Promoting GMP/SSOP for SMEs in Fish Processing: Indonesia's Perspective

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Fish fillet production in Indonesia

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The fish processing industry of Indonesia comprises mainly the domestic-based traditional fish products factories commonly operated by small to medium-scale processors catering mostly to the domestic market. Fish processing establishments are spread out in all the provinces in Indonesia most particularly in Java Island where almost 60% of the total industries are situated. About 40% of the countryÊs total fish catch of 4.71 million mt is utilized by the processing establishments, which are engaged in fish curing such as salting-drying (85%), salting-boiling (11%), smoking (3%), and fermentation (1%). About 50% of the total fish catch is marketed fresh and the other 10% is processed by large-scale fish processors in the form of frozen fish, canned fish, etc. The most important fish products of Indonesia are the salted-dried fish, salted-boiled fish (*pindang*), fish paste, fermented fish (*peda*), fish sauce, smoked fish, etc. The countryÊs total production of fish products was about 1.50 million mt in 2004 but this decreased to about 1.46 million mt in 2005 (**Table 1**).

Issues and Constraints

In order that IndonesiaÊs traditional fish products meet the safety and hygiene requirements, various issues and concerns such as the need for adequate infrastructure and equipment, adequate supply of potable and clean water and sufficient quantity of ice, and availability of clean handling and processing areas, etc. should be addressed. Since the countryÊs fish processing industry is dominated by small and medium-sized establishments (SMEs), efforts are being made to encourage the SMEs to improve their knowledge and skills on processing technology especially on the adoption of good manufacturing practices (GMP) and standard sanitation operating procedures (SSOP). Adequate knowledge on these aspects of fish processing as well as having sufficient and clean processing facilities will assure the country of fish products that are of high quality and safe for human consumption not only for the domestic market but also for the competitive export market as well. In order to be able to address the abovementioned issues and concerns, Indonesia through the Directorate of Fisheries

Table 1. Indonesia's production of fish products (mt)

Product type	2000	2001	2002	2003	2004	2005
Salted-dried fish	611,662	584,394	571,577	598,235	568,323	478,360
Salted-boiled fish (*pindang*)	66,457	134,071	124,826	121,491	122,807	95,776
Fish paste	16,581	21,607	7,251	9,342	9,809	13,911
Fermented fish (*peda*)	7,950	13,442	4,996	4,911	4,665	6,452
Fish sauce	76	524	2	6	10	71
Smoked fish	37,641	36,561	53,905	56,574	59,403	86,690
Frozen fish	305,923	307,235	319,237	573,911	633,200	699,224
Canned fish	21,227	25,299	36,913	28,415	31,945	49,211
Fish meal	1,640	12,204	16,612	8,635	7,339	7,251
Others	9,195	30,158	53,645	53,355	65,443	28,012
TOTAL	**1,078,352**	**1,165,495**	**1,188,964**	**1,454,875**	**1,502,944**	**1,464,958**

Product Processing, Directorate General of Fisheries Product Processing and Marketing of the Ministry of Marine Affairs and Fisheries, is actively participating in the SEAFDEC Program on Quality Assurance Systems for Small and Medium-Sized Fish Processing Establishments in ASEAN Member Countries under the Government of JapanÊs Trust Fund Program (JTF). Through the countryÊs participation in this SEAFDEC Program, the implementation of GMP/SSOP in the SMEs in Fish Processing could be promoted for the quality and safety of its fish products.

The Fish Processing Establishments in Indonesia

As in most countries in the ASEAN region, the SMEs engaged in fish processing in Indonesia also comprise the pre-processing and traditional product processing establishments. The pre-processing establishments (PPEs) produce mainly fish fillets as semi-processed raw materials for large-size establishments producing surimi or surimi-based products or fish jelly products.

Pindang processing in Indonesia

The production capacity of the countryÊs PPEs is from 500 to 3,000 mt. The processing of fish fillets requires washing of the deboned and trimmed fish with cool clean water and packing the product with ice. However, in most cases the infrastructure, materials and equipment are not adequate. In addition, there has been scarce supply of good materials for fish filleting because large quantity of fresh raw materials is exported. Most PPEs also lack awareness on hygiene requirements and this resulted to not very good quality of the products from handling to processing thus distribution is localized only in the domestic market. Moreover, the locations of the PPEs are spread in the whole country making it difficult for concerned government agencies to monitor and conduct surveillance on the performance of the PPEs.

