CODEX ALIMENTARIUS COMMISSION E

Food and Agriculture Organization of the United Nations

World Health Organization

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Agenda Item 5 **CX/FFP 11/31/5**

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FISH AND FISHERY PRODUCTS

Thirty-first Session

Tromsø, Norway

11 – 15 April 2011

PROPOSED DRAFT CODE OF PRACTICE FOR FISH AND FISHERY PRODUCTS (Section on Smoked Fish)

(At Step 3 of the Procedure)

Governments and interested international organizations are invited to submit comments on the attached Proposed Draft Code of Practice at Step 3 and should do so in writing in conformity with the Uniform Procedure for the Elaboration of Codex Standards and Related Texts (see *Procedural Manual of the Codex Alimentarius Commission*) to: the Secretariat, Codex Alimentarius Commission, Joint WHO/FAO Food Standards Programme, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy, by email codex@fao.org or fax: +39-06-5705-4593 with a copy to Codex Contact Point, Norwegian Food Control Authority, P.O. Box 8187 Dep. 0034 Oslo, Norway, Email: ccffp@mattilsynet.no, fax: +47.74.11.32.01 **by 15 January 2011.**

BACKGROUND

The 30th Session of the Committee agreed to return the section on smoked fish of the Proposed Draft Code of Practice for Fish and Fishery Products for redrafting by The Netherlands, comments and consideration by the next session of the Committee.[1]

Comments are invited on the proposed draft COP as indicated above.

[1] ALINORM 10/33/18, para. 82

PROPOSED DRAFT CODE OF PRACTICE FOR FISH AND FISHERY PRODUCTS (SECTION ON SMOKED FISH)

DEFINITIONS

2.9 SMOKED FISH, SMOKE-FLAVOURED FISH, SMOKE-DRIED FISH

- **"Smoking"** is a process of treating fish by exposing it to smoke from smouldering wood or plant materials in a smoking chamber. This process is characterised by an integrated combination of salting, drying, heating and smoking steps.
- **"Smoking by regenerated smoke"** is a process of treating fish by exposing it to smoke which is reproduced or regenerated as an aerosol of smoke condensate (liquid smoke) in a smoking chamber under the time and temperature conditions similar to those for hot or cold smoking.
- **"Smoke drying"** is a process in which fish is treated by combined smoking and drying steps to such an extent that the final product can be stored and transported without refrigeration and to achieve a water activity of 0.85 or less.
- **"Drying"** is a process in which the moisture content in the fish flesh is decreased by exposing the fish to circulating air under controlled conditions.
- "**Hot smoking**" is a process in which fish is smoked at an appropriate combination of temperature and time sufficient to cause the complete coagulation of the proteins in the fish flesh. Hot smoking is sufficient to kill parasites, to destroy non-sporulated bacterial pathogens and to injure sporeformers of human concern.
- **"Cold smoking"** is a process of treating fish with smoke using a time/temperature combination that will not cause significant coagulation of the proteins in the fish flesh but that will cause some reduction of the water activity.
- **"Smoke Condensates**" A smoke condensate is a freshly generated smoke that has been cooled, condensed, and filtered to remove undesirable contaminants to produce a condensed liquid that gives rise to smoke colour, taste, and preservation when used in the smoking process.
- **"Smoke flavours"** are either smoke condensates or artificial flavour blends prepared by mixing chemically-defined substances in known amounts or any combination of both (smoke-preparations).
- **"Smoke flavouring"** is a process in which fish or fish preparations are treated with smoke flavour. The smoke flavour can be applied by any technology (e.g. dipping, spraying, injecting, soaking).
- **"Salting"** is a process of treating fish with salt of food grade quality to enhance flavour and/or to lower water activity in fish flesh by any appropriate salting technology (e.g. dry salting, brining, injection salting).
- **"Packaging"** is a process in which products covered by this code are put in a container to avoid contamination, prevent rehydration and quality losses and/or extend shelf life.
- **"Storage"** is a process in which products covered by this code are kept under conditions to assure their safety and quality in conformity with Sections 3 and 6 of the Standard for Smoked Fish, Smoke-Flavoured Fish and Smoke-Dried Fish (under development).

