FISH SMOKING

Smoking as a method of preservation of perishable foods dates back to civilization. Fish and fishery products are one of the most perishable of all staple commodities. They are, therefore, suitable media for the growth and proliferation of micro-organisms. To prolong the shelf life of fish, fish is preserved by smoking. Smoke is generated from wood by burning. Smoke has bacteriostatic, bactericidal and antioxidant functions while heat generated from the wood has dehydrating effect on the fish.

The combination of these processes gives fish dry effect. Hence a well smoked fish can keep in storage for months without undergoing spoilage.

Fish smoking is the traditional occupation of artisanal fishermen and women in Nigeria with simple traditional ovens. There are different types of local ovens being used depending on the location. In the Northern part of the country, Banda is used generally while in the South, it ranges from simple pit-ovens to drum-oven. The most important advantage of these simple ovens is the low capital cost. However, many disadvantages have been reported which include:

- Inefficient utilization of fuel wood
- Poor quality of fish due to lack of control over the temperature of the fire and the density of smoke.

To arrest these problems many workers have invented improved smoking kilns such as Chorkor kiln, Altona/Watanabe smoking kiln, Ivory Coast kiln, etc.

TYPES OF FISH SMOKING PROCESS

Two types of smoking processes are in common use. The cold smoking process in which the temperature of the smoke does not exceed 30^{o}C and hot smoking process during

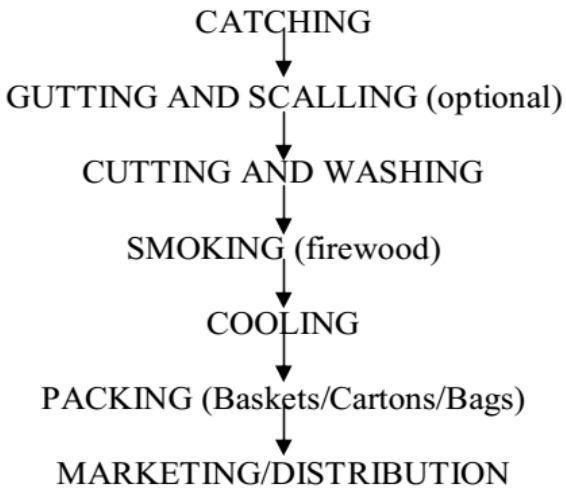
which the fish is properly cooked with their temperature reaching 120^{o}C or so while the centre of the fish may be 60^{o}C.

Cold smoking is practiced in advanced countries where alternative means of preserving the fish such as refrigeration is available. Cold smoking is primarily to improve the flavour of the fish and retain its nutritive value. Cold fish is not well cooked, has shorter shelf life and is easily infested by micro-organism such as bacteria and molds if not properly stored in a refrigerator. Moisture retention is usually high and may be in the order of 35-45%.

Hot smoking is the traditional method of fish smoking in the tropics. Fish is smoked until cooked in order to obtain a product with extended shelf-life, since alternative preservation methods such as refrigeration are absent in the remote fishing villages where most fish processing takes place. The primary aim of hot smoking is to preserve the product flavour and colour arising as a result of preservation function.

The Traditional Smoking Process

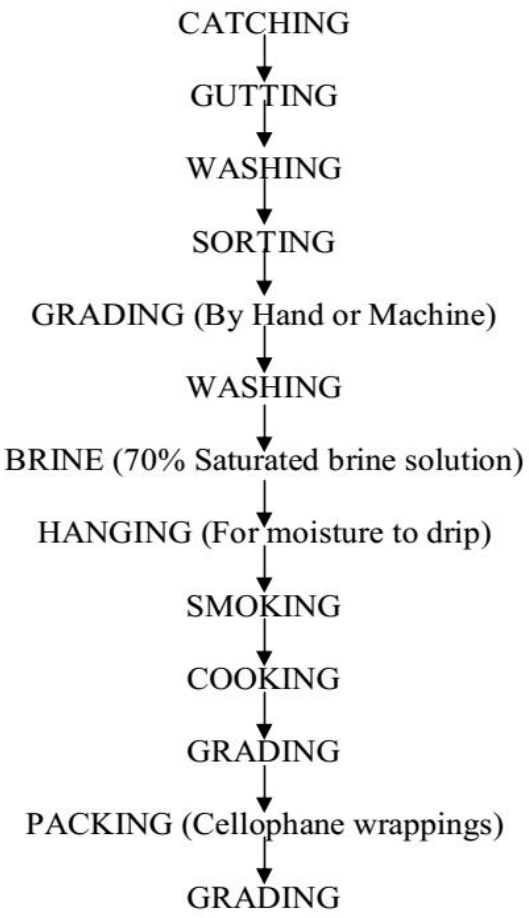
The traditional smoking process is widespread and supply the bulk of smoked fish found in most markets in Nigeria using the traditional smoking kilns. Below is the flow chart of how fish is smoked traditionally:



Flow-chart for a traditional Fish Smoking

The Modern Smoking Process

The modern smoking is practiced using the mechanical smoking kilns. This mostly practiced in the advanced countries of the world. The smoking process can be summarized as follows:



Flow-chart of the Modern Smoking Process

FISH DRYING AND THE USE OF SOLAR TENT DRYERS

Drying of fish in the open sun is a common worldwide and also in Nigeria, especially in the arid and semi-arid regions such as Lake Chad area because of the very arid conditions there. However, there are significant losses due to spoilage, contamination by dust and insect infestation because he fishes are dried on bare ground.

