

Battered and breaded fish products

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The most important item among the group of value added products is the battered and breaded products or coated products processed out of a variety of fish and shell fish. A coated product is one, where a food material is coated with another food stuff. Coating the food product with a batter and breading before cooking is an established age old domestic practice. However, changing food habits of consumers has created the need for an increased market supply of ready to cook or ready to serve products which include the most prominent coated fishery products.

Breading and battering of food products enhance characteristic such as appearance, flavour and texture. Battered and breaded products offer a convenient food valued widely by the consumer. Many products are coated and immediately frozen, or they may be pre-fried, and then frozen for distribution and sales to consumers and food service establishments. They can be quickly reconstituted by conventional heating methods. As far as fish processing industry is concerned, value addition is one of the possible approaches to raise profitability, since this industry is becoming highly competitive and increasingly expensive.

The coating process

The production of battered and breaded fish products involves several stages; they are portioning/forming, pre-dusting, battering, breading, flash frying, freezing and cold storage.

Portioning/forming

Portioning is an important stage in the production of coated fish products. The objective of this step is to cut or shape the substrate in the most economical way so that minimum loss occurs during portioning and further processing. Cutting loss and surface area of the portions are two important points which determine the economics of coated products. Fish blocks are the common substrate used for the preparation of coated fish products. Fish block refers to frozen fish fillets moulded into a block. A recent innovation for the catering sector is forming of skinless and boneless fish fillet into a pre-determined shape and size using specially designed forming machines. The shapes vary from conventional fillet shape to fingers, nuggets etc.

Pre-dusting

Before dipping into batter, the fish portion is given a pre-dusting in a fine raw flour type material. Batter mix itself can be used for pre-dusting. A more sophisticated and expensive pre-dust may contain salt, spices, seasonings and flavourings for functional and flavouring purposes. The purpose of pre-dusting is to prepare the surface of portion so that batter can adhere uniformly. Pre-dusting machines of varying capacities for different types of products are commercially available.

Application of batter

A batter can be defined as a liquid mixture composed of water, flour, seasonings into which food products are dipped before cooking. Conventional batters are of low to medium viscosity and hence, can be applied with total submersion or overflow batter applicators. The formula for the preparation of batter mix is given in Table 1. The batter flour is mixed with two parts of water to get the required consistency. The fish portion is totally submerged in the batter.

Table 1. Batter mix composition

Maida	1000g
Corn flour	100g
Bengal gram powder	100g
Salt	12g
Sodium tri polyphosphate	5g
Turmeric powder	5g
Hydrocolloids (Guar gum)	5g

Breading

The breading is normally a bread based crumb. The batter coated portions are further coated with bread crumbs. Generally medium sized porous crumbs with relatively large granulations are used. Breading can be done manually or mechanically. The bread crumbs are uniformly applied over the product and excess crumbs are removed using an air

blower. The coating pick up depends on the viscosity of batter and type of crumbs. In general, a pick up ratio of 30-35 % is advised.

Pre-frying

The purpose of pre-frying is primarily to set the coating on the fish portion. The temperature of frying oil and the time of frying are critical. The normal frying temperature is between 180-200°C and the time is 20-30 seconds. The term pre-frying is used because the final product frying is completed by the consumer for a duration of 4-6 minutes depending on the portion size and thickness.

Freezing

Immediately after the flash frying, the product is cooled by a fan and then frozen in an IQF machine at -40°C. Freezing is usually carried out in a spiral freezer. Since the fried portions are fragile, care should be taken to avoid contact between the portions while loading in the freezer.

Packing and storage

The coated product may undergo dehydration, discoloration and becomes rancid during frozen storage. Use of proper packaging material can prevent these problems and enhance the shelf life. Thermoformed containers are most commonly used for coated products. The packed products are usually stored in a cold store at -20°C.