SECTION 12.1 - PROCESSING OF SMOKED FISH

In the context of recognising controls at individual processing steps, this section provides examples of potential hazards and defects and describes technological guidelines, which can be used to develop control measures and corrective actions. At a particular step only the hazards and defects, which are likely to be introduced or controlled at that step, are listed. It should be recognised that in preparing a HACCP and/or DAP plan it is essential to consult Section 5 which provides guidance for the application of the principles of HACCP and DAP analysis. However, within the scope of this Code of Practice it is not possible to give details of critical limits, monitoring, record keeping and verification for each of the steps since these are specific to particular hazards and defects.

Smoking of fish and dried smoking of fish have a long tradition as preservation methods for fish. As such experience regarding the potential hazards has been gained over the time. New technologies of smoking and smoke flavouring of fish and storage of smoked products and smoke-flavoured products under refrigerated and frozen conditions have altered the barriers to growth of bacteria.

Whilst new technologies have been developed for the production of smoke-dried products, the low water activity of the end products has not altered the product stability and safety during storage.

The pre-requisite programme described in Section 3 applies as well as the general considerations for the handling of fresh fish in Section 4, and the description of HACCP and DAP analysis in Section 5.

The recommendations made for the production of fresh fishery products in Section 8 are valid for the preparation of fish used as raw material for the production of fish products covered by this section.

If raw material likely to contain viable parasites is to be used steps must be taken to eliminate this hazard during processing steps, e.g. freezing, heating or salting the product. Alternatively, the final product should be treated in a way to kill parasites.

The topics to be dealt with in this chapter will be those covering the special features of the smoked products, smoked-flavoured products and smoke-dried products as well as the handling of these products. Where the process, packaging or storage conditions of the product are not described in this code, the operator should endeavour to scientifically validate the safety of such a process, packaging or storage of the product so as to eliminate further hazards to the consumer.

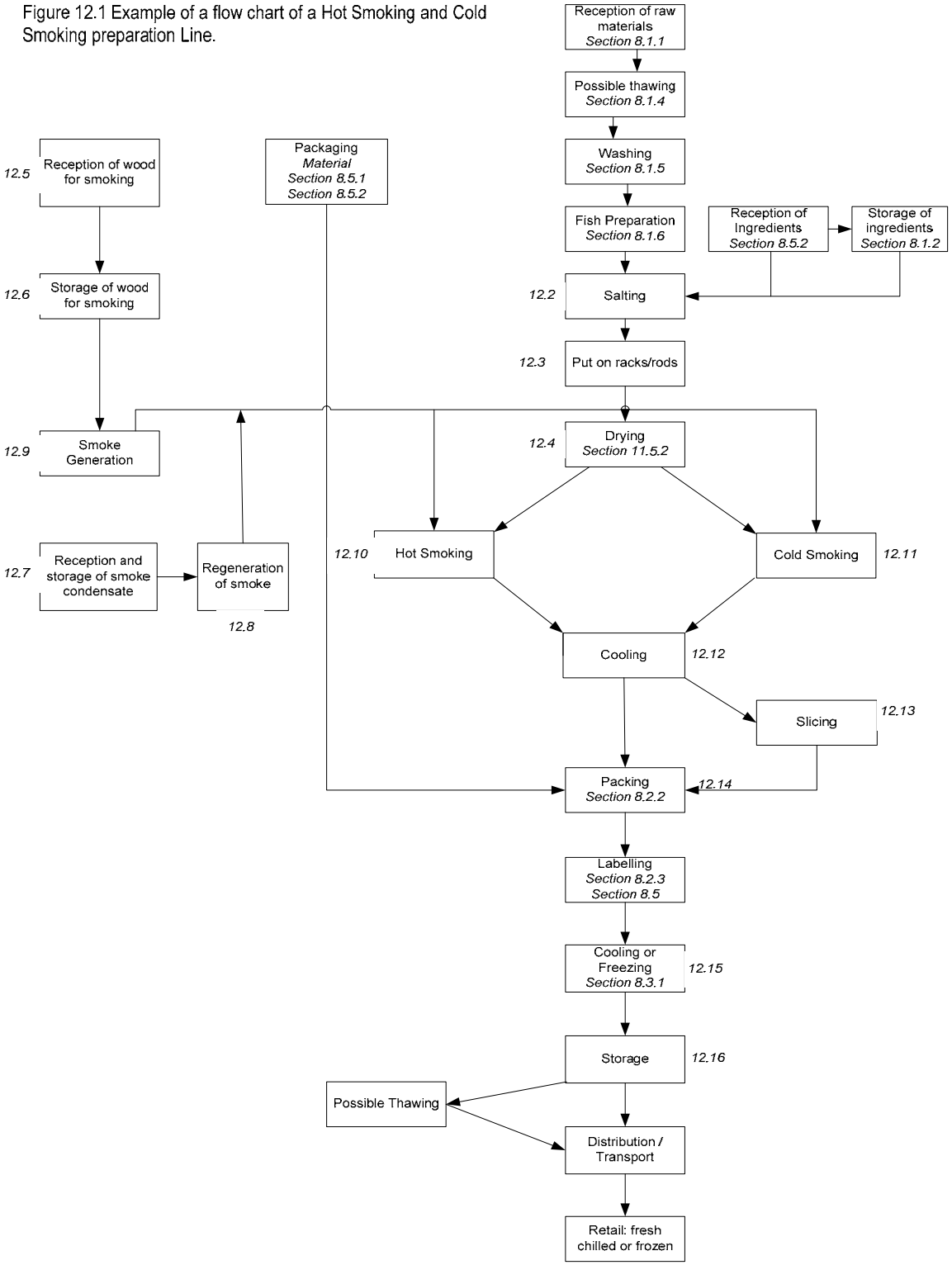
Hot smoked products and some cold smoked products, such as smoked salmon are ready to eat without a further cooking preparation stage. For these products it is necessary to introduce highcare practices during the processing, which would include employment of trained staff who handle products in segregated areas, using dedicated equipment. For instance non smoked and smoked fish must be kept separate to avoid cross contamination.