To reduce post harvest losses and improve the poor conditions of fish dried on bare ground solar dryers of varied kinds and designs are in use in some part of the world for fish preservation.

Fishes dried in solar dryers like the solar tent are far cleaner and better than those on bare ground. They also have no foul smell arising from the fish as a result of on-set of decay. NIFFR solar tent has been widely extended and accepted in over 20 fishing villages around Kainji Lake and Jebba Lake. The dryer is made of cheap and locally available material.

When many fisher folks around the country eventually adopt the technology, it is hoped that the solar dried fish (which bears very close resemblance to the imported cod stock) will save the country huge foreign exchange.

FISH PROCESSING

FISH CANNING

Is a process involving heat treatment of fish in sealed containers made of tin plates, aluminum cans or glass, until the product has been fully sterilized. For example canned Geisha and canned Sardines. It makes fish available for the inhabitants of very remote non-fishing areas.

During canning heat treatment should be sufficient to destroy all heat sensitive bacteria and spores, inactivate the enzymes and cook the fish so that the products remain acceptable to the consumers after prolonged storage.

Commercial Sterilization: it is used in thermal processing to describe the heat treatment designed to kill substantially all micro-organisms and spores which if present would be capable of growing in the product (it eliminate the spores of Clostridium botulism and reduced to the barest minimum the spores of the most heat resistance spore forming food spoilage micro-organism e.g. Bacillus stearothermophilus.

The canned food fish is also prevented from contamination by pathogenic organism by storing them in a air-tight package. If the heat treatment is properly carried out, canned fish may remain in storage for several years without refrigeration.

Excessive heat treatment or over processing must still be avoided, as this will adversely affect the organoleptic and nutritional quality of the fish.

Traditional canned fish are obtained from small pelargic fish species such as:

- Herrings (*Clupea spp*)
- Mackerel (*Scomberomerus spp*)
- Anchovies (*Engraulis spp*)
- Tuna (*Thunnus spp*)
- Bonga (*Ethmalosa spp*)

Morocco is the highest producer of canned Sardines.

Fish intended for canning must be in first class condition and must be handled in a hygienic manner to reduce the microbial load on the fish. Poor quality fish will produce canned fish with off odour and flavour with poor texture.

FISH MINCE

It can be defined as fish separated in comunited form from the frames, scales, bones and fins of fish. Fish mince can be prepared either mechanically by the use of flesh/bone separator or non-mechanically. Fish mince is very versatile and can be used to make a variety of products such as fish portions, fish fingers, fish cakes, fish sausage and fish cheese.

Mechanical Preparation

The fish/bone (or meat/bone) separators also called deboning machines can be used to retrieve flesh attached to bones and frames of fish and thus makes them better utilized instead of discarding them as a waste. This machine consists of a feed belt, perforated drum, scraper and an auger.

Fish is prepared by removing the head, skin, bone, internal organs such as gut, kidney, liver, air-bladder, blood vessel, etc (i.e make fish blemish free material before passing to a flesh/bone separator).

The prepared fish is fed into the deboning machine which squeezed the fish between the feed belt and perforated drums in such a way as to allow only flesh to pass through. While the bones and skins are collected separately. This is used in recovering so-called flesh (about 10% extract flesh) which otherwise would have been discarded from its frame. All these are utilized, thus maximizing the profit from the landings and fish is still made available cheaply to the consumers.

Non-mechanical

It involves the use of organic acid to produce minced fish by a combination of physical and chemical methods, and end product may have rancidity or autolysis.

SURIMI

These are wet concentrates of proteins of fish muscle that is mechanically de-boned, water-washed fish flesh. It is prepared from marine fish after minced fish has been cold water-washed at 10% to remove fat and water soluble components. After washing, sieve the water to recover the remaining solids which is tasteless, odourless and white which is the base for surimi. The end product is frozen and is used in the preparation of diverse

fish foods such as kamaboko, tempura and chikwa (Japanese Surimi based products), fish sausage, fish ham, fish stick, fish balls and hamburger.

The difference between minced fish and Surimi is that while minced fish is the fish flesh which is separated from bones and skin (usually mechanically) surimi is prepared after minced fish have been washed in water to removed fat and wet soluble components.

Differences between fish processing and preservation

- Processed fish may be consumed directly while preserved fish may need some form of preparation before consumed
- Processing of fish often enhance its quality while fish preservation does not
- Fish processing is laborious and time consuming while fish preservation requires short time and not laborious
- Fish processing is quite expensive while fish preservation is less expensive
- Fish preservation require high technical know-how and skill labour while fish preservation require little or no skill

Similarities between fish processing and preservation

- Both increase shelf-life of fish
- Both can occur simultaneously. For example fish meal produced by sun-drying, oven drying or smoking (preservation) before grinding (processing)
- They both reduce post harvest resource waste/loss
- Both produce end point which are different from the starting point