UK P&I CLUB

Carefully to Carry

Liquid natural oils, fats and fatty products

The products dealt with below include crude vegetable, animal and marine oils as well as fats. Some of the oils are edible and others are used in the production of soap, paint, lacquer, cosmetics and medicines. Occasionally, refined vegetable oils are shipped. When these products are transported by sea, a variety of difficulties may be encountered, the cause of which generally fall into two categories.

- Handling (basically temperature control).
- Contamination.

Handling

Claims still frequently arise which involve allegations of unsatisfactory handling by ships. It is sometimes necessary to apply heat to these cargoes, since during a sea passage, the temperatures encountered are likely to be lower than those recommended by the shippers. Many products of this type are adversely affected by heating so that some deterioration is inevitable, with the extent of the damage depending on the nature of the product and length of the voyage. Unsatisfactory temperature control can cause additional deterioration, usually because the carrying temperature has been too high for all, or part of the voyage. It is possible for experts to estimate the level of unavoidable damage and hence the extent of any further damage caused by poor temperature control.

Damage may also result if the carrying temperature is allowed to fall below that recommended by the shippers. The normal procedure for heating this type of product is by heating coils at the tank bottoms and lower sides, with heat being transferred throughout the oil, mainly by convection current. The heat transfer becomes progressively less efficient as viscosity increases. The viscosity of liquid natural fatty products is greatly affected by temperature and a reduction in temperature of only a few degrees can have a serious effect. If the heating process is inadequate to the maintenance of sufficient fluidity within the bulk of cargo, then the liquid in the vicinity of the heating coils can become overheated.

During the discharge of cargo, if the environmental temperatures are very low, further problems may arise as a result of solidification, which most commonly occurs when a tank is almost empty and the liquid level has fallen below the level of the heating coils. Under such circumstances, the final residues may be removed by sweeping or by steam stripping, provided the receivers are able to accept the fat and water mixture which is produced. Ship's officers responsible for discharging heated products in cold climates should ensure that the maximum pumping rate is maintained and that there are no interruptions during discharge, shore operations permitting.

"The carrier shall properly and carefully load, handle, stow, carry, keep, care for and discharge the goods carried."

Hague Rules, Articles iii, Rule 2

Carefully to Carry Advisory Committee

This report was produced by the Carefully to Carry Committee – the UK P&I Club's advisory committee on cargo matters. The aim of the Carefully to Carry Committee is to reduce claims through contemporaneous advice to the Club's Members through the most efficient means available.

The committee was established in 1961 and has produced many articles on cargoes that cause claims and other cargo related issues such as hold washing, cargo securing, and ventilation.

The quality of advice given has established Carefully to Carry as a key source of guidance for shipowners and ships' officers. In addition, the articles have frequently been the source of expertise in negotiations over the settlement of claims and have also been relied on in court hearings.

In 2002 all articles were revised and published in book form as well as on disk. All articles are also available to Members on the Club website. Visit the Carefully to Carry section in the Loss Prevention area of the Club website www.ukpandi.com for more information, or contact the Loss Prevention Department.

Contamination

In the past, the most common contaminant, resulting in claims, was water, originating from shore or ship tanks, pumps or lines at the time of loading, or introduced by mistake, or due to leakage. Some products contain a significant quantity of water when shipped, but the presence of excess water in others may accelerate deterioration. Experts can frequently estimate the damage due to contamination with excess water.

More recently, traders and governmental authorities have taken a serious view of the contamination of edible products by traces of chemical substances. Often, but not invariably, these contaminants have come from residues of previous cargoes.

It is normal practice for samples to be drawn by independent surveyors during loading, or immediately after loading, and for at least one set of these samples to be given to the ship. It is important that the ship has a set of loading samples, since most claims are based upon differences in analytical parameters in samples drawn at loading and discharge. If the master is instructed to deliver a set of samples to the receivers on arrival at the discharge port, it is recommended that he requests that the shippers provide a second set of samples for the use of the shipowners. Any such samples handed to the ship should be properly stored during the voyage, preferably in a refrigerated store.

At the time of discharge, samples are always drawn by the receivers or their surveyors. Normal analyses conducted at both load ports and discharge ports are quite straightforward and the typical parameters determined are water, free fatty acid, unsaponifiable matter and odour. If there is evidence or suspicion that on delivery the cargo does not conform to either a specification or to the loading samples, more detailed chemical analysis may be performed. There are now reliable and effective procedures available for determining traces of chemical contaminants. Certain contaminants can be identified and determined at levels as low as 10 parts per billion (ppb). Contamination at this level will result from admixture of 10 grams of contaminant, with 1000 tonnes of cargo. Most chemical contaminant can be identified and determined at levels of 100 ppb or 100 grams per 1000 tonnes of cargo.

When cargo is loaded or trans-shipped, it is essential to consider the nature of previous cargoes. In some cases, it is virtually impossible during tank cleaning to remove all traces of previous cargo to a level which is not detectable by modern laboratory equipment. For this reason, restrictions are laid down in the contracts of sale, regarding the immediate previous cargo carried in each of the ship's tanks. These restrictions are imposed within the industry by such bodies as FOSFA and NIOP. Their rules should always be consulted. They are constantly under review and may change in the future. Similar restrictions were imposed in the past concerning leaded petroleum or other leaded products. Shippers and charterers should be notified in good time of the nature of the three previous cargoes carried in each individual tank.

