

International standards, Waste management in processing industries

1. ISO 9000 Standards

International Organization for Standardization (ISO) was established in 1946 at Geneva, Switzerland with an aim of developing uniform international manufacturing trade and communication standards. The purpose of ISO is to promote the development of standardization and related world activities in order to facilitate the international exchange of goods and services and to develop cooperation in intellectual, scientific, technological and economic activities.

The ISO which was started with 14 founding members from Europe, the US, and the British Commonwealth has grown to a world wide federation with over 136 member countries. The task of developing international standards is entrusted with over 180 active technical committees (TC) and over 620 active sub-committees, comprising over 30,000 specialists.

ISO established standards in quality management and quality in the form of the ISO core series of standards in 1987 based on the British Standards (BS) 5750 series (published in 1979) and adopted as ISO 9000 series. Several countries have adopted these as country standards. Bureau of Indian Standards (BIS) has adopted the ISO 9000 series of standards as the Indian Standards (IS) 14000 series.

The ISO 9000 document

ISO 9000 standards document consists of series of five documents with sub-sections covering all aspects of quality management. These are,

ISO 9000: Quality management and quality assurance standards - guidelines for selection and use.

ISO 9001: Quality systems-model for quality assurance in design/development, production installation and servicing.

ISO 9002: Quality systems - model for quality assurance in production and installation.

ISO 9003: Quality systems - model for quality assurance in final inspection and test.

ISO 9004: Quality management and quality system elements - guidelines

2. Codex Alimentarius Commission or Codex standards

Codex Alimentarius Commission is the the international organization for food standards established jointly by the Food and Agricultural Organization (FAO) and World Health Organization (WHO) of the United Nations Organization. The aim of the Codex is to develop food standards to be used worldwide with a view to protect consumers' health and ensuring fair trade practices. Codex documents include provisions in respect of good hygiene, food additives, contaminants, labeling and presentation, and methods of analysis and sampling. Member countries use these standards as a basis to formulate their own standards.

The Commission has established various specialist committees to deal with separate areas in food industry and the committee on Fish and Fish Products is established in Norway which meets regularly for establishing quality standards.

3. United States Food and Drug Administration (USFDA) Standards

The Food and Drug Administration of United States of America (USFDA) has enacted several laws to safeguard the interest of its citizens. The laws and regulations are intended to ensure that the foods are pure, wholesome, and safe and produced under sanitary conditions, and that all labeling and packaging are truthful, informative and not deceptive. All imported food products regulated by the FDA are subject to inspection at the time of entry. Illegal or violative shipments are detained and destroyed or re-exported to the port of the origin. The regulations of food law are expected to cover aspects such as health safeguards, economic

safeguards, labeling requirements, sanitation requirements, personnel hygiene requirements, plant construction design and layout, defects, food additives, warehousing, food standards and HACCP implementation.

9.4. Waste management in processing industries

The seafood processing industries process a variety of sea foods such as fishes, crustaceans and molluscs and are generally located along the coastline. The size of these units vary depending on the quantity of material that can be processed. The processing operations generally involve washing, eviscerating, dressing, processing, use of additives and other ingredients, rendering fish in to byproducts such as fish meal, oil and solubles, fish paste products etc. All these process produce large quantity of liquid and solid wastes rich in organic matter and these wastes have to be suitably handled/ treated so as to reduce polluting effect on receiving waters/ the environment.

Impact of wastes

The solid and liquid waste generated during the processing of seafood basically has two types of impact; economic and environmental impact.

Economic impact

The economic impact of the wastes is due to the loss of product incurred during processing operations both in solid (viscera, scales, bones, shells etc) and liquid (dissolved and suspended material in waste water) form. The cost of product loss as well as the cost incurred in treating the waste adds to economic loss. The cost of treatment generally depends on the type of treatment to be employed and volume of waste to be treated.

Environmental impact

Discharge of untreated or inadequately treated wastes affect the ecological balance of receiving waters (streams, lakes or coastal waters). The wastes being biodegradable, cause eutrophication and depletion of oxygen which not only results in development of abnoxious odours but, also affects the fauna and flora of the water body. Hence, it bcomes necessary to treat the wastes generated from fish processing industries.

Characteristics of waste

The solid wastes produced during the processing include fish offal, viscera, scales, skin, shells etc which are rich in nutrients and can be easily disposed either by land filling or by transforming in to variety of by-products. The liquid waste rich in dissolved and suspended organic substances are characterized by their high biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), fats, oil and greases (FOG). The polluting effect of liquid wastes can be reducing by minimizing the concentrations of these parameters and water usage which in turn helps in reducing the cost of treatment.

Treatment of waste water

The high organic load in waste water makes it easily amenable for treatment process which mainly aims at reducing the BOD value to acceptable limits before discharging in to natural waters. The biological treatment process of waste treatment involves encouraging the growth of heterotrophic microorganisms. The waste treatment systems commonly employed for treating seafood processing waste are;

- Activated sludge process
- Aerated lagoons
- Stabilization/polishing ponds
- Trickling filters

Activated sludge process

The activated sludge treatment system involves degradation of organic substances by encouraging the growth of heterotrophic microorganisms in waste water held in tanks in presence of excess of oxygen by mechanical aeration. The microorganisms convert the soluble organic compounds to carbon dioxide and cellular material. After treatment, the aeration is stopped, allowed to stand for some time for settling of settleable organic matter. This process removes BOD and suspended solids to the extent of 95-98%. The treated water is removed and the sludge collected at the bottom is removed retains some portion in the tank itself as inoculum for subsequent treatment process.

Aerated lagoons

Use of aerated lagoons for treating the waste water from the processing industries involves holding in pools or ponds of varying size and aerating using air diffusers located on the bottom of the pond with the help of fixed or floating mechanical aerators or compressors. This approach to waste treatment is used where sufficient land is not available for retention or land application of waste water and economics do not justify an activated sludge system. Efficient biological treatment can be achieved by the use of the aerated lagoon system ensuring 55 to 90% reduction in BOD within 2 to 10 days retention.

The aerated lagoons can be of two types.

- Aerobic oxidation ponds where all solids are completely mixed and kept in suspension creating aerobic condition.
- Facultative-aerated lagoons where the contents of the pond are only partially mixed allowing settling of suspended solids and favouring anaerobic decomposition.

Stabilization/polishing ponds

Aerobic stabilization ponds are utilized where land is readily available. The effluents treated in the aerated lagoon are further improved by holding in series of stabilization/ polishing pond system. This system depends on the action of aerobic bacteria which convert organic carbon to carbon dioxide and bacterial cells. Algal growth is stimulated by incident sunlight which penetrates to a depth of 1 to 1.5 meters. Oxygenation of water takes place by photosynthetic activity of algae and also by diffusion through air/water interface. These systems can achieve 80 - 95% removal of BOD .

Trickling filters

Trickling filters are circular metal or cement tanks filled with irregular shaped inert material (stones, plastic scrapings, molluscan shell etc) which serve as substratum for attachment and growth of heterotrophic bacteria. The waste water is sprayed at constant rates onto the surface of packed columns of inert material which allows establishment of biological film. As the waste water flows down the biological film, the organic matter is removed by the microorganisms. Trickling filters can achieve a BOD removal of > 70%.

The treated waste water meeting regulatory standards is ultimately disposed by discharging to overland surface waters, irrigating agricultural crops, percolation to groundwater, surface ponding or evaporation.