Figure 12.1

Example of a flow chart of a Hot Smoking, Cold Smoking and Smoking by regenerated smoke preparation Line, including possible slicing operation at the Cold Smoking line.

This flow chart is for illustrative purposes only.

For in-factory HACCP implementation a complete and comprehensive flow chart has to be drawn up for each process.



12.1.2 Salting (see also sections 11.3 and 11.4)

Potential Hazards: Microbiological contamination, chemical and physical contamination, biotoxins, scombrotoxins

Potential Defects: Decomposition, physical contamination, undesired texture

Technical Guidance:

- Typically fish for hot smoking are salted only a short time for enhancing flavour, using a low to medium strength salt brine.
- Fish for cold smoking are dry salted, wet salted, combined salted or salted by brine injection of a medium strength salt brine to enhance flavour and for safety purposes. To ensure a uniform salt distribution throughout the fish, it is left for up to 24 hours under refrigeration to equilibrate.

  Histamine formation may develop in fish of the susceptible species, if the fish is kept at a too high temperature for a prolonged time.
- Brine should be prepared from food grade salt and water of potable quality.
- Brine should be replaced according to the environmental conditions and the process.
- Salt content of the brine should be monitored regularly.
- For fish for cold smoking the salt content in the fish should be more than [3%] [3.5%] salt in the water phase to avoid growth of *Clostridium botulinum.*
- The brine should be kept cooled and the temperature should be monitored, in particular if the brine is recycled for pickle injection.

  Where brine is injected special care should be taken for the maintenance, cleaning and disinfection of the equipment (section 11.4.2).

  To assure proper salting the fish should be of similar size.

12.1.3 Hanging and racking

Potential Hazards: unlikely

Potential Defects: Physical damage, inadequate separation

Technical Guidance:

- Fish should be hung or racked in a way that ensures that pieces are completely separated from each other allowing an adequate flow of air/smoke.
- The mesh in the racks should be large enough to allow an adequate flow of air/smoke.

12.1.4 Drying

See Section 11.5.2

Technical Guidance:

- The drying process should ensure that the fish loses an adequate amount of water to be stable during the hot smoking process.
- Care must be taken to avoid excessive loss of moisture leading to poor (dry) texture.

