



mackerel



sardine



horse mackerel



anchovy

## Freezing Line



### PROCESS DESCRIPTION

Operation of the freezing line is very simple because the work method is always the same. The only complexity lies in setting the different speeds and freezing time suitable for each type or size of fish. After programming these settings, it will be easier to reach an optimum level of quality in the final product.

This line has been designed for pelagic species of different sizes.

**1. Loading hopper.** It is the feeding hopper where the fishing is poured manually through a container turner. This hopper is full of fresh or salt water to cushion the fall of the product to prevent from damages. At the same time, it will perform a thorough cleaning to remove existing impurities. In addition, to keep the water at low temperature, it includes a pump and a coil (exchanger) through which brine of the freezing tanks circulates. Access for the tank cleaning is made through the side gates.

The hopper is connected through a lifting conveyor to the brine tank. This conveyor will be synchronised with the freezing tank, which will transport the fishing draining the fresh water, that will return to the hopper through a tray designed for that purpose.

**2. Brine freezing tank.** The product will be transported from the loading hopper conveyor to the freezing tank, full of brine at an

approximate temperature of  $-20^{\circ}\text{C}$ , in which it will be frozen. Then, it will be submerged by means of a top loading system, which is incorporated to the conveyor, and will perform a double travel through the tank. The time the fishing takes into the tank depends on the conveyor speed, which may vary depending on the fish size being frozen. At the end of the tank, a conveyor synchronised with the main one removes the frozen fish, draining the brine dragged by the product, that will return to the main tank through a tray.

**3. Glazing machine.** When the fish comes out of the tank, it goes through fresh water in the immersion glazing machine, where the fish salt on the surface is eliminated, being damped in fresh water at a few tenths over  $0^{\circ}\text{C}$ , which will be frozen in the sub-cooling tunnel, improving the fish appearance and its conservation.

This machine includes a tank containing a cooling coil to keep the water at low temperatures. It carries a pump installed to remove the water by suction, already filtered, from the area where the cooling equipment is, to pump it to the impulsion collector.

Inside the tank there is a conveyor taking the product through the glazing machine and then, removes it to take it to the sub-cooling tunnel.

Different glazing levels are achieved by modifying the conveyor speed, which will allow production to be adjusted to the fishing size and glazing wanted.

**4. Freezing tunnel (drying and sub-cooling).** The freezing tunnel conveyor takes the product from the glazing machine, which includes a tray to prevent the product from being damaged, and takes it through the tunnel where, by means of a forced-ventilation evaporator, the fresh water layer that the product has in the glazing machine along the conveyor will be frozen and then, dried. The air temperature in the tunnel is  $-32^{\circ}\text{C}$  and the water percentage in the product will not exceed 5%.

The product, that is already frozen and glazed, comes out through the same infeed/discharge conveyor at the other end of the tunnel, ready for being processed.

**5. Weighing line.** At tunnel exit, the product is discharged onto a conveyor for further manual selection with the objective to separate species depending on their size and waste, if any.

The product is taken to the box, bag or bins filling area, according to the pre-set selection.

