

**Course Name: Canning Technology and Value Addition in Seafood**

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**Lecture:17**

**Seafood pre-processing P1**

Welcome to the NPTEL course, Canning Technology and Value Addition of Sea Foods. We were discussing about canning procedure for various seafood products. In the previous two sessions, we had discussed about canning of fin fish and, canning of crustaceans and molasses also we had seen. In this session, we will be discussing about pre-processing methods. Processing of fish, why it is being done? It is to ensure the best possible market quality, to ensure proper form of final product, also to ensure safe health and it is most important to process the product, raw product and also to reduce the waste. So, these are the objectives of processing, why we go for processing. Also, in simple words, processing helps in not only saving the, preserving the nutritional quality, it helps in extending the shelf life. But at the same time, it also ensures that the products are available during off seasons and at the distant places. That are also the objectives of the processing. The main goal of processing is to have high product quality and extended shelf life.

Fish being a perishable commodity, we need to preserve the flavor and texture because it undergoes rapid changes. It depends upon the temperature and the conditions where it is being caught. To reduce the temperature or to reduce the microbial contamination, immediately after the capture of the fish, it needs to be de-cut and beheaded and washed. It removes the chances of contamination or the spread of microbes to the other parts of the body. And for these reasons, live fish, the maintenance of live fish or transportation of live fish has also been preferred. In many markets, these are encouraged in fact, they have tanks where they can maintain the live fish and the consumer they can go and actually they can buy the product by just looking at them and they can collect the fish they want. While capturing, the stress and damage caused by the fishing methods, they also act as a mediator for the physiological changes. They also cause further spoilages and other processes. So, these things it happened during the capture of fish and during pre-processing, we have to avoid such kind of products and the damaged products or where the microbial contamination has happened or it has begun, such types of products need to be changed. Deformed products need to be removed or discarded.

Pre-processing is actually a preparation step which prepares the fish for the final processing. If the final processed product needs to be good, if it has to be in the good condition, then pre-processing should do more efficiently. And pre-processing it can be done on the ship, the ship is going for days to gather for fishing, then it can be done on

board or it can be done in the shore after bringing the material to the plant, the pre-processing can be done. So usually when it reaches to the plant, it is inspected, washed, sorted, graded and it is butchered if it is larger in size. And during butchering, we remove the unwanted parts that is head, viscera, tail and fins.

During this process, 30 to 70% of the fish is being discarded, that is waste part which is not utilized, it is being discarded and this enters into the feed industry. Now, after pre-processing, the fish it can be sold as whole or it can be processed into different forms. If we are selling the products as whole, then this fetches low fare compared to the processed fillets or other forms. So usually, the different forms they fetch more amount or they have higher fare in the market and the discarded materials, they can be used to develop the alternative products. And when we do pre-processing, a number of steps are involved in this. It includes scaling, which is removing the scales, then cutting the fins and belly flaps, then deheading, slicing the fish into small pieces or streaks or slices, then evisceration, removing of the viscera part and then filleting and removing bones of fish if it is larger in size, then bones need to be removed and skinning again if it is thick skin, the skin need to be removed and grinding of fillets. These are some of the preliminary steps that are adopted in a pre-processing center. So, if you look at the picture here, you can see in the first figure it is a whole fish and in the second figure it is the head is removed and the gut is also removed. So, this is another form of pre-processed fish, but in this fish the fins are maintained as such and you can market it as such or you can market in the other form where you remove the fins and the head and the gut is also removed or you can cut it into small slices and the rib can be maintained or you remove the rib also. So, these are the different forms of pre-processed fish that can be marketed or that can enter into the processed section. And this is the same figure. You have few more points here. This is fillet here, the single fillet and this is the butterfly fillet where you maintain the midrib. Along the midrib it is cut into two and it is called butterfly fillet and dressing is the process where you remove the fins and the head region and it can be like hole, steaks, breast, fillet. These are the different forms of the fish.