On the other hand, the traditional product processing establishments (TPEs) in Indonesia are predominantly engaged in fish curing producing such products as salted-dried fish, smoked fish, salted-boiled fish, and fermented fish. One of the most important cured fish in Indonesia is the salted-boiled fish locally called „pindang‰, which plays an important role as source of nutritious and low-cost food in the Indonesian diet. However, in recent years, production of „pindang‰ has decreased brought about by the short shell-life and storage triggered by poor sanitation and hygiene during its processing. „Pindang‰ is prepared in two different ways, i.e. through dried-salted boiling and brine boiling, the latter being most popularly practiced at present. The major species of fish used are scads (*Rastrelliger* spp.) and little tuna or sometimes milkfish. The processing of „pindang‰ involves washing the cleaned fish with clean water and arranging them in bamboo baskets. Granular or rock salt is sprinkled on the fish (15-25% of fish weight) then 10-12 baskets are tied together for boiling in a big container (with 25% salt) for 15-30 minutes. The baskets are washed with hot brine and after each basket is drained and cooled, the fish is packed for distribution.

As in the PPEs, the TPEs are also constrained with inadequate infrastructure, materials and equipment as well as antiquated technology based only on inherited techniques. The inadequate knowledge on hygiene practices resulted to the distribution of „pindang‰ only in the local markets. The participation of Indonesia in the SEAFDEC Program is expected to raise the status of „pindang‰ as a nutritious fish product not only for domestic consumption but also for export.

GMP/SSOP for SMEs Fish Processing Establishments

The Directorate of Fisheries Product Processing under the Directorate General of Fisheries Product Processing and Marketing of the Ministry of Marine Affairs and Fisheries conducted a survey on the real situation of the countryÊs PPEs and TPEs. In an effort to improve the safety and quality of the countryÊs fish products through the adoption of GMP and SSOP by the PPEs and TPEs and in order to comply with quality assurance requirements, initial SSOP guidelines have been formulated by the Directorate of Fisheries Product Processing and being promoted for adoption by the countryÊs SMEs. Although based on IndonesiaÊs perspective, other countries in the ASEAN region could refer to the draft guidelines (**Box 1**) for the development of their own SSOP guidelines for PPEs and TPEs.

Plan of Action

With the participation of Indonesia in the SEAFDEC Program on Quality Assurance Systems for Small and Medium-Sized Fish Processing Establishments in ASEAN Member Countries, pilot projects will be conducted from 2007 to 2011 to develop and disseminate GMP/SSOP for fish fillet production as well as for salted-boiled fish (*pindang*) production. The specific activities for the PPEs will include:

1. development of GMP/SSOP for PPEs (using the draft guidelines as reference)
2. dissemination of GMP/SSOP to fish fillet processors
3. actual introduction of GMP/SSOP for fish fillet production in Tegal, Central Java
4. preparation of manual on GMP/SSOP for fish fillet production

For the TPEs, the specific activities include:

1. development of GMP/SSOP for TPEs (using the draft guidelines as reference)
2. dissemination of GMP/SSOP to salted-boiled fish processors
3. actual introduction of GMP/SSOP for on salted-boiled fish processing in Bali
4. preparation of manual on GMP/SSOP for salted-boiled fish production

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Box 1: Guidelines on SSOP for PPEs and TPEs (Indonesia's Perspective)

1.	Plant Construction and Layout	
1.1	**General Considerations** The plant and surrounding area should be such that these can be kept reasonably free from contamination. The buildings should be sufficient in size without crowding of equipment or personnel, well constructed and with good maintenance. The plant and surrounding area should be designed and constructed so as to prevent the entrance and harboring of insects, birds or other vermin, but to permit ready and frequent cleaning.	**Specific Guidelines** • The location of the processing plant, its design, layout, construction and equipment should be planned in detail with considerable emphasis on the hygienic aspect, sanitation and quality control. • Where new premises are constructed or when existing buildings are modified, the local authorities should always be consulted in regard to building codes, hygienic requirements of the operation, and sanitary disposal of sewage and plant wastes. The food handling area should be completely separate from any parts of the premises used as living quarters.
1.2	**Specifications** Floors should be hard surface, non-absorbent and adequately drained	**Specific Guidelines** • Floors should be constructed using durable, waterproof, non-toxic, non-absorbent materials which is easy to clean and disinfect. The materials should be non-slip and without crevices and should slope evenly and sufficiently for liquids to drain into trapped outlets fitted with removable grills. • Junctions between the floors and walls should be impervious to water and should be coved and rounded for ease of cleaning.

