General Aspects of Seafood Quality

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Quality is generally considered as the degree of excellence. Quality is often related to the price at which a commodity is purchased or the purpose for which it is to be used. In relation to seafoods, quality is the sum total of its composition, nutritive value, degree of freshness, physical damage, deterioration while handling, processing, storage, distribution and marketing, hazards to health, satisfaction on eating and yield and profitability to the producer and middleman. In short, fish quality means all those attributes which a fish consumer considers to be present individually or collectively in the item. Quality control, in the case of seafoods, means all the steps taken between harvesting and retail trade to protect the quality of the final product. Inspection consists of monitoring which is necessary to measure the effectiveness of the quality control procedure and also those official devices which are used to protect the consumer and facilitate trade.

Uniqueness of seafood quality control

Quality control of seafoods differs a lot from that of any other food. Fruits, vegetables, etc. are harvested under ideal conditions i.e. the right type of food is harvested at the right time and at the right place. This means that it is possible even to select the right species, to rear them to the desired level of growth and harvest them in a pre-determined place as per pre-determined schedule. In the case of seafoods, the harvesting is from the sea, rivers and other water areas from the stocks of unknown identity as to age, sex etc. under the most difficult conditions. Hence, the intrinsic quality varies in all possible combinations. Another phenomenon which complicates the quality control of seafoods is the unpredictability of catch. At times, the catches may exceed the handling capacity when even ice may not be available in sufficient quantities. Sometimes, catches are poor and the processing units have to remain idle for weeks together. Another peculiarity of tropical fisheries is the presence

of large number of species in limited quantities making quality control more difficult.

Quality control set up

Depending upon the size of the production units, quality control is the responsibility of a single individual or a department. Usually, in smaller units, the entire responsibility is on one individual whereas in bigger units a team of individuals looks after the various activities. The quality control team should have close liaison with the production and marketing divisions. The latter should furnish information on the changes in consumer outlooks and quality complaints and the former should incorporate these suggestions in the products produced subsequently. However, in doing so, due attention is to be given to the production cost. High production cost results in high prices at sales point and potential customers may look for substitutes resulting in reduced sales. Hence, quality improvement at minimum cost is ideal.

Responsibilities of a quality control department

1. Formulation of specifications for raw materials, supplies, in-plant process, containers and finished products
2. Development of test procedures and testing of quality of products
3. Development of sampling schedule - number of units and frequency of sampling to be worked out
4. Preparation of forms for recording and reporting
5. Attending to troubles and advising stoppage of production or rectification of defects
6. Attending to special problems relating to quality and complaints
7. Reduction of rejects, maintenance of uniform quality, increased customer satisfaction and employee morale
8. Training of personnel

History of seafood quality control and inspection in India

Export of fish and fishery products from India commenced in 1953 with the export of small consignment of frozen shrimp from Cochin. In those days, there were only 3 or 4 exporters in the field and the volume of export was too small fetching foreign exchange less than 2 crores of rupees. At present there are over 400 exporters in the country with the total value of exports touching Rs. 4697 crores in 1997-98. Quality control and pre-shipment inspection system was instrumental for this phenomenal growth of the seafood industry.

At the early start of the industry, the exporters were free to ship their consignments without any inspection for quality. Later, in the light of certain setbacks, Govt. of India decided that any consignment exported from this country should meet certain pre-determined and specified standards of quality. This resulted in the enactment of a comprehensive legislation entitled "Export (Quality Control and Inspection) Act 1963". This act came into force with effect from 1st September 1964. Initially, a voluntary pre-shipment inspection system was introduced from 1st September 1964. According to this system of inspection, the exporters willingly subjected their products for inspection to check whether they conformed to the prescribed standards. At that time, the pre-shipment inspection was operated by the Central Institute of Fisheries Technology, Cochin which was recognized as the Inspection Agency under Section 7 of the said act. In fact, the voluntary inspection of marine products imparted sufficient knowledge to the processors to get familiarised with the inspection system. Subsequently, the export of marine products was brought under compulsory pre-shipment inspection system with effect from 15th March 1965. Later, consequent upon the decision of Govt. of India, inspection of marine products was taken over by the Export Inspection Agency from 1st May 1969. Initially, only frozen shrimps and canned shrimps were under the purview of statutory inspection which was gradually extended to other commodities also as given below in Table 1.

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Table 1. *Date of commencement of inspection for different products*

	Product	Date of enforcement of compulsory Quality Control pre-shipment inspection scheme
1.	Frozen shrimp	15.3.1965
2.	Canned shrimp	15.3.1965
3.	Frozen froglegs	1.3.1966
4.	Dried shark fin	12.1.1970
5.	Dried fish maws	12.1.1970
6.	Dried fish	22.6.1970
7.	Dried prawns	22.6.1970
8.	Frozen lobster tails	28.12.1971
9.	Dried Bombay duck and laminated Bombay duck	5.5.1973
10.	Canned crab meat	5.2.1977
11.	Frozen pomfrets	31.12.1977
12.	Frozen cuttle fish and squids	31.12.1977
13.	Beche-de-mer	22.7.1976
14.	Fish meal	26.4.1980

Mainly 4 objectives are served by an inspection system.

