals. The training programmes at IFP are sectoral specific and also subject specific in different disciplines of the post harvest technology and refrigeration technology. The training programmes are designed in such a way that it provides intensive hands on experience (On Job Training) on a commercial scale to the students who are pursuing specialized education in Fisheries, Bio-technology, Food Science, Food Engineering and professionals working in the fisheries sector. The training programmes at IFP will equip the candidates with an insight into the subject and also help them to gain sufficient proficiency in the same. So far umpteen number of students from various disciplines at Graduate, Postgraduate, Research Scholars and Engineering Graduates (Food technology) from all over the country and even candidates from abroad have been trained in this Institution in the above disciplines.

*IFP runs two regular training programmes:*

***Processing Technician training programme*** for a duration of three months to the candidates sponsored by industry with an objective to educate Processing Supervisors from the industry on the diversified methods of fish processing. The course includes theoretical and practical modules of post harvest technology, written exercises, tests and local tours.

***Refrigeration Technician's training programme*** for a duration of six months to the candidates. Refrigeration engineering theory and on the job training in electrical works connected with refrigeration, basic Physics, Chemistry, Welding, Psychrometry, Thermodynamics and practical sessions on repairs and maintenance.

Various Short term miscellaneous programmes are offered by IFP:-

***On Job Training programmes for students***: IFP conducts 'OJT' to students at graduate and postgraduate levels. Students from 20 different colleges are the regular beneficiaries of IFP's OJT programmes 3,042 no. of candidates have been trained during last five years.

Details of beneficiaries are given below:

**Kerala**

St. Xaviers College, Vaikom
Govt. College, Kottayam
MES Asmabi College, Kodungaloor.
MES College, Ponnani
Assumption College, Changanassery
St. Aloysious College, Edathua,
School of Health Science, University of Calicut
School of Applied Life Science, MG University
S.B College, Changanassery,
NSS Hindu College, Changanassery
S.N. College, Kollam
BCM College, Kottayam

**West Bengal**

APC College, Kolkata
B.K.C.College, Kolkata

**Uttaranchal**

Fisheries College, G.B.Pant, University

**Bihar**

RDS College, Muzaffarpur
M.L.S.M. College, Darbanga
Jawaharlal Nehru College, Dheri-on-sone
S.K. Mahila College, Begusari.
Munshi Singh College, Motihari
SNS College, Motihari
Ganga Singh College, Chapra

**Madhya Pradesh**

Barkuttullah University, Bhopal

**Orissa**

Government Polytechnic, Berhampur

**Andhra Pradesh**

Andhra University, Visakhapatnam

**Tamilnadu**

Udaya School of Engineering Kanyakumari
Andal Alagar College of Engineering
P. Bharatidasan College of Engg. Trichy
Hindustan college of Arts & Science, Coimbatore
Tamilnadu Agriculture University, Coimbatore
Karpagam Arts&Science College, Coimbatore
RVS College, Coimbatore

Central Marine Fisheries Research Institute (CMFRI) Govt. of India

Regional Research Laboratory,CSIR Thiruvananthapuram Govt. of India

Central Institute of Fisheries Technology (CIFT) Govt. of India

National Fisheries Development Board (NFDB) Govt. of India

Fisheries Department Govt. of Kerala

Marine Products Export Development Authority (MPEDA) Govt. of India

Matsyafed Kerala

Fisheries Department Govt. of Orissa

Fisheries Department Tsunami Emergency Assistance Programme (TEAP) Govt. of Kerala