Box 1: Guidelines on SSOP for PPEs and TPEs (Indonesia's Perspective) (Cont'd)		
	Drains should be of adequate size, suitable type, equipped with traps and with removable gratings to permit cleaning	• Suitable and adequate drainage facilities are essential for removal of liquid and semi-liquid wastes from the plant. There should be no floor area where stagnant water might collect in pools. Drains should be constructed from smooth and impervious materials and should be designed to cope with maximum flow of liquid without any overflowing and flooding. Each drainage inlet should be provided with a deep seal trap which is appropriately located and easy to clean.
	Internal walls should be smooth, waterproof, resistant to fracture, light colored and readily cleanable	• Acceptable materials for wall finishing should have adequate impact resistance, desirable surface qualities and easily repairable. • All joints should be sealed with compound resistant to hot water and cover strips should be applied where necessary. • Wall-to-wall and wall-to-floor junctions should be coved or rounded to facilitate cleaning. Walls should be free from projections and all pipes and cables should be sunk flush within the wall surface or neatly boxed in.
	Windows should be kept to a minimum size, sloped towards the processing area	• Window sills and frames should be made of smooth waterproof materials, and if of wood, should be kept well painted. Internal window sills should be sloped to prevent storage of miscellaneous materials or accumulation of dust and should be constructed so as to facilitate cleaning. • Windows should be filled with whole panes and those which open should be screened. The screens should be constructed so as to be easily removable for cleaning and should be made from suitable corrosion-resistant material.
	All doors, through which fish are moved, should be sufficiently wide, well constructed of suitable material, and should be of a self-closing type	• Doors, through which fish are moved, should be either sheeted with or made of a corrosion-resistant metal or other suitable material with adequate impact resistant and, unless provided with an effective air screen, should be of a self-closing type. Both doors and frames of the doorways should have smooth and readily cleanable surface. • Doors, through which the product is not moved, such as those providing staff access, should be appropriately surfaced, at least on the processing area side, to allow ease of cleaning.
	Ceilings should be designed and constructed to prevent accumulation of dirt and condensation and should be easy to clean	• Ceilings should be free from cracks and open joints and should be of smooth, waterproof and light coloured finish, which do not permit the growth of mould
	Premises should be well ventilated to prevent excessive heat, condensation and contamination with odours, dust, vapour or smoke	• The air flow in the premises should be from the more hygienic areas to the less hygienic ones. Good ventilation is important to prevent condensation and growth of moulds in overhead structures. • Ventilation opening should be screened and, if required, equipped with proper air filters. Windows which open for ventilation purposes should be screened. The screens should be made easily removable for cleaning and should be made from suitable corrosion-resistant material.
	Adequate lighting in the processing room and should be covered	• Light bulbs over the working areas where fish are handled at any stage of preparation should be of the safety type, or otherwise protected to prevent food contamination in case of breakage.
1.3	**Hygiene Facilities** Areas where fish are received or stored should be separated from areas in which product preparations or packaging are conducted so as to prevent contamination of the finished product	**Specific Guidelines** • Well-defined areas of adequate size, preferably separate rooms, should be provided for receiving and storing raw materials and for operations like washing, filleting or other processing and packaging. • Manufacture or handling of edible products should be entirely separate and distinct from the areas used for inedible materials. • Receiving and storage areas should be clean and readily capable of being maintained in clean condition and should provide protection of raw materials from deterioration and contamination.
	Separate refuse room should be provided on the premises	• If refuse is to be collected and held before removal, adequate precautions should be taken to protect it against rodents, birds, insects and exposure to warm temperatures.
	An adequate supply of potable water and/or clean sea water, under adequate pressure, should be available at numerous points throughout the premises at all times during working hours	• All water available for use in various parts of the establishments where fish are received, held, processed, packaged and stored, should be potable water or clan sea water.