Coating equipment

Manual coating is time intensive and is low efficient. Besides hygienic handling of the product is practically impossible and the quality of the product will be inferior. The introduction of coating equipment solves this problem. Each step in coating requires a separate machine or component.

Forming machine

When the consumer demand different shapes like round, oval, star etc., a forming machine is required. A machine with different dyes will serve this purpose. The different shapes can be produced only with surimi or fish mince. Depending on the market demand, the product can be formed into any shape.

Pre-dusting machine

Pre-dust is usually applied by a breading machine suitable for handling flour. This will also have a special sprinkler conveyor that applies a thin and even layer of pre-dust to the top of the product.

Batter application equipment

The main problem during battering is that batter solids settle out during coating operation. To overcome this problem, two types of batter applicators are used. One is over flow type and other is a sub-merger type which has a top sub-merger device. In the earlier type, batter applicator machine will draw the portion through a shallow puddle of batter by a conveyor belt so that the bottom of the product is

coated with batter. The continuous overflowing of the batter coats the top of the product. An air blower is used to remove excess batter. In top sub-merger applicators, the batter is recirculated both within the batter machine itself and through an automatic batter make up system. A top sub-merger is used to keep the products under the batter.

Breading application equipment

The design and operation of breading equipment depends on the properties of the bread crumbs. There are 3 types of bread crumbs; free flowing, flour type and Japanese crumbs. A free flowing breading machine coat the product with bread crumbs by recirculating the breading material using a pump. In flour type breading machines, as the breading is not free flowing, the movement of bread crumbs through the machine is mechanically driven by a augers or vibrators. Most Japanese crumbs consists of a mixture of large, coarse and fine particles. In a typical Japanese applicator machine, the different sized particles are separated and then recombined in the proper proportion and deposited onto the product.

Fryers

The frying operation during the coated product preparation may be fully or partially dependent on the type of the product. A continuous food fryer is a material handling conveyor that carries the product through the cooking oil. Speed limit of the conveyor belt is set by the specific frying time of each product. The fryer should have the sufficient heating capacity to maintain the set temperature.

Freezer

Spiral freezers are used for freezing coated products. These freezers require less space and can be easily adapted to the process line.

Coated fish products

A wide variety of coated products can be prepared from fish fillet, mince, crustaceans etc. Generally lean white fleshed fishes are used for the preparation of coated products. Fresh water fishes like catfish, tilapia is suited for this purpose as they have white and easy to prepare fillet. A brief description of different products is given below.

Coated fish fillet

Fried coated fish fillet is a prominent food item in the European markets. Table sized fishes with a minimum pin bones are suitable for making this product. Skinless fillets are given a cold blanching treatment in 2% brine for 3-5 minutes and then drain off. This will improve the color and texture of the fillet. The breading and battering are done as described above. The frozen coated fillets are immediately packed in thermoformed containers or pouches. A specified number of such consumer packs are then packed in master cartons and is stored at -20°C.

Fish fingers/ fish steaks

Fish fingers are regular sized portions cut from rectangular frozen block of fish fillet or fish mince. Fish fingers are made into different shapes

such as rectangular, square, wedge and French cuts. A typical british coated fish finger weighs about 28 g of which upto 50% is contributed by batter and bread crumbs. The cut pieces are given a coating of pre-dust, batter and breading as in the case of fish fingers. It has been observed that sensory quality of fish finger developed from fish fillet is superior to that developed from mince block.

Mince based products

Mechanically deboned fish meat is termed as fish mince. Meat is separated from the fish by forcing the fish against a screened surface, so that the flesh passes through the opening as a finely ground paste known as mince. A meat bone separator is used for this purpose. A common type of meat bone separator is a belt and drum model. The headed and gutted fish is passed between a counter rotating belt and a perforated drum. The meat is passed through the perforations in to the interior of the drum while bones and other solid materials are retained on the outer drum shell where it is removed by a scraper. The perforations in the drum are usually 3-7 mm in dia. The bone free meat/ mince is delivered to one side by means of a screw conveyor in the drum. The initial quality of fish is very important in deciding the yield and quality of the mince. About 50-60% of the whole fish can be removed as mince by using drum type meat bone separators. Generally minced fish is block frozen as 1-2 kg blocks at -40 ° C in a plate freezer and stored in cold store at -18 ° C. Depending on the type of raw material, fish mince can have a frozen storage life up to 6 months without any appreciable quality deterioration.