1. To ensure that the product has been prepared from quality raw material and it has never been grossly contaminated.
2. To ensure that the product is absolutely free from pathogens or toxins of public health significance.
3. To ensure that the product was processed under ideal conditions.
4. To ensure that the product would have a reasonably extended shelf-life.

The consignment-wise inspection

In the initial years, inspection of fishery products was confined to end products. For a commodity to be inspected under this sytem, the exporter applies to the Export Inspection Agency (EIA) for inspection and issue of export certificate. The Inspection Agency carries out inspection adopting laid down techniques to ascertain whether they meet the prescribed standards. Based on the inspection results, certificate of export worthiness is issued by EIA.

To carry out inspection, each day's production is given a code number. The exporter will group each day's production and form a lot or consignment for inspection. Samples are drawn from a lot as per a prescribed sampling scale given in Table 2.

Table 2. *Sampling schedule for marine products*

Number of master cartons in the lot	** Number of master cartons to be selected as sample
Upto 12	2
13 to 24	3
25 to 40	4
41 to 80	5
81 to 120	6
121 to 180	7
181 to 250	8
251 to 350	10
351 to 500	12
501 to 750	14
751 to 1000	18
1001 to 1300	22
1301 to 1600	25
1601 to 2000	30
2001 and above	40

** In the case of frozen shrimps meant for export to U.S.A., sampling will be increased by additional 50% of the normal sampling.

The parameters tested during inspection are:

1. General appearance and odour
2. Dehydration
3. Discolouration
4. Deterioration
5. Black spots
6. Broken and damaged pieces
7. Legs, veins, loose shells etc.
8. Foreign materials/filth
9. Non-uniformity of size
10. Size grade
11. Weight
12. Bacterial quality

The consignment-wise inspection has the following demerits:

1. Only end product is inspected
2. Loss on account of reprocessing
3. Loss on account of last moment rejection
4. Dislocation of shipment schedule
5. Blocked capital

The in-process quality control system

With a view to make the quality control and inspection scheme more meaningful and effective, it was felt imperative that, in addition to the end product inspection, the processing plants should be encouraged to adopt Good Manufacturing Practices (GMP). Accordingly, Government of India introduced the In-process Quality Control (IPQC) scheme for processed seafoods with effect from 31.12.1977. Under this scheme, processing of fishery products for export purpose is permitted only in processing units approved by a Panel of Experts (one member each from EIA, CIFT, MPEDA, BIS and the industry). To qualify for such an approval, the processing units must have the minimum sanitary and hygienic facilities

stipulated by the EIA as per Govt. of India notification S.O. 4007 and 4008 dated 31.12.1977. The required minimum facilities are given below.

1. Surroundings - construction and lay-out
2. Processing areas
3. Ceilings, walls and floor
4. Fly proofing, animal and vermin control
5. Lighting and ventilation
6. Working tables, utensils & their up-keep
7. Machinery
8. Cold storage and warehousing
9. Water and ice
10. Sanitary facilities and control which include
    a. Cleaning facilities
    b. Washing facilities
    c. Sewage disposal facilities
    d. Toilet facilities
11. Personnel health and hygiene
12. Transportation facilities
13. Maintenance of records

IPQC checks will be carried out at the following stages of processing

a. Raw material on receipt
b. Raw material after grading
c. Raw material after washing and filling
d. Product after freezing

The organoleptic and bacteriological inspection of the frozen product will be carried out by EIA and the certificate of fitness will be issued.

Merits of the IPQC system, later renamed as QCIA System

a. Control is exercised through all stages of processing, final production, storage and transportation.

b. Rejections are avoided because the defects are located and rectified during the process of manufacture

c. Consistency in quality

d. No blocked capital

Later, as per Govt. of India notification S.O. 1153 and 1153A dated 9.4.1988, the IPQC system was retitled as "Quality control and inspection in aproved units" - QCIA. Another change was the introduction of a new system - "Modified In-process Quality Control (MIPQC) scheme" which is at present retitled as- "In-process Quality Control (IPQC)." Under this scheme, only those processing units which are already approved under the QCIA system as mentioned above and are having the following additional infrastructural facilities are approved.

1. The processors should have necessary facilities for the transportation of raw material from fish landing centres/procurement centres and also for transporting finished products from the unit to the wharf for shipment. For such purpose, only insulated/refrigerated trucks shall be used.

2. Adequate facilities for receiving raw material for pre-processing, freezing, storage and inspection shall be available.

3. The processing unit shall have competent and qualified technical personnel to supervise pre-processing, processing and packing operations.

4. The unit shall have its own laboratory or arrangement with an independent testing laboratory approved by the Export Inspection Council.

The responsibilities of the processor under the IPQC (previously known as MIPQC) scheme include:

1. To draw samples at various stages of processing and from the finished product for the purpose of tests.

2. To evaluate the results of the samples tested and decide on the conformity of these samples to the prescribed specifications.

3. Drawing of samples for bacteriological analysis from the various stages of processing and finished products and getting the same tested.