Box 1: Guidelines on SSOP for PPEs and TPEs (Indonesia's Perspective) (Cont'd)	
When in-plant chlorination of water is used, the residual content of free chlorine should be maintained at not more than the minimum effective level for the use intended	• Chlorination systems should not be relied on to solve all hygiene problems. The indiscriminate use of chlorine can not compensate for non-hygienic conditions in a processing plant. • Ice used in the operation of the fish processing establishment should be made from water of potable quality. Care must be taken to ensure that ice used to chill fish does not contaminate the fish.
Where non-potable auxiliary water supply is used, the water should be stored in separate tanks and carried in separate lines, identified by contrasting colours and labeled, and with no cross connections or back-siphonage with the lines carrying potable water	• Non-potable water may be used for such purposes as producing steam, cooling heat exchangers and fire protection. • It is very important that the systems of storage and distribution of potable and non-potable water are entirely separate and there is no possibility for cross-connection or for inadvertent usage of non-potable water in the fish processing areas. • The same requirement for separation systems would apply for clean sea water when it is used in processing.
Proper facilities for washing and disinfection of equipment should be provided	• Facilities should be present in every processing establishment for cleaning and disinfection of utensils, containers and other equipment. • Any containers and equipment used for offal or contaminated materials should not be washed in the same area.
Adequate and conveniently located toilet facilities should be provided	• Toilet rooms should have walls and ceilings, with smooth washable light coloured surface and floors constructed of impervious and readily cleanable materials. Toilet facilities should be well-lit, ventilated and kept in a hygienic condition at all times. Adequate supply of toilet paper should be available in each toilet cubicle. • The doors leading to the facilities should be of self-closing type and should not open directly into the fish processing areas. • Hand-washing facilities of a type not requiring operation by hand, with an adequate supply of potable water or clean seawater, with liquid or powdered soap and with suitable hygienic means of drying the hands, should be provided adjacent to the toilets and in such position that the employee must pass them when returning to the processing room. Where paper towels are used, a sufficient number of receptacles for used towels should be provided. • Notices should be posted directing personnel to wash their hands after using the toilets. • The following formula could be used as a guideline in assessing the adequacy of toilet facilities in relation to the number of employees: 1-9 employees = 1 toilet 10-24 employees = 2 toilets 25-49 employees = 3 toilets 50-100 employees = 5 toilets For every 30 employees over 100 = 1 toilet
Facilities should be available in the processing areas for employees to wash and dry their hands and for disinfection of protective hand coverings	• In addition to hand-washing facilities available in toilet rooms, a number of wash basins with an adequate supply of potable water or clean seawater and liquid or powdered soap should be provided whenever the process demands. These should be located at all employee entrances in full view of the processing floor and should be of a type not requiring operation by hand or should be fed by continuous flow of potable water or clean seawater. Single-use paper towels are recommended and the facilities should be kept in a hygienic condition at all times.
Staff facilities consisting of lunchrooms, changing rooms or rooms containing shower or washing facilities should be provided	• Where workers of both sexes are employed, separate facilities should be present for each except the lunchrooms which could be shared. As a general guideline, the lunchrooms should provide seating accommodation for all employees and the changing rooms should provide enough space for lockers or some alternative facilities for each employee without causing undue congestion. • Clothing and footwear not worn during working hours must not be kept in the processing areas.
Storage facilities should be available for proper dry storage of packaging materials	• Separate facilities for the storage of cartons, wrappings or other packaging materials should be provided in order to protect them against moisture, dust or other contamination.
If poisonous or harmful materials, including cleaning agents, disinfectants, sanitizers and pesticides are stored, these should be kept in a separate room designed or marked specifically for this purpose	• All such materials must be prominently and distinctly labeled so that these can be easily identified. The room should be kept locked and the materials contained in it should be handled only by personnel trained on their use.

