**F3 Packing Water**

Packing water is supplied by PUB and is normally separated into 5 sections. They are contained in silos as storage containment units. The 5 types of silos are catered for water used to like -

Leaf water - Cattappa leaves are stored in a filter mesh, acting like teabags to secrete out the necessary compounds in the leaf to make leaf water.

Fresh Water -Dechlorinated

Salt Water - 1% salt

Sea Water - 35% salt

Water - Contains chlorine

Leaf water is primarily used for freshwater fishes and is normally diluted with 1% salt to soften water hardness. Fresh water is supplied for all uses. From all water in tanks, packing water for exports, filtered drinkable water, and more. Saltwater is catered for freshwater fishes. Seawater is mainly for marine fishes in the marine fish house. With all the main components being water - the water is supplied by PUB and since PUB is known to remove contaminants in water using chlorine, it is not available to use as chlorine may still be present in water. Hence, we will need to perform Reverse Osmosis.

Reverse Osmosis is a systematic filtration setup where it purifies water through a semi-permeable membrane that separates ions. Pressure is applied to overcome osmotic pressure thus filtering the contaminants. A specially designed RO system at Sunbeam contains carbon to filter out chlorine ions as the small amount of chlorine can kill fish in water. This can also alter the taste and odor of water. Carbon filtration can remove byproducts but not inorganic compounds and requires frequent water changes. Another method of chlorine removal is through sunbathing under the sun for 3 days (depending on the water level of the tank). This will allow water to stabilize and remove unwanted gases through evaporation.

However, for seawater, we would import as the contents of minerals are not 100% the same as mimicked ones. We cannot replicate the same level of natural minerals in imported ones. Replicating is also difficult as cost production will be high and it may pose a certain level of safety for the fish.

When packing for fish, we are to use packing water for specific species of fish. There are 10 separate tanks, each with different types of water contents ranging from medications in water, soft/hard water, soft+medicated treated water, and more. This is because we want to ensure the best when customers receive their fish all in good condition. We are to also fast the fish 2-3 days before exporting them to prevent ammonia levels from rising from the waste products.

Packing water is part of trial and error and we will best see fit if this method works for a certain type of fish. This can act as part of improvement for better packing in the future. Packing can also be draining as some fishes would take quite a while to acclimate to the water and would require special medications in water. Some fish would need to be salt bath first before adding the packing water. The sad part is when the customer wants to cancel, we will need to repeat the steps which reduces the manpower.

We do export international shipments and most fish can be packed for long travel of <36 hours. If a shipment is longer, we would normally use a tranquilizer and sedatives to put it to sleep first to reduce its stress level and so the metabolism does not spike up which is a good practice so oxygen in the bag will not be consumed too much. The ammonia reducer used can not last for the whole shipment.

Some packing can be different. For example, shrimps will need a green net packed inside the bag as shrimps need something to sit or hold onto while in the bag. For cichlids more than 6.5cm in length, we will need to double bag to prevent the plastic from bursting - same for fishes that can have sharp spikes on its body. For cichlids less than 3.5cm in length, we will need to place plastic strips to prevent them from fighting in the bag, creating more sections and space for them.

I had a thought where if we could introduce aeration in packing water before being packed. However, it would not be advisable as the aeration used may contain unwanted gases as the aerator is located outside of the fish house supporting other numerous fish house rows through the air inlet pipe. Thus, we would use 100% pure oxygen, and it is much higher.