



Inside Out Factory Freezer Trawlers

by Ray Hayter

 NEWFOUND RESOURCES LIMITED

Factory freezer trawlers are designed and laded out with maximum utilization of space, making them highly efficient for at-sea processing. Above is the *Newfound Pioneer*, owned by Newfound Resources Limited and used for Northern shrimp processing.

Processing of Northern shrimp (*Pandalus borealis*) on board a factory freezer trawler (FFT) is a very dynamic process that generates three distinct shrimp products: large raw, cooked, and industrial raw. Shrimp are processed either in the raw or cooked form and packaged ready for market when the vessel arrives back at port. Depending on many factors (market demand, size of shrimp, time of year, price, etc.), all of the potential products may or may not be produced in any given voyage.

When fishing/processing begins, it runs 24 hours a day seven days a week with the crew divided into two watches (shifts) working in a six hours on and six hours off format. This

continues until the vessel is full or has to return to port; it stops only for mechanical breakdowns, defrosting tunnel freezers, cleaning and sanitizing, or bad weather.

In order to obtain a license for processing and exporting product from Canada, the onboard factory must be a registered processing facility with CFIA (Canadian Food Inspection Agency). CFIA requires FFTs to have a QMP (Quality Management Program) in place, which is a Hazard Analysis Critical Control Point based food safety system. This program's focus is to prevent food safety issues from occurring by identifying potential hazards and putting controls in place to reduce the risk of the hazard occurring.

Processing begins when the shrimp are brought on board the vessel. The trawls are brought on board and the shrimp are dumped into temporary holding tanks in the stern. From there, they travel by conveyor to a physical inspection area to remove any by-catch and foreign objects such as stones. Next the shrimp pass through a mechanical by-catch separator and then on to a size grading machine, commonly referred to as a “shaker.” This machine has the ability of grading up to five different sizes. Traditionally the two largest sizes are destined for the Japanese market (large raw shrimp); the next two sizes are exported to the European, Russian or Chinese markets (cooked shrimp); and the smallest (industrial raw) go to the industrial market or peeling plants.



The processing of shrimp begins once the product is brought aboard the vessel. The product travels by conveyor to inspection stations, by-catch separators (pictured above), and size grading machines.

Japanese market sizes are transferred on separate conveyers to an additive treatment dip, which is basically a colourant and antioxidant. Next the shrimp are manually inspected for foreign material and defects, then weighed and packaged. Typically the net weight is usually 1 or 3.5 kilograms. The boxed product is then placed in trays and frozen in vertical plate freezers to temperatures of -30°C . After freezing, the product is placed in bagged master cartons with the appropriate labels and transferred to the cargo hold/cold storage.



Large raw shrimp are transferred on separate conveyers to an additive treatment dip (shown above), which is a colourant and antioxidant.

The next two sizes of shrimp are cooked, graded, and transferred by conveyers to the cookers. The cookers are of a water immersion style which fill and unload automatically with the help of electronic eyes and timers. Because the product does not require any cooking by the end user, the product is classified as high risk under the QMP; cooking, therefore, is considered a kill step and is a critical control

point in this process. Special controls, which must be documented, are in place to ensure that the core temperature reaches a minimum temperature of 80°C . Shrimp exiting the cooker are then cooled and manually inspected for foreign material and defects (i.e., broken



Finished cooked 5 kg Northern shrimp market ready.

shrimp). Next the product enters a tunnel freezer, which freezes the product in an IQF (Individually Quick Frozen) form to a minimum of -26°C . After exiting the tunnel freezer, the shrimp are packaged in a 5 kilogram poly lined carton with the appropriate labelling and transferred to the cargo hold.

The smallest shrimp (industrial raw) travel by conveyer to a temporary storage tank until the cooked product is processed. Through the use of conveyers and flumes, the product is

transferred to the tunnel freezer for freezing in IQF forms. This product, upon exiting the freezer, is packaged in 20 kilogram poly woven sacks, labelled and transferred to the cargo hold.

FFTs are designed and laded out with maximum utilization of space. This engineering makes the onboard factory very efficient in the at-sea production of northern shrimp.

Ray Hayter is an Instructor with the School of Fisheries, Fisheries and Marine Institute of Memorial University, in St. John's, Newfoundland.