Fisheries Department Kolleru Restoration Programme Govt. of Andra Pradesh

Society for Assistance to fisherwomen (SAF) Govt. of Kerala

Cochin University of Science & Technology (CUSAT) Kerala

Brackishwater Fish Farmers Development Agency (BFFDA) Govt. of Kerala

Agency for Development of Aquaculture, Kerala (ADAK) Govt. of Kerala

# OUR FORMER DIRECTORS

# Publications brought out by IFP since inception for the benefit of the fishing industry

| S.No. | Bulletin Nos. | Subject |
|---|---|---|
| 1 | IFP Bulletin No. 1 (1977) | A study on capacity utilization of the Integrated Fisheries Project |
| 2 | IFP Bulletin No. 2 (1978) | Diversified Fishing |
| 3 | IFP Bulletin No. 3 (1980) | Purse-seining – Development in Indian Water |
| 4 | IFP Bulletin No. 4 (1980) | Result of the Exploratory Fishing in Quilon bank and gulf of Mannar |
| 5 | IFP Bulletin No. 5 (1980) | Repair and Maintenance of Fishing Gear |
| 6 | IFP Bulletin No. 6 (1984) | Hand book on Fish Handling |
| 7 | IFP Bulletin No. 7 (1984) | Design and Rigging 500 meshes of Bottom trawls |
| 8 | IFP Bulletin No. 8 (1984) | Design and Rigging of Bottom trawls |
| 9 | IFP Bulletin No. 9 (1984) | Design and Rigging of Mid water trawls |
| 10 | IFP Bulletin No. 10 (1985) | Design and Rigging of Shrimp trawls |
| 11 | IFP Bulletin No. 11 (1985) | Deep Sea Resources of South-West Coast |
| 12 | IFP Bulletin No. 12 (1989) | A critical study on the exploitation of Fishing Resources by the Integrated Fisheries Project |
| 13 | IFP Bulletin No. 13 (1997) | Product development from Antarctic Krill |
| 14 | IFP Bulletin No. 14 (1997) | Results of the Exploration of Unexploited and other Exploitable Marine Resources of the West Coast of India by M.F.V.Sagarika and M.F.V.Samudrika |
| 15. | 'Tharang' -2004 | Hindi House Magazine |
| 16. | 'Tharang' -2006 | Hindi House Magazine |

Other need based training programmes offered are Canning of sea foods, Product development from fresh water fish, Fish filleting and freezing, HACCP concepts, Refrigeration technology, Training on freezing plant and cold storage service & maintenance.

***Apprenticeship to Vocational Higher Secondary Education completed students***: IFP offers one year apprenticeship to students who have completed VHSE in fish processing. So far 117 candidates have passed out from IFP.

**Rural development programme**: The project has launched skill upgradation programme in value added product processing for fisherwomen. Extensive training programmes are provided to Self Help Groups from fishermen community aiming at the dissemination of rural appropriate technology developed by the Project in seafood processing.

**Processing and marketing of Green Mussel produce farmed by fishermen societies** : IFP has enthused the fishermen societies for collective efforts of harvesting and making available large quantities of green mussel for pre-processing. The material harvested from different localities were brought to one destination and depuration & shucking were carried out at a single point under the supervision of the technical staff from IFP. The produce was subjected to product development and test marketing.

**Processing & marketing of fresh water fishes**: IFP has experience in product development and its standardisation of fresh water fishes while working in association with the Kerala Fisheries Department's Peoples campaign for fresh water fish culture. In addition, Department of Fisheries, West Godavari district, Government of Andhra Pradesh has identified 200 Nos. of Intermediate (+2) studied and above qualified entrepreneurs as Master Trainers to be intensively trained by IFP on Post harvest technology and value added products from fresh water fish. The Master trainers in turn will transfer the technology to thousands of Kolleru lake inhabitants under Kolleru rehabilitation programme.

### 5.4 Recent R&D Efforts:

***5.4.1 NATP***: IFP was identified as the nodal agency for the commercial production, test marketing and consumer response research of value added products from low-priced fish in major cities and small towns under the World Bank funded National Agriculture Technology Project (NATP). The Project disseminated all the successful works carried out by it to the fishing industry by way of workshops, publication of booklets and by imparting Training and extending consultancy to the Industry, etc.

***5.4.2 Introduction of products in TFS (Tin Free Steel) Cans***: Processing section has introduced a new generation container for packing tuna fish in Tin Free Steel (TFS) cans during January 2004. These cans are made indigenously and are with easy open lids. There is a price advantage of almost 100% over that of the imported cans and hence a substantial saving in foreign exchange by way of import substitution.

"**Light meat tuna in oil**" and "**Diet Tuna in water**" were introduced in TFS Cans. Diet tuna with no added oil is a totally novel concept in India to provide low calorie canned food at a reasonable price, and it is well accepted in the market as a healthy food as it contains natural omega 3 and no added oil. Both these cans are introduced in the market. So far IFP has produced more than 1,00,000 cans and marketed in all major metros in India. The feedback received from the dealers shows that IFP's Sagar brand canned products have replaced many reputed international brands in supermarkets/ hypermarkets especially after the introduction of tuna products in TFS cans.

***5.4.3 Instant fish curry in retortable flexible packages***: IFP has developed fish curry products in retortable pouches as early as in 1994 with the collaboration of Defence Food Research Laboratory (DFRL), Mysore. DFRL used to produce meat and vegetable curry products for supply to Defence forces. But the fish curry in retortable pouches is a totally new concept conceived by IFP and the Project had standardized

the product after conducting extensive heat penetration studies of different products with different media using modern electronic gadgets like Ellab's (Denmark) F0 Value monitor.