12.1.5 Reception of wood or plant material for smoking

Potential Hazard: Natural toxins, chemicals, paint, impregnating material in the wood or plant material

Potential Defect: Undesirable odours

Technical Guidance:

- The wood or plant material should be dry enough for smoking and free from chemicals, paint etc.

- Wood or plant material of species (e.g. eucalyptus) not suitable for smoke production should not be used.

12.1.6 Storage of wood or plant material for smoking

Potential Hazards: Toxin formation from moulds

Potential Defects: Undesirable odours

Technical Guidance:

- Wood or plant material for smoking should be stored in a dry place.
- Contamination during storage should be avoided.

12.1.7 Reception and storage of smoke condensate

Potential hazards: Residues of PAH

Potential Defects: Unlikely

Technical guidance:

- Smoke condensate should come from a reputable and reliable source.
- Containers with smoke condensate should be stored in a dry, clean place.
- Containers with smoke condensate should be labelled adequately as such.

12.1.8 Regeneration of smoke

Potential hazard: Unlikely

Potential defects: Inadequate smoking

Technical guidance:

- "To be developed."

12.1.9 Smoke generation from wood and other plant material

Potential hazards: Formation of excessive amounts of PAH

Potential Defects: Inadequate smoking

Technical guidance:

- The amount of smoke entering the chamber should be controlled in line with the instructions of the manufacturer.
- Smoke generation is created by smouldering (pyrolysis) and care should be taken to ensure that there is no flame development.

12.1.10 Hot smoking

Potential hazards: Survival of parasites and micro-organisms, chemical contamination from smoke

Potential defects: Physical contamination (tar, ash), poor colour, flavour and texture

Technical guidance:

- Time and temperature of the smoking process should be monitored to achieve the desired colour, taste and texture.
- The temperature in the centre of the product has to reach [65°C] for complete coagulation of proteins and [72°C] in the thermal centre for at least 2 minutes for effective control of *Listeria*. Other time/temperature combinations which have the same effect can be used.
- To achieve the above the heated air and the smoke should be evenly distributed in the smoking chamber.

12.1.11 Cold smoking

Potential hazards: Chemical contamination from smoke, growth of Clostridium botulinum

Potential defects: Physical contamination (tar, ash), poor colour, flavour and texture

Technical guidance:

- In the cold smoking process the temperature of the products is kept below the coagulation temperature for the fish, usually under 30°C, but can vary between 27°C and 38°C.
- Time and temperature of the smoking process should be monitored to achieve the desired colour, taste and texture.
- Cold smoking must be carried out under microbiologically monitored hygienic conditions in a chamber and using equipment that is subjected to a detailed hygienic schedule.
- Smoking time should be long enough to reduce the water content of the product sufficiently.
- The total smoking process should be continued until moisture content targets and weight loss targets are reached.
- The salt content in the water phase must be above [3 %] to assure effective control of growth of *Clostridium botulinum*.

12.1.12 Cooling

Potential hazards: Microbiological contamination

Potential defects: Poor taste and texture

Technical Guidance:

- Cooling should be done in a controlled environment to avoid cross contamination.
- When smoking is finished the fish should be cooled rapidly and thoroughly to a temperature which minimises microbiological growth in relation to the determined shelf-life.
- Cooling too slowly may promote the growth of microorganisms harmful to humans.

12.1.13 Slicing

Potential hazards: Microbiological contamination

Potential defects: Physical contamination, poor slices

Technical guidance:

- The smoked fillets may be cold tempered to stabilise the fish flesh for mechanical slicing.
- The slicing process and the transport of the conveyer belts are critical to the hygienic condition of the end product.
- maintain a flow of products to avoid undue accumulation of products along the processing line.
- The slicer and the conveyer belts should be kept clean by frequent and planned cleaning during the process.
- The slicing devices should be well maintained for optimal slicing performance.

12.1.14 Packing

Potential hazards: Microbiological, chemical and physical contamination

Potential defects: Physical contamination

Technical guidance:

- Smoked products may be chilled or frozen prior to packaging.
- Packaging material should be clean, sound, durable and sufficient for intended use and of food grade material.