4. To decide whether the lots of fish and fishery products processed and packed are export worthy or otherwise.

Units approved under the IPQC system inspect and clear the goods for export by employing qualified and approved technologists. If the required level of quality control drills are not exercised in any factory, the approval granted to that unit can be withdrawn.

Merits of the IPQC (previously MIPQC) system include:

a. The technologists of the processing unit can certify the export worthiness of the products and can collect the formal certificate from EIA.

b. Inspection fee is only half the rate applicable to the QCIA system.

Records to be maintained

1. Processing register

This will indicate the total quantity of raw material purchased with variety, quantity received, quantity packed, filled weight, count when packed as well as bacterial condition of the raw material.

2. Consolidated production register

This indicates the total quantity produced grade-wise, quantity shipped and the balance available at any time.

3. Packing register

This indicates the exact number of cartons produced each day, the cartons certified and the balance to be certified.

4. Inspection register

These will contain data on organoleptic and bacteriological analysis of each day's production and the details of analysis of sanitary samples.

5. Register for non-conventional packs

This includes entries of all non-conventional packs stored in the cold storage.

Subsequent changes in the inspection practices

Government of India, as per notification dated 13.12.1990 recognized all the seafood processing factories, approved under the IPQC system by the various EIA's in the country as an Agency for pre-shipment inspection of the commodities produced by them for export subject to the following conditions.

a. that the manufacturer/exporter shall carry out the inspection prior to export under the technical control of the Director (Inspection and QC).

b. that the manufacturers/exporters, in their performance shall be bound by such directives as the Director (I&QC), Export Inspection Council may give to them in writing from time to time.

The Ministry of Commerce has also decided that self-certification would be extended to those units that have attained an export level of 1.5 crores on an average for the last 3 years and have received no quality complaints on such exports.

The IPQC units will also be authorised to issue inspection certificates in favour of another exporter through whom the consignment is being exported. However, in the event of any complaint on quality received from the foreign buyer the IPQC unit and the exporter through whom the consignment is exported will be jointly and severally responsible.

The Government of India has also directed as per letter No. 6/5/91-EI and PE dated 25th July 91 that exporters having a firm letter to the effect that the overseas buyer does not want pre-shipment inspection from any official Indian Inspection Agency can export the commodities without inspection.

Further, as per notification dated 25th July 91, Government of India exempted notified Star Trading Houses, Trading Houses, and Export Houses from the purview of pre-shipment inspection of fish and fishery products.

Over a period of time, there has been considerable change in the concept of fish processing. The modern seafood processing industry is very much technologically advanced and sophisticated as any other food industry. Simultaneously, the perception of quality has also changed. In the efforts to satisfy the customer there has been a constant search for suitable methods to ensure the quality of seafoods. The global increase in food poisoning has been an important factor influencing this search. Such outbreaks are mainly caused by microorganisms that gain entry into the product at different stages of handling and where measures taken are not adequate to eliminate them. Further, several ingredients are now added to seafoods as additives, antioxidants, preservatives, emulsifiers, cryoprotectants and colouring materials. There are also problems of pesticide residues, toxic metals, mycotoxins, biotoxins, antibiotic residues and the like. Under these circumstances, the responsibility of the processor has become increasingly complex and hence there is a global shift from food standards to food safety. The world is now moving towards the HACCP concept, a preventive strategy, to combat food safety problems and above all, a commitment of the management for the production and distribution of safe products. The HACCP - based quality system involves the following steps.

1. Systematic Hazards Analysis
   - Identification of hazards
   - Assessment of severity of the hazard
2. Determination of Crtical Control Points (CCP)
   - CCP1 which will assure control of a hazard
   - CCP2 which will minimise a hazard
3. Determination of preventive measures

4. Establishment of monitoring procedures
   - Visual inspection
   - Sensory evaluation
   - Physical/chemical/bacteriological aspects
   - Quantitative aspects and recording
5. Establishment of critical limits and corrective action
6. Documentation of actions and results
7. Establishment of verification procedures

Many advanced and advancing countries of the world have already adopted the HACCP concept for their seafood industry. The US FDA is going to make it mandatory for marine products of the export sector. With a view to harmonising the various Quality Management Systems the International Standards Organization has developed a set of standards called ISO 9000 series. The HACCP concept can become a part of these standards.

Many of the seafood processing factories in this country have implemented the HACCP system. All processing factories exporting seafoods to European Union are now expected to get approval as per EU norms 91/493. Export Inspection Agency continues to be the competent authority for quality assurance in this country as per Quality Control, Inspection & Monitoring Rules 1995. According to this, the factories are first assessed by a team of officials drawn from EIA, CIFT and MPEDA (The Inter-Departmental Panel - IDP). Processing units cleared by IDP are assessed by a Team of Experts, called the Supervisory Audit Team (SAT) drawn from CIFT. Based on the final recommendation given by SAT, the factory is approved. All the approved units are monitored by SAT once in 2 months. At present there are 60 processing factories in the country, approved under this system, for export of seafoods to European Union. More and more factories are in the process of getting approval.