It is important that, before loading, every care and attention should be paid to the proper preparation of tanks, pumps and pipelines. It is very important that the tank coating is maintained to a high standard. The coating covering all sections of the tank must be sound. Where any breakdown of the coating takes place, particularly where epoxy and polyurethane coatings are concerned, there is a risk that the remains of previous cargoes may accumulate, creating a potential source of contamination. The breakdown of epoxy coating usually manifests itself in the form of blisters, open or closed, or in areas where the coating is detached, forming pockets which cannot be reached by cleaning water. In these areas, there is also a risk that rust may form, which is again likely to trap cargo residues and lead to contamination. It is not possible to properly clean tanks with damaged coatings. Cases have been recorded where traces of the third previous cargo have been found when samples of damaged coatings were tested.

Another possible source of contamination is the penetration and softening of epoxy and polyurethane coating by a previous cargo. This may find its way later into newly loaded products. Masters should always consult the 'cargo resistance' list provided by the manufacturers of the tank coating. This will list those cargoes to which the tank coating is resistant. For cargoes not included in the list, or cargoes without resistance indicators, or when deviating from the maximum temperatures indicated on the list, the manufacturers should always be consulted.

Bearing in mind that even the most minute traces of previous cargoes may be discovered, (although this may not always lead to significant damage), it is evident that the washing of cargo tanks must be performed with the utmost care. The precise method of cleaning will depend on the previous cargo carried and the state of cleanliness required for the products to be loaded. The relevant tank cleaning guides should always be consulted. Generally, the most important part of the tank cleaning process is butterworthing with hot or cold sea water at sufficient pressure and at the appropriate tank levels. This should be followed by fresh water washing in order to remove sea water residues. Tanks which may have contained monomer or drying oils should first be washed with sufficient quantities of cold water to avoid polymerisation of cargo residues. In some cases it is necessary to employ tank cleaning chemicals but their use is generally limited as it may be difficult to dispose of slops.

On completion, the tanks should be clean, dry and free from residual odours. It may also be desirable to take wall-wash samples and have them analysed for traces of previous cargoes, but this requires skilled inspectors. The presence of an odour in a tank, which has been cleaned, indicates the presence of cargo residues and also indicates the need for further cleaning. It is advisable, when checking for residual odours, to make the test after the tank has been closed for a period. Testing should, in any case, be carried out by personnel who have not been working in or near the tanks for at least one hour.

When cargo with a high melting point has been carried, tanks should be washed with hot water. If possible, steam should be used to ensure the residues are effectively melted and cleared, and the cleaning process must also include the tank lines, tank lids and vent lines, including pressure vacuum valves and risers. Examples of cargoes with high melting points include phenol and waxes.

Cargo pumps, usually of the hydraulic deep well type, should be dismantled and inspected, as recommended by the manufacturer. The pumps should be purged in order to test the seals which separate the cargo and the hydraulic oil from the void space in the pump. This procedure should always be followed after tank cleaning, before loading and discharging and after repairs. The results should always be properly recorded in the ship's log book or other formal records. Where defects to the seals are suspected, cargo should not be handled until corrective measures have been taken. Due consideration must be paid to the trim of the ship when cleaning pumps, in order to ensure that any contamination product is properly drained away. Portable pumps should be tested before being lowered into the cargo tank.

Before loading, if heating coils are not to be used, they should be thoroughly purged and blanked both at the supply and the return ends. Even though coils may have been in use for some time, they should be pressure tested before loading, in order to avoid the possibility of contamination through leaks which might have developed. Pumps not required for cargo handling should always be isolated.

Special attention should be paid to the cleanliness of vent lines, as they may contain residues of previous cargoes, both in a liquid and a solidified state. Vent lines, when not cleaned after discharge, may drain into a newly loaded tank when the vessel changes trim or when encountering heavy weather. Solidified cargo residues in a vent line may melt, due to the heat emitted from a heated cargo and the melted product may drain back into the tank, causing contamination. The practice of steaming ventlines after the carriage of heated cargoes is to be recommended as blocked lines may result in over-pressuring of cargo tanks.

Drain cocks which are fitted at the lowest parts of deck and manifold lines, as well as plugs at the bottom of cargo valves, should be opened and rinsed in order to remove any trapped cargo residues. These drain cocks may contain sufficient liquid to result in serious contamination. When clearing deck and drop lines it is important to ensure that the dead ends of these lines and drop lines are not over-looked. They should be opened and thoroughly cleaned.

Mild steel tanks are still sometimes used for the carriage of natural oils and fats but their use is in decline as cargo charterers more frequently stipulate the use of stainless steel or coated tanks. When used, mild steel tanks should be free from rust and scale, since remnants of previous cargoes are likely to be trapped and transferred into subsequently loaded cargoes. Where sensitive cargoes have been carried in mild steel tanks, contamination has been known to occur from the residues of hydrocarbon (petroleum products) cargoes.

The importance of proper tank cleaning procedures and the correct preparation of tanks and all related equipment prior to loading cannot be over-emphasized. Masters may wish to consider appointing an independent surveyor to verify the condition of the tank coating, heating coils and hatch openings after the tank preparations are completed.

On completion of loading, an ullage survey by an independent surveyor may be appropriate, whereafter valves and hatches should be sealed. This process can be repeated at the discharge port. The practice of taking onboard samples at all stages of the loading and discharging operation which is referred to earlier, is also to be highly recommended.

Should contamination occur at some stage in the course of transit, it may be possible, by analysis of such samples, to identify the source of contamination. By ensuring that the cargo is carried to the highest standards, the product should be well protected.

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