- Condensation of water on the surface of the smoked product should be avoided.

12.1.15 Cooling or freezing

Refer also to Sections 8.3.1 and 12.12

Potential hazards: Microbiological growth, survival of parasites

Potential defects: Poor taste and texture

Technical guidance:

- If freezing at this process step is carried out to kill parasites, a time/temperature regime has to be chosen as laid down in Annex I of the Standard for Smoked Fish, Smoke-Flavoured Fish and Smoke-Dried Fish (under development).

12.1.16 Storage

Refer also to Section 8.1.2, 8.1.3 and 14.2.18

Potential hazards: *Microbiological growth*

Potential defects: Poor taste and texture, decomposition, freezer burn

Technical guidance:

- For the control of *Clostridium botulinum* refer to Annex II of the Standard for Smoked Fish, Smoke-Flavoured Fish and Smoke-Dried Fish (under development).
- Temperature recording in the cold store is essential for both cooled and frozen product to meet shelf-life requirements.

12.2 SMOKE-FLAVOURED FISH

Smoked-flavoured fish is a product which imitates a smoked product in taste.

The smoke flavour can be applied in different ways via different technologies and at different stages of the process. In contrast to the smoking process, the different production steps are not necessarily carried out in a smoking chamber and are not carried out in a fixed order. Heat can be applied at all stages of the process, or the product can be sold uncooked to the final consumer for further preparation (heating).

The deviating characteristics of the smoke-flavoured products shall be clearly described on the label so as not to mislead the customer.

Potential hazards: Microbiological contamination, parasites, physical contamination, chemical contamination

Potential defects: Too little or too much smoke flavour, non-homogenous distribution of smoke flavour

Technical guidance:

- Fish used for smoked-flavoured fish should be of good quality and prepared according to good manufacturing practices.
- Smoke flavours should not be used in an attempt to improve poor quality fish.
- Smoke flavours must be applied according to the manufacturer’s recommendations.
- Only approved smoke flavours from reputable manufacturing sources should be used.
- Smoke flavours that are diluted prior to application to the fish must be diluted with food grade materials and/or water of potable quality

12.3 SMOKE-DRIED FISH

The product has to be rehydrated, which is generally done by putting the product in boiling water or soup prior to consumption.

