

Circular 02-17-04-21

RE: Carriage of frozen fish

Ingosstrakh has recently faced with number of requests from Shipowners entered with us in respect of carriage of frozen fish. Please find the below advice with regard to carriage of frozen fish cargo prepared under assistance of Messrs. IMCS.

Quality / Duration of storage

The best quality fish is that frozen by the flash or rapid freezing process. Rapid freezing results in the formation of only very small ice crystals which, unlike large crystals, do not rupture the cell walls and thus do not result in the loss of cell fluids (drip) on thawing.

The following criteria may be used to assess fresh fish: unobtrusive odor, firm and resilient flesh, brilliant red color of gills, bright, glossy color.

The fish must be properly deep frozen on loading. If it is not at the required core temperature, it will spoil during a long voyage. Checks must accordingly be carried out during loading. Properly deep-frozen fish sounds like wood when struck. The core temperature should be measured for each batch by drilling a hole into the middle of the fish and measuring the temperature with a meat thermometer. In the case of (unpacked) tuna, a spike is used to make holes 3 - 5 cm in depth in the fish so that the measurement can be made.

Occasionally, fish is delivered which, after freezing, has been exposed to higher temperatures. Such incorrect storage results in depreciation and may be recognized by the formation of frost on the cartons. Fish covered with a thick layer of ice or with brown discoloration or freezer burn must also be rejected prior to loading.

According to, the duration of storage for various types of fish is as follows:

Designation	Temperature	Rel. humidity	Max. duration of storage
Frozen oily fish	-28 - -18°C	90 - 95%	8 months
Frozen lean fish	-20°C	90 - 95%	12 months
Frozen filleted fish	-28 - -23°C	90%	6 - 9 months

Frozen fish which has been stored for an excessively long period has a dry, straw-like texture and poor flavor and is described as freezer damaged.

Packaging

Fish, usually packaged in plastic film, is transported in cartons or boxes. Oily types of fish should, if possible, be vacuum packaged in an oxygen-impermeable film as there is a

risk of rancidity due to the high oil content.

Packaging sizes are so selected that the dimensions of the individual area modules or area module multiples are conformed to the conventional pallet sizes (800x1200 mm and 1000x1200 mm) and cargo units may thus be produced.



Photos illustrating packaging

Container transport

Refrigerated containers should be used. Ultra-low temperature refrigerated containers are capable of transporting goods at a temperature of -60°C .

Cargo handling

It is essential to maintain the freezing chain during cargo handling as this is the only way to maintain the storage life and quality of the fish.

In damp weather (rain, snow), the cargo must be protected from moisture, since quality may be diminished.



Photos illustrating packaging damage, caused by high moisture during cargo handling operations.

Fusion of boxes into a frozen mass.

Because of the cargo's sensitivity to mechanical stresses, it must be handled with appropriate care (breakage).



Photos illustrating packaging damage caused by mechanical stress.

Stowage space requirements

Pre-refrigerated, dry, neutral in odor.

Segregation

Clean, un-impregnated and new fishing nets, fiber rope, thin fiber nets, thin wooden battens.



Photos illustrating separation of the cargo by thin fiber nets.

Cargo securing

In order to ensure safe transports, the packages must be stowed and secured in the means of transport in such a manner that they cannot slip or shift during transport. They must not be damaged by other articles or items of cargo.



Photos illustrating stowage of the boxes. Top layer stowed from side to side tightly (without gaps). Void spaces are choked with boxes to avoid shifting of the cargo.

Risk factors and loss prevention

Frozen fish requires particular temperature, humidity/moisture and ventilation conditions (storage climate conditions).

RF Temperature.

A written cooling order must be obtained from the consignor before loading is begun. This order must always be complied with during the entire transport chain.

The following Table merely constitutes a rough estimate of appropriate temperature ranges. Temperatures may deviate from these values, depending on the particular transport conditions.

Designation	Temperature range
Travel temperature (favorable temperature range)	
Frozen oily fish	-28 - -18°C
Frozen oily fish	-29°C
Frozen lean fish	-20°C
Frozen filleted fish	-28 - -23°C

Since, as a result of the high protein and water content, autolytic processes still proceed at temperatures as low as -10°C, frozen fish must always be at a temperature of below -18°C.