**5.4.4 Consultancy** is continuously provided in processing of fin fish to the industry especially in Retortable pouch packed products. Consultancy is also extended by experts of the Project in setting up of canning plant, processing plants, cold rooms, freezers and ice plants. User agencies being LDCL, A&N Administration, private industrialists and fishermen societies.

### 5.5 Specialized programmes:

**Post tsunami relief and rehabilitation measures**: Under this programme, IFP has extended its hand to the Tsunami affected States of Kerala, Andhra Pradesh and Andaman & Nicobar islands for providing training and consultancy services in post harvest seafood technology & quality control, establishment of cold storages & chains under the livelihood security component. Whereas Government of Kerala is utilizing the technology and services of IFP in the following:-

***5.5.1 Training of Master Resource Persons***: Through this programme, it is intended to produce a group of trained personnel who can in turn train more beneficiaries along the coastal area to produce fishery products through hygienic and low cost techniques. This programme is being implemented with the help of IFP along the tsunami affected coastal districts. The Master Resource Persons are being trained in IFP for one month in hygienic fish processing and quality control using rural appropriate technologies so that technically trained manpower rendered available will add momentum to the healthy growth of our fishery economy. By using these trained MRPs, training can be imparted at secondary levels to hundreds of fishermen and women. An array of good quality products and services will be rendered available to the society in general and a livelihood means ensured to fisherwomen.

***5.5.2 Sea Food Kitchen***: Creation of job opportunities and expansion of economic activities are considered important development strategies in tackling social and economic trauma like Post Tsunami crisis. 20 Sea Food Kitchens were proposed to be established at strategic locations of tsunami affected districts by the individual groups (funded by Government departments), with technical and technological support of IFP. Each Unit will provide employment to 10 people directly and number of people indirectly. Only ready to serve/cook products like Cutlets, fish curry, rice, tapioca, kababs, fish balls, breaded & battered anchovies, white sardine and other sea food snack items like coated prawns, coated fillets, coated mussels, etc. are made in these Units on a daily basis. These enterprises can perform essential functions like creating quality job opportunities and additional income, providing quality goods and services and contribute significantly to the local economies.

### 6.0 Inter Institutional interface

For the common cause and mission of fisheries development, we have consolidated the synergies of all related institutions for every given task through appropriate inter institutional linkages. For example in the instance of gender development of the fishermen community, IFP had mutually beneficial interactions with Womens' Development Corporation, Social Welfare Department and local self governments (Panchayathi Raj institutions) fisheries departments of States like Kerala, Andhra Pradesh, Tamilnadu and Orissa.

### 7.0 Future Prospects And Potential:

The post harvest scenario including catering to the domestic and overseas markets offers quite a few opportunities and vistas to explore and exploit which undoubtedly pose quite as many attendant challenges and demands. IFP is looking forward to utilizing these opportunities and taking head on these challenges.

7.1 IFP will continue its key function of post harvest technology upgradation and its appropriate dissemination by way of large scale production and marketing of various value added products from

all varieties of captured and cultured fishes with accent on non-conventional resources and new generation products.

**7.2 HRD efforts**: As the national fishery economy grows, there will be a heavy demand for qualified fishery professionals. IFP will continue to offer several need based on job training programmes for all the students of the fisheries education system and build up a competent cadre. Also training of industry sponsored candidates will be taken up.

### 7.3 Consultancy

IFP will also cater to the needs of the industry through consultancy, demonstration processings and consumer response surveys.

### 7.4 Rural development programmes

In order to empower the rural populace in coping with the developing national economy, IFP proposes to transfer rural appropriate technology to the needy section with special accent on women empowerment. The technologies so transferred will be locally relevant, easily assimilable and economically viable so that transcribing of the same will be easy for the beneficiaries.

## 8.0 Conclusion

IFP will provide an ideal post harvest technology upgradation and dissemination facility, which can be easily replicated in all fishing States.

IFP's services can be extended to all fishing States by opening Project's Regional Processing, Training & Extension Centres at minimum possible costs at locations where large quantities of fish are landed.

This will not only benefit the fish processing industry of the country but also indirectly benefit the primary producers (fishermen) by returning a better share of benefit.

State Government's Fisheries Departments will also be exposed to new vistas of fish handling and processes as well as value addition and thus help in their endeavours of regional development.

IFP, or any organisation for that matter has to readjust itself to the changing needs of changing times. We are quite aware, however, that we will be adjudged based on how far we could foresee changes to which we should redefine ourselves. Our endeavours will be in that direction in the days to come.

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Very interesting project The work in introduction of new low-cost fish products for domestic consumption is most important Thank you for your hospitality.

Stephen Drew
FAO, Rome, Italy

8th July 1987.

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