Molded fish products from mince

Fish mince is a raw material for a variety of value added molded products like balls, cutlets, surimi based analogs etc. Molded fish product occupy an important position among the sea food products. They have all the beneficial features of seafood along with the added nutritional ingredients. The molded products have good market share in the Indian snack food industry. These products also go to the export market and earn foreign exchange for the country.

Fish balls

Fish balls are generally prepared from the mince of low cost fish. The preparation of fish ball is simple and requires only few locally available ingredients. Hence it is an ideal product for small scale units. The simplest way of preparing ball is by mixing the fish mince with starch, salt and spices. The mix is then made into balls, cooked in boiling 1% brine. The cooked balls are cooled and then battered and breaded.

Fish cutlets

Fish cutlet has become a popular snack at celebrations, household functions, tea times etc. The basic raw material required for preparation of this product is cooked fish meat generally from less costly fresh water fish or cooked meat from skeletal frame obtained after filleting of fresh water fish. Cooked fish mince is mixed with cooked potato, fried onion, spices and other ingredients. This mass is then formed into the desired shape, each weighing 30 g. The formed cutlets are battered and breaded. Finally, it is

frozen and stored in the thermoformed trays at -20°C.

Fish burgers

Fish burgers are more or less similar to fish cutlets but less spicy. Usually burgers are eaten sandwiched with fresh vegetables and plain buns. Mince from white fleshed species is generally used for the burger preparation. Cooked mince is mixed with salt, cooked potato, fried onion, flour, spice mixture and formed into the preferred shape. Generally, the starch content is to be kept below 15% and the meat content must not be less than 30% for ensuring a meaty flavour.



Fig. Fish burgers

Fish sausage

Fish sausage is an analog of sausage prepared from meat/ chicken sausage. The major ingredient is fish mince. Mince is mixed with salt, sugar, sodium glutamate, starch and soy protein in a silent cutter. Spices can be added according to the preference. The

paste thus formed is stuffed into a casing made of animal origin or synthetic origin. Stuffing is done by an automatic screw stuffer. The casing tube is closed by a metal ring. The sausage is then heated in hot water at 90°C for 40-60 mnts. After cooling, it is cooled down slowly to avoid shrinkage of casing material and then stored at refrigerated condition.



Fig. Fish sausage

Coated fish analogs

Several value added seafood analogs can be prepared from surimi made from white fleshed lean fishes. Surimi is washed and frozen fish mince

added with cryoprotectants. The repeated washing of mince removes water soluble nitrogenous matter and flavour compounds. Surimi is used as the raw material for the preparation of sea food analogs. The most suitable Indian species for surimi preparation is threadfin bream, croakers, ribbon fish, lizard fish, barracuda grouper etc.

The formulation for seafood analog comprises surimi, water, starch, other proteins, oil, salt, flavorings and colorants. Salt is added to solubilise the surimi proteins and permit it to make elastic and firm gels after cooking. The texture is modified by other ingredients such as cold water and starch.

Surimi based seafood analogs are developed in several styles, but particularly as crab meat. Crab meat is made as filaments and shaped as crab stick or crab claw. Crab stick is the currently the most prevalent surimi based fabricated sea food products in the world and is manufactured in large quantity. For imitation shrimp, lobster and scallops, the product is made using moulds. All these imitation products can be further converted to coated products by battering and breading process. These seafood analogs possesses the accepted texture, flavour and appearance of the authentic products.