For the efficient preparation of the processed product or to get the top quality and maximum yield the pre-processing should be very efficiently done. For this the skill is required and this skill is acquired only by practice. So, the person who is involved or the people who are involved in pre-processing they need to be practiced regularly only then the skill can be developed. We can also go for mechanized pre-processing and this will reduce the cost and improve the economic performance. In small scale it is not done. It is usually small scale they go for manual method of pre-processing. In larger industries or larger businesses, they go for mechanized way of pre-processing. Initially, the fish is stunned if it is a larger fish similar to the larger animals the fish is also stunned using the electricity and this is to prevent the accumulation of lactic acid which is a byproduct produced as a result of glycolysis and this lactic acid it causes deposition or formation of

red spots in the skin region. This reduces the quality of the product. So, in larger fish we go for stunning so that we can prevent the formation of lactic acid and thereby avoid the development of red spots. Grading is also very important. Grading can be done according to species, according to the size and also the damaged and non-damaged species also can be graded. We can go for manual grading or we can go for mechanical grading. We also have automated sorters but this is rarely used in small plants. This is mainly in larger industries you will find the application of automatic sorters. This is a picture of a sorter. Sorter has a conveyor belt. This is the one which is used in US and it has two smooth rotating rollers. Here you can find the smooth rotating rollers and a conveyor belt. The distance between the rollers and belts they are adjusted in such a way that the thick fish they are retained and they move along the length of the belt whereas the thin fish it falls down and it is separated from the thick fish. So this is one way of sorting the fish and this also helps in grading the fish. Then we have grading machines. There are series of compartments which are connected by slits of varying sizes and with the help of rotating rollers or conveyor belts different products are graded. They are passed to these compartments and usually the grading is done according to the thickness and the thickness and length they are correlated together. A particular size of fish or the length of fish it will have a particular thickness. That is taken as a standardized thing and it is maintained based on that the grading is done for the fish. This is a scaler or the slime remover. It's more like a cement mixture. This was developed from that idea. You will find here one is vertical drum scaler with a rotating bottom and this one is a cylindrical scaler so it is like a cement mixture which is positioned in a tilted angle. In the slime remover the fish is put in the drum and it is washed along with the water so it helps in removing the slime. 2-3% of the body weight is slime and that need to be removed. Slime excretion it stops immediately after rigor mortis. The slime needs to be removed and it is done using washing. Again, this is another rotating scaler or slime remover. Again, this is a perforated one inside it is perforated. The fish it is washed in this along with water it also helps in removing the slime. And these are some of the scalers. These are manual scalers with the help of the scalers the scales can be removed so it is used for descaling process. And usually, the tools are run towards the head region from the tail towards the head region the tools are used.

Sometimes we also go for blanching and blanching the fish for 3-6 seconds in the boiling water and scales can be removed by moving the hand along the perpendicular axis of the body. That is another method of scaling descaling. And we can also go for mechanized or power-resistant descalers. Usually in the small-scale industry if you are going for manual scaling then we use this kind of tools knives and other descalers. There is a larger industry then we go for power-resistant or mechanized tools. And in the electric this is another tool for descaling that is electrical handheld scaler. It's much simpler and it is electrically operated. The speed is much higher than the other manually operated scales. So, it helps the efficiency is much higher and 80-90% of scales can be removed

easily. And in this tool, it consists of a cylindrical rotating scraper of 30-40 mm diameter which is powered by an electric motor. And it is connected to a flexible rod and at the bottom there is a vertical cylindrical scaler which has a rotating bottom and fixed sideboard. And this also helps in removing the scales as well as slime. This also can be used. And then we have cement mixtures which we have seen in the previous slide. This is a larger drum which is placed in a tilted angle. And this is used for descaling large number of fish or large amounts of fish. Fish is put inside the drum and this is a perforated or contour is punctured. The surface is rough. The fish is rotated inside the container along with the water. It helps in removing the scales. This is a cylindrical descaler. The cylindrical scaler with a horizontal rotational axis and it is periodically tilted during the scaling cycle which causes the fish to tumble inside. It's more like the cement mixture where again it is placed at an angle. Initially it is rotated in the horizontal axis but during the scaling process it is tilted at an angle and it also helps in removing the scales efficiently. We can also inject water with pressure inside the scaler drum which will also enhance the performance of the equipment. So, these are some of the equipment which are used for removing the scales. So next equipment is washer. After descaling it needs to be washed. These are some of the washers you can see here you have vertical washer. This is a vertical axis drum washer and then we have horizontal axis drum washer. This is a combination of washer conveyor belt. You have a conveyor belt which carries the fish and then this is a conveyor with water spraying system. These are some of the different types of washers that are used in the pre-processing industry. Then washing, it helps in removing the accumulated bacteria. It also helps in removing the adhering materials like blood or blood stains or any other material which are sticking to the surface of the fish and that is removed during washing. And the effectiveness depends upon the kinetic energy of water stream. That is how forcefully the water is injected or pumped into the washer that influences the effectiveness of the washing. And also, the ratio of water and fish is important. Usually it is taken as 1:1 but in practice we go for 1:2. That is 1:2 ratio of water is used for washing.