Box 1: Guidelines on SSOP for PPEs and TPEs (Indonesia's Perspective) (Cont'd)

1.4	**Equipment and Utensils** All work surfaces and all containers, trays, tanks or other equipment used for processing should be of smooth, impervious, non-toxic material which is corrosion-resistant. Such equipment and utensils should be designed and constructed to prevent hygienic hazards and permit easy and thorough cleaning. In general, the use of wood for this purpose is not recommended	**Specific Guidelines** • Contamination of fish product during processing can be caused by contact with unsatisfactory surfaces. All food contact surfaces should be smooth, free from pits, crevices and loose scales, substances harmful to man, or other ingredients used and capable of withstanding repeated cleaning and disinfection. • Equipment should be so designed that they can be easily dismantled to facilitate thorough cleaning and disinfection. • Containers used for holding fish products should preferably be constructed of plastic or corrosion-resistant metal and, if of wood, these should be treated to prevent entry of moisture and coated with a durable, non-toxic paint or other surface coating that is smooth and readily washable. • Equipment and utensils used for inedible or contaminated materials should be identified as such and should not be used for handling fish products intended for human consumption.
	Surfaces on which fish product are processed shall be made of suitable corrosion-resistant material, other than wood, and all joints on such surfaces should be smooth and watertight	• It is important that all surfaces be of non-absorbent and crevice-free material so that these will not become saturated with juices containing micro-organisms which would give rise to off odours and become source of contamination. Corrosive materials are objectionable because the product of corrosion may contaminate the products.
	Tables should be so constructed that these, and the areas beneath, can be readily cleaned	• Tables should be constructed so that there will be no inaccessible points which may be omitted in establishment clean-up. Stands for workers along the processing lines should be constructed of metal, should be well maintained and should be movable or so constructed that the stands and the floor beneath can be properly cleaned.
	Transport vehicles should be designed to protect fish product (especially fish fillet) from warming during transport and should be of such material and construction as to permit easy and thorough cleaning	• Vehicles used for transporting fish products (especially fish fillet) should be designed to provide some means of refrigeration and constructed to ensure constant protection against contamination by dust, and the drying effect of sun and wind. Even where ice is very cheap and travel times or distances are relatively short, the use of an insulated vehicle provides an additional insurance against inadequate icing or unforeseen delays. • For the purpose of cleaning, the transport vehicle should have wall, floor and roof linings made of suitable corrosion-resistant material with smooth and non-absorbent surface. Floors should be adequately drained.
	Removal of solid, semi-solid or liquid wastes from fish product unloading, holding and processing areas should be on a continuous basis so that these areas are kept clean and there is no danger of contaminating the product	• All waste materials, resulting from the operation of a processing plant, should be disposed of as soon as possible in a way that they can not be used for human food and in a manner that they can not contaminate food and water supplies or offer harborage or breeding places of rodents, insects or other vermin. • Containers, flumes, conveyors, bins or storage bays used for removal, collection or storage of offal and other waste should be cleaned frequently with potable water or clean seawater containing an appropriate amount of free chlorine. • All waste materials from containers and vehicles should be removed in such a way as not to cause any contamination and not to create any nuisance. • Arrangements or the disposal of trade refuse and inedible waste should be approved by appropriate official agencies having the jurisdiction.
	Effective measures should be taken to protect against the entrance into the premises, especially storage areas, and the harborage on the premises of insects, rodents, birds or other vermin	• An effective and continuous programme for the control of insects, rodents, birds or other vermin within the establishment should be maintained. • All rodenticides, fumigants, insecticides or other harmful substances should be of an approved type and should be stored in separate locked rooms or cabinets and handled only by properly trained personnel.
	Dogs, cats and other animals should be excluded from areas where fish products are received, handled, processed or stored	• Dogs, cats and other animals are potential carriers of diseases and they should not be allowed to enter or live in rooms or areas where fish and products are handled, processed or stored.
	All persons working in fish processing plant should maintain high degree of personal cleanliness while on duty and should take all necessary precautions to prevent the contamination of the products with any foreign substance	• All employees should wear, appropriate to the nature of their work, clean and protective clothing including footwear and a covering for the hair or beard where required, all of which should be either washable or disposable. The use of waterproof aprons where appropriate is recommended. • Any behaviour which can potentially contaminate the fish products such as eating, smoking, chewing of tobacco and other materials and spitting should be prohibited in any part of the product handling areas.
	No person who is known to be suffering from, or who is a carrier of any communicable disease, or has an infected wound or open lesion should be engaged in the preparation, handling or transporting the fish and fish products	• Plant management should require that any person afflicted with any illness, should immediately report to management. • Management should not allow any person known to be affected with disease capable of being transmitted through food or known to be a carrier of such disease, to work in any area of a plant in a capacity in which there is a likelihood of such person contaminating the fish products with disease-causing micro-organisms.