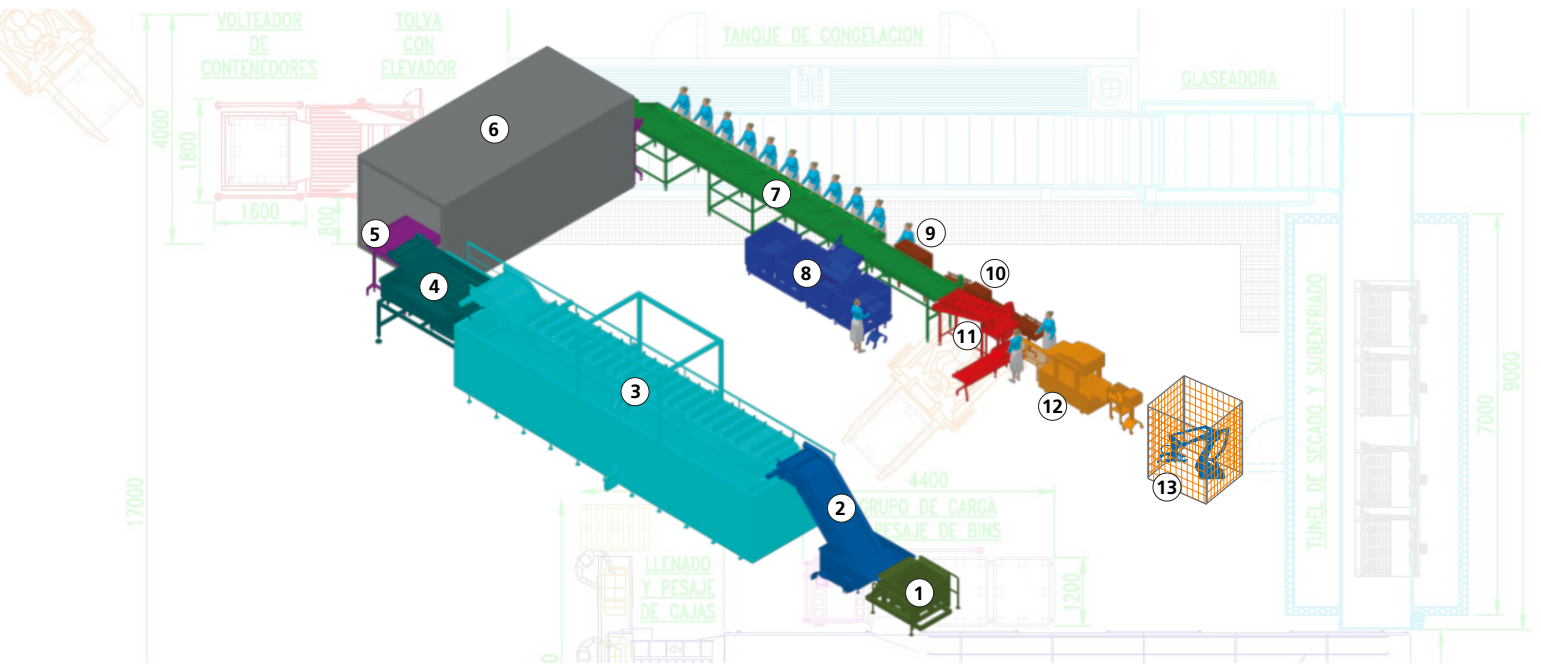
**6. Hydraulic unit.** Feeds the hydraulic actuators of each machine automatically. Pre-heating of the unit is necessary before starting the line process.

The flow controllers for each line motor are included in the unit, which allow the conveyor speeds to be set and therefore improving quality and line production.

## ADVANTAGES OF THE SYSTEM

Control and parameterisation system of temperatures of the freezing process, that allows us to optimise the cooling output and energy expense.

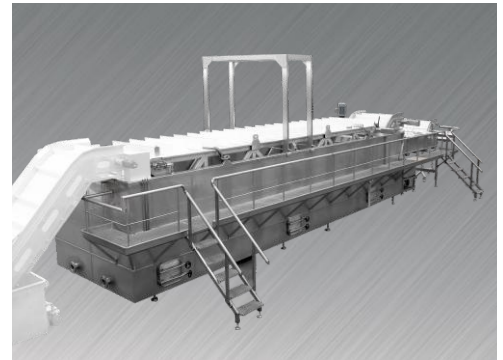
Speed management of product freezing through parameters entered into the system, that allows for automatic feed process in time and space of the ice front inside the product.