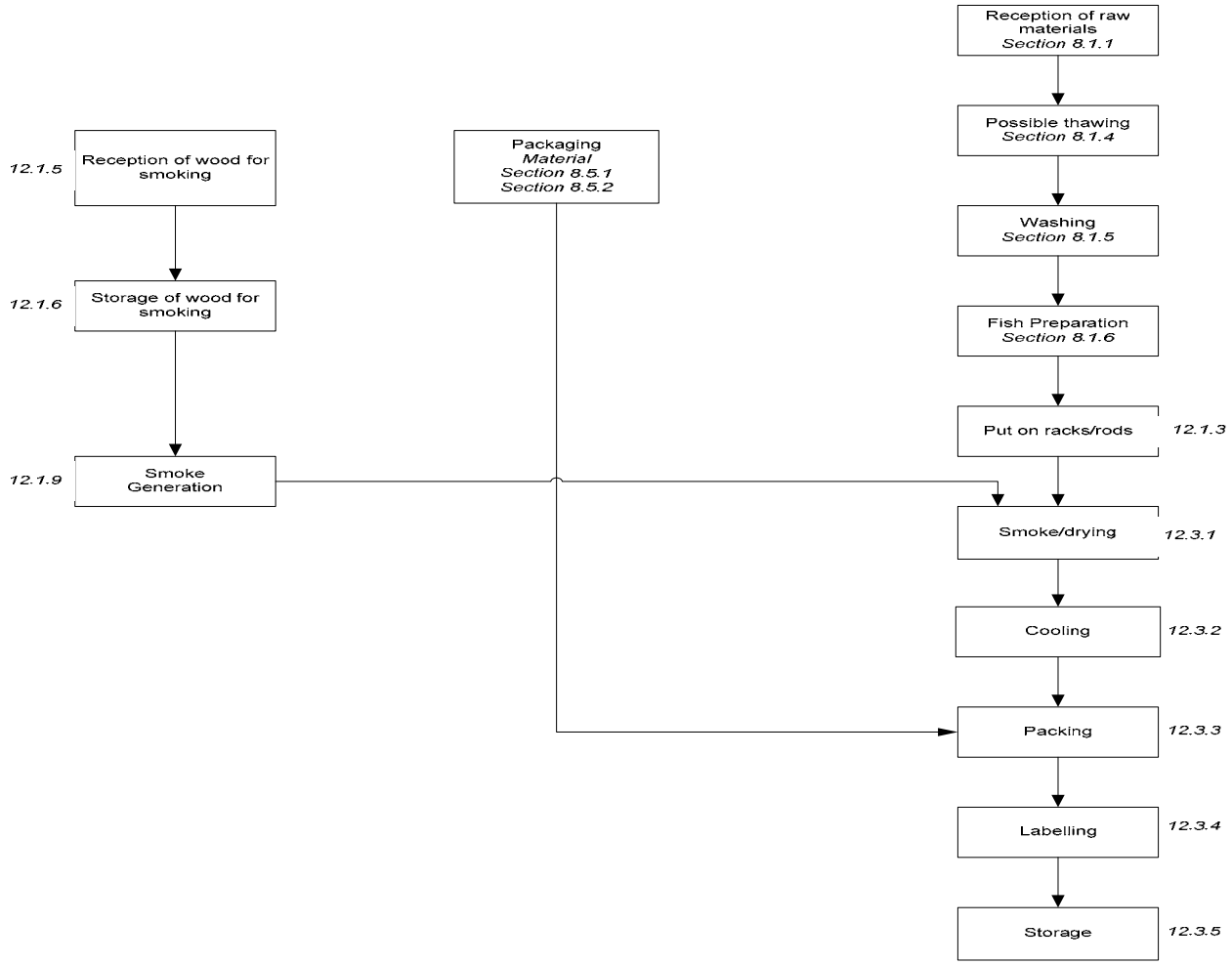
Figure 12.2

Example of a flow chart of a smoked dried fish preparation line.

This flow chart is for illustrative purposes only.

For in-factory HACCP implementation a complete and comprehensive flow chart has to be drawn up for each process.

Figure 12.2 Example of a flow chart of a Smoked Dried Fish preparation Line



12.3.1 Smoke drying

Potential hazards: Survival of parasites and micro-organisms, chemical contamination from smoke

Potential defects: Physical contamination (filth), burnt parts, poor texture

Technical guidance:

- Time and temperature of the smoking process should be monitored to achieve the desired texture and -water activity.
- To achieve the above the heated air should reach each part of the product evenly.
- The fish should be far enough away from the fire to prevent any burning of fish parts.
- Contamination of smoke dried products with sand, ash, dusts, filth and rust should be avoided.
- No animals, domestic or wild should have access to the smoke drying area.

12.3.2 Cooling

Potential hazards: Unlikely

Potential defects: Insect infestation, cross contamination with filth

Technical Guidance:

- When smoke drying is finished the fish should be allowed to cool to ambient temperature.
- Cooling should be carried out in a dry area under controlled conditions to avoid partial rehydration and cross contamination, respectively.
- No animals, domestic or wild should have access to the cooling area.

12.3.3 Packing

Potential hazards: Chemical and physical contamination

Potential defects: Physical contamination, physical damage

Technical guidance:

- Packaging material should be dry, clean, sound, durable and sufficient for intended use and of food grade material.
- The packaging should enclose the product to protect it against environmental influences, according to the law and customs in the country where the fish is to be sold.
- Rehydration of the smoke dried product should be avoided.

12.3.4 Labelling

Potential hazards: Unlikely.

Potential defects: Incorrect labelling.

Technical Guidance:

- The smoke dried products should be clearly labelled and contain information that the product has to be rehydrated and heated prior to consumption.

12.3.5 Storage and transportation

Potential hazards: Unlikely

Potential defects: Insect infestation, physical damage

Technical guidance:

- The smoke dried fish should be handled with care.
- Care should be taken to avoid any rehydration.