Chapter 20 – Flashpoint Contaminations of Diesel Oil and Gas Oil

The bulk liquid trade has a history of flashpoint contamination, where high flashpoint cargo (eg diesel oil or gas oil) has been loaded into a tank that previously discharged a low flashpoint cargo, such as naphtha or gasoline. Such contamination can lead to significant delays and subsequent claims for flashpoint contamination of the 'first-foots' of a diesel oil or gas oil cargo.

When first-foots are contaminated, there is an inevitable dispute as to whether the ship can continue loading or whether the contaminated first-foots have to be discharged ashore.

If loading continues, after re-purging with inert gas, it will be hoped that the cargo can be blended back to within specification by dilution with sound cargo. This option is risky as, if the end result does not conform to the calculations undertaken, the ship now has a full flashpoint contaminated cargo on board.

Alternatively, the first-foots may be discharged ashore and the tanks re-purged with inert gas before resumption of loading. This option may lead to significant delays and possibly substantial demurrage disputes between owners and charterers.

20.1 Common Industry Practice

Several options are available to avoid contamination when preparing cargo tanks to load high flashpoint cargo following a discharge of low flashpoint cargo:

1. Cargo tanks are hot water washed (this is not essential but it speeds up the subsequent gas-freeing operation) and gas-freed for entry.

   This option avoids flashpoint contamination of the next cargo loaded and has the advantage of allowing entry for inspection of the cargo tanks.

   This option may not be available because of commercial pressure to load the next cargo as quickly as possible.
2. Cargo tanks are cold water washed, ensuring that all liquid lines are flushed in the process, with recovery of the seawater/oil slops into the vessel's slop tank(s).

   The seawater can then be decanted overboard, from the bottom of the oil/water mixture, before recovering the oil part of the slops into the vessel's oil retention tank, in compliance with Annex I of MARPOL 73/78 (Reference 30). All cargo tanks are then purged with further inert gas until the hydrocarbon content of the vapour phase is less than 2% by volume (ie the industry accepted standard).
3. The most common method is simply to purge each cargo tank with inert gas until the hydrocarbon content of the vapour phase is *'less than 2% by volume'*.

This option is popular because it is quicker and requires fewer personnel than options 1 and 2. However, if it is not carried out properly, it may result in subsequent claims for flashpoint contamination of the next cargo first-foots.

20.2 Hydrocarbon Content of the Vapour Spaces

After discharge of a cargo such as naphtha or gasoline, the cargo tank vapour spaces will contain a mixture of inert gas and predominantly C_{5+} (with some C_3 and C_4 present) hydrocarbon vapours.

Such hydrocarbon vapours are approximately twice as heavy as the inert gas vapours (consisting mostly of nitrogen). Given this disparity in density, it is inevitable that the hydrocarbon vapours will settle towards the bottom of each cargo tank.

The industry accepted standard with regard to flashpoint contamination is to purge cargo tank vapour spaces with inert gas until the hydrocarbon content is less than 2% by volume. This corresponds approximately to 100% of the lower explosive limit (LEL) of the hydrocarbon vapours present, but concerns flashpoint contamination criteria only.

It is often assumed that the dilution method of purging the cargo tanks with inert gas (using inlets at the top of the tank and venting from the top of the tanks) is sufficient to reduce the entire vapour space hydrocarbon content to less than 2% by volume. Unfortunately, this is not always the case and a layer of heavier density hydrocarbon vapour may remain in the bottom of the cargo tank. This layer of hydrocarbon vapour is absorbed into the first-foots of the next cargo loaded, resulting in flashpoint contamination.

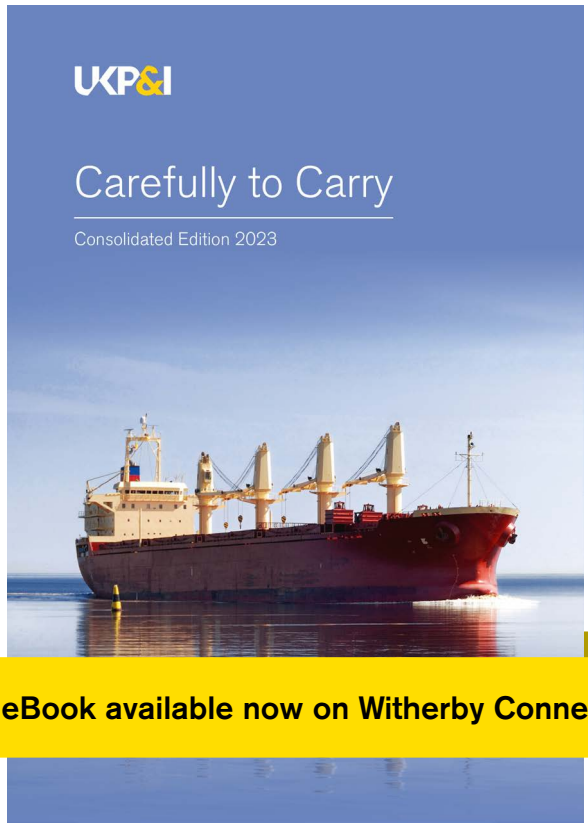
If option 3 is the preferred option, the following operational procedures are recommended to ensure that the cargo tank vapour spaces are clear of hydrocarbon vapours (ie lower than 2% by volume) before loading the next high flashpoint cargo:

1. Ensure that all cargo lines and cargo tank sumps are completely clear of the previous low flashpoint cargo.
2. Set the cargo lines so that inert gas is delivered to the top of the tank (as per normal) but the tanks are vented to atmosphere from the bottom of the tanks. This can usually be achieved by opening the liquid lines to the liquid cargo manifolds and, if possible, connecting this outlet to the vent riser(s).
3. Start inerting and venting the bottom of the tanks to atmosphere via the liquid manifolds. This layering method is considered to be more economical than the dilution method and will ensure that all hydrocarbons are removed from the bottom layers of each cargo tank. 1 to 1½ volume changes should be sufficient for each tank.
4. Continue to inert gas purge each pair of wing tanks in turn until the purging operation is complete.
5. Take hydrocarbon readings from the middle and bottom (ie bottom 1 m level) and confirm that hydrocarbon readings are below 2% by volume.

Great care should be taken when using multigas detectors in inert gas atmospheres (usually with oxygen content below 5% by volume). Gas detectors that use *non-dispersive infrared (NDIR) detectors* can be used safely in inert gas atmospheres to give direct gas concentrations in both the *%Volume* and the *%LEL* modes. Some types of gas detector, however, operate using *dual catalytic sensors*. In the *%Volume* mode, with correction factors applied, they will give the correct gas concentrations. In the *%LEL* mode, however, these sensors can only be used in inert gas atmospheres that contain at least 10% by volume oxygen. They cannot be used in normal inert gas atmospheres (ie less than 5% by volume oxygen) and, if used in such circumstances, will give unreliably erratic readings.

Carefully to Carry

Consolidated Edition 2023



Full eBook available now on Witherby Connect

Price: £95

This comprehensive publication, compiled by the UK P&I Club, details best practice for the carriage, loading and storage requirements of a wide range of cargoes. It also contains essential information on draught surveys and preparing cargo plans.

Outlining and expanding on all major international cargo regulations and guidelines, it also includes detailed checklists, information on draught surveys and guides to preparing cargo plans. Cargoes covered include timber, gas, grain, steel and other metals, bulk goods and refrigerated goods.