Holds/containers must be appropriately pre-cooled prior to loading. They should be approximately at a temperature of at least -18° C.

The required travel temperature should be maintained at all times because it is only in this way that the activity of microorganisms comes to a standstill and enzymatic degradation processes are largely suppressed. Temperature measurements must be performed and recorded at regular intervals.

The travel temperature must be maintained constantly as variations in temperature may result in re-crystallization, resulting in growth of the ice crystals. Variations in temperature are associated with continual slight thawing and refreezing. Since small ice crystals have a higher vapor pressure than larger ones, they will melt more rapidly when the temperature rises, while on cooling the same effect means that the water is preferentially deposited as ice on the larger ice crystals. This consequently brings about growth of the ice crystals, as a result of which the rapidly frozen fish increasingly takes on the appearance of slowly frozen fish on storage. The large ice crystals rupture the cell walls, as a result of which, on thawing, cell fluids (drip) escape, giving rise to a distinct reduction in utility value.

Temperatures lower than specified are not generally harmful, but they should be maintained throughout all the transport operations as there is otherwise a risk of re-crystallization.

At temperatures of -62°C , the "eutectic point" (EP) is reached. Only once the EP is reached is all the water in the cells of the product completely frozen and all microbial decomposition brought to a standstill, i.e. at temperatures of below -62°C it is possible to transport or store foodstuffs for an "infinite" period without loss of quality.

RF HUMIDITY / MOISTURE

Designation	Humidity/water content
Relative humidity	approx. 90 - 95%
Water content	65 - 80%
Maximum equilibrium moisture content	approx. 90%

Higher relative humidity may be permitted for frozen goods because the low temperatures mean that microbial growth is no longer possible.

Relative humidity in the hold/container should be kept at 95% in order to prevent the surface of the fish from drying out (freezer burn), an effect which may also be counteracted by plastic film packaging.

RF Ventilation

Recommended ventilation conditions: circulating air, 6 circulations/hour without supply of fresh air in order to ensure uniform cooling of all parts of the cargo.

RF Biotic Activity

Frozen fish displays 3rd order biotic activity.

It belongs to the class of goods in which respiration processes are suspended, but in which biochemical, microbial and other decomposition processes, which must be taken into account, still proceed.

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loss of quality.

RF Gases

No risk.

RF Self-heating / Spontaneous combustion

No risk.

RF Odor

Active behavior	Frozen fish has a very slight, unpleasant odor. It must, on principle, be stowed alone in a means of transport as odor tainting must always be expected, even when the product is packaged in plastic film and cartons.
Passive behavior	It is highly odor-sensitive and very rapidly absorbs foreign odors.

RF Contamination

Active behavior	Frozen fish does not cause contamination.
Passive behavior	Frozen fish is extremely sensitive to contamination. Holds/containers must therefore be clean and in a thoroughly hygienic condition. It is recommended that fitness for loading of the hold/container be confirmed by an inspector.

RF Mechanical influences

Fish packaged in cartons must be secured in the hold or container in such a way that it cannot move during transport. In the case of container transport, it is also important for the goods to be secured in the door area so that they cannot fall out of the container when the doors are opened.

RF Toxicity / Hazards to health

Some types of fish contain natural toxins, such as the toxin of the puffer or porcupine fish, which is not destroyed even by boiling. The toxic body parts of these fishes must accordingly be removed immediately.

Toxic breakdown products may also be formed which may be hazardous to humans.

RF Shrinkage / Shortage

Weight loss of approximately 1 – 2% may occur during transportation.

RF Insect infestation / Diseases

If the specified temperature and humidity conditions are maintained, microorganisms constitute no risk as their activity comes to a standstill at approximately -10° C.

Care must be taken to ensure that the gills have been removed from tuna as they may undergo spoilage even at low temperatures.

Sea and freshwater fish may be attacked by internal parasitic worms. Filleted fish must not contain any parasites.

As a basic principle, a veterinary certificate is required for transport operations.

We would like to additionally draw Shipowners' attention to the need of immediate report about any cargo incident to Ingosstrakh which remains of paramount importance for further handling of the case in the most professional and effective manner.

If you require any further information or assistance, please do not hesitate to contact Ingosstrakh.

Best regards,

Ingosstrakh Insurance Company

P&I Department