1 Container turner



2 Loading hopper



3 Brine freezing tank



4 Glazing machine



5 Freezing tunnel infeed/discharge conveyor



6 Freezing tunnel



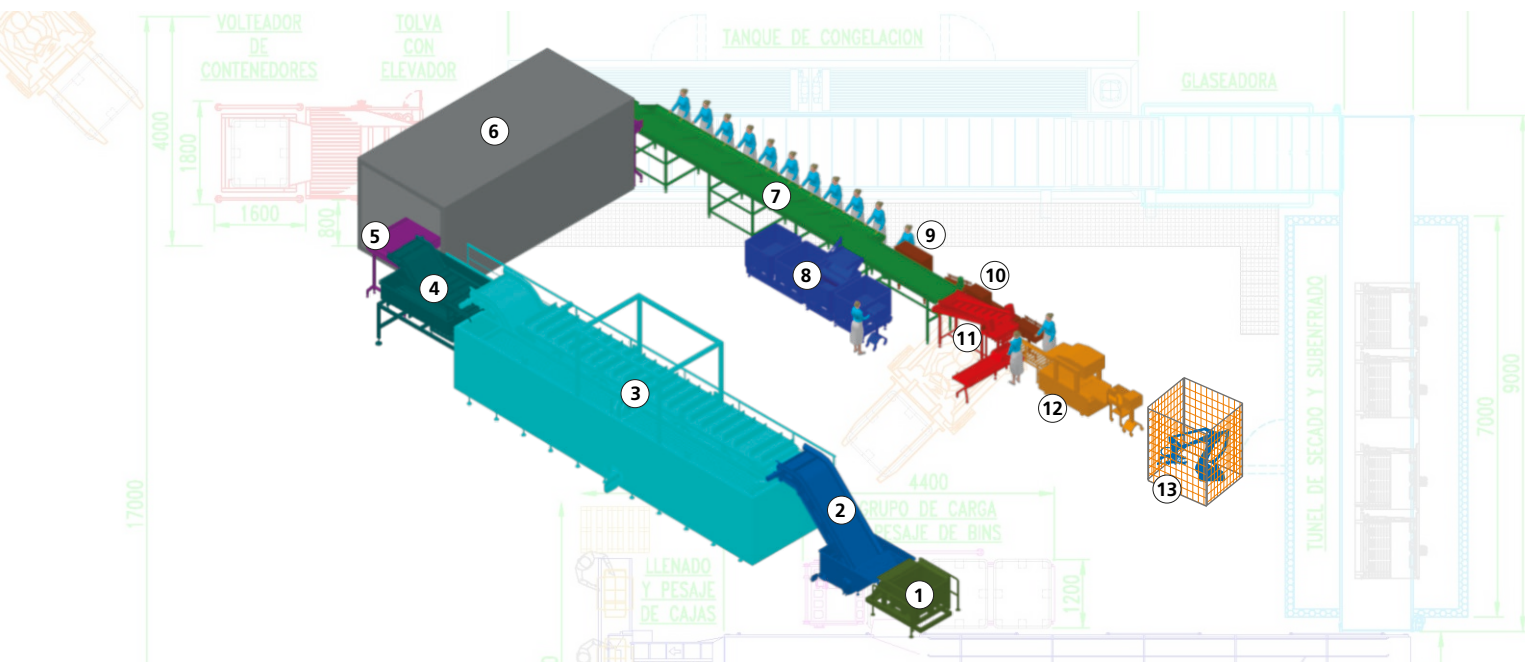
7 Packaging line



8 Bins filling line



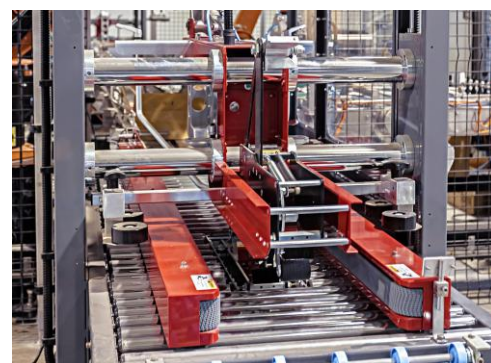
9 Bag sealing machine



10 Bins weighing machine



11 Box sealing machine



12 Packaging line



13 Box palletising robot