After washing the gut headed fish in the end it is important because if we go into the processing step or the next step this will carry the adhering materials to the further processing. The washing can be done mechanically also and mechanized scrubbing is more efficient because it removes 90% of the bacterial load. And following are the washers that are commonly used and these are operated for 1 to 2 minutes and we can also go for combination of different washers. In the vertical drum washer, it is a convenient one. It is a small sized one portable and whereas horizontal tumbler washer though it is the most common it is horizontal one and it occupies most space. The vertical drum washer has a rotating perforated drum which is around 2 to 4 meter long with holes 10 mm in diameter. Inside metal or rubber bars helps in tumbling and mixing of fish and it also along with the water the fish is mixed with water so it helps in cleaning and this is promoted or this is enhanced by the metal bars or the rubber bars

placed inside the drum. And rotation in the tilted angle is also possible. In the equipment the vertical axis it is tilted and it also enhances the washing. Actually, the bars after washing, they help in moving the product to the further next section if it is to the next washer or the next processing section it helps in it pushes towards the next session.

And washing in the continuous process it is done by spraying the pressurized water through the perforated pipes which is installed in the drum. So that is if we are going for combination that is where you are combining the drum with the conveyor belt pressurized water is pumped inside the drum and it is washing the contents and the fish is carried to the next session through the using the conveyor belt and the dirt water can be collected it can be used for other purposes. Though the combination washer conveyor it is efficient but it is less popular usually it is used to separate fish from the ice because the ice has lower density it floats on the surface so ice can be removed easily using this washer. Since the density of fish is higher it falls easily on the conveyor belt and it can be taken to the next session. The effectiveness is lower than the drum washer.

We had seen in the previous slide there are different washers that are used for washing the fish. We have vertical drum, horizontal drum, a combination of washer and conveyor belt and usually the washing is done for 1 to 2 minutes and in the vertical drum washer it is a small sized washer it is convenient to handle since the size is small it can be handled easily whereas the horizontal tumbler washer it occupies larger space because it is horizontally placed and in the drum washer the drums are perforated and they are rotating regularly or continuously. The length of the drum is like 2 to 4 meter long and these are perforated and the perforation size are like 10 millimeter in diameter. These are round holes which are seen on the drum and there are bars placed inside the drum this can be metal bars or rubber bars and these bars they help in mixing the fish or tumbling of the fish during rotation. When you put the fish and the water inside the drum when it runs along the perforations it gets washed off perforations they help in washing and also the bars it helps in promoting or moving the fish towards the outlet so it not only helps in moving the fish inside the drum but also it pushes the fish to the next section.

And washing can be enhanced by the spray of pressurized water through the perforated pipes which are placed inside the drum. Kinetic energy or the speed with which the water is entering into the drum that is also very important and finally the dirty water is collected in the basins or the outlet and these are used for the other purposes. Combination washer conveyor it is less popular and it usually it is used to separate the ice from the fish because the ice has lower density it floats on the surface of water the fish it falls on the conveyor belt so it helps in moving or separating the fish and it moves to the next section or the finish section the conveyors it pushes the fish further in the line. The effectiveness of combination washer conveyor is also lesser than the drum washers the conveyor belt it does not scrub or it does not do any scrubbing action so which is the

efficiency therefore comes down for this kind of washer. So, in this section we have seen different kinds of tools or different kinds of methods that are adopted during the pre-processing and the further steps we will be dealing it in the next session and let's wind up for today. Thank you.