KISH P&I CLUB

Loss Prevention Circular KISHPNI-LP-10-2021
(Shipboard fuel treatment and Bunker related disputes)

Shipboard fuel treatment and documenting the treatment procedures on board is of ultimate importance in dealing with bunker issues and disputes. It has been experienced that bunker disputes can be very costly and time consuming for both the member and the P&I clubs. The best way to prevent bunker issues and disputes is by way of proper fuel treatment on board and good documentation practice. It may not come as a surprise, but there has been a general increase in bunker quality disputes in relation to VLSFOs in the wake of the 2020 Sulphur Cap. This is due to the characteristics of the VLSFO fuel oils and incorrect/poor handling of the fuel on board.
It is vital that the owners, managers or operators concerned take the necessary steps to secure their legal position. Ideally, if all precautions have been taken, damage and subsequent disputes may be avoided, or at least they cannot be attributed to lack of or mismanagement in fuel treatment onboard.
Different stages and types of fuel treatment can be distinguished:

- Storage
- Cleaning (settling, purifying and filtering)

►Storage:

Proper fuel storage arrangements on board the vessel can make all the difference. Even on-spec fuels may cause problems if tanks and fuel lines are not clean, if fuels are not properly segregated, and if fuel temperatures are too high or too low. In case of a dispute, it is paramount that the storage conditions can be proven; accurate documentation of all the measures in place is key. Vessels may carry different types of fuels: distillates only, or e.g. a combination of HSFO, VLSFO, ULSFO, diesel or gasoil. Each fuel grade must be strictly separated by suitable tank arrangements and piping.
But even different bunker deliveries of the same grade must be stored in separate tanks; especially today as VLSFO consists of different blend components. The widely differing VLSFO properties, such as density and viscosity, as well as others, may well result in compatibility issues when these basic rules are not followed. Another concern is the much shorter 'shelf-life' of VLSFOs during which the fuel remains homogenous and stable, compared to the traditional residual HFOs. This is not only due to the (complex) nature of blends but is also closely related to the storage temperature, which may cause thermal stress.
Marine residual fuels need heating to lower the viscosity. The temperatures needed depend on the fuel's characteristics, but also its location in the vessel's fuel system. Recommended temperatures in the storage tank, settling or service tank, separator or at the engine all differ. Apart from training and knowledge, it is important that the engineers, in order to know the fuel characteristics, have the analysis results readily available.
However, when using VLSFOs two other properties are important as well: cold flow properties and stability. All these properties can come in conflict:

- Many VLSFOs have a relatively low viscosity and do not need much heating.
- However, the cold flow properties may require higher temperatures, and this may in turn harm the VLSFOs' stability when stored for a longer period of time.

There are a variety of tests in relation to cold flow properties, but only one is part of ISO8217 standard: the pour point.

The pour point is the temperature at which the fuel no longer flows. To avoid this, heating is required, but prolonged storage at high temperatures will destabilize the fuel, one of the results of which is the formation of sludge (= asphaltene precipitation).

To avoid thermal stress a fuel in the storage tank should not be heated excessively: it only needs to be transferred to the settling tank. We are still in a learning curve as far as VLSFOs are concerned, but it seems that 'the rule of thumb' of +10°C above the pour point, generally used for residual HFOs, is no longer enough in some cases. A waxy fuel is better kept at a temperature of +15°/+20°C above pour point. Special attention should be paid to double bottom storage tanks and low sea temperatures (in wintertime).
We have seen VLSFOs with a very high WAT - 'Wax Appearance Temperature' – the temperature at which wax crystals are formed. These fuels should preferably be avoided (It would be advisable to have a maximum of 50°C). Experience shows that the WAT can be substantially higher than the pour point, compared to what we usually see with distillates (cloud point versus pour point).
The same goes for VLSFOs close to the Total Sediment Potential (TSP) limit upon delivery, so between 0.07% m/m and 0.1% m/m in case the fuel has a high WAT as well. Unfortunately, the WAT test is **not** part of the ISO8217 standard; table 2 specifications.

As far as storage is concerned, best practice comes down to:

- up-to-date fuel management procedures
- dedicated tanks and systems per fuel grade
- no mixing of different bunker deliveries
- receive bunkers in empty tanks
- maintain a temperature of minimum 15°C/20°C above pour point in case of 'waxy fuel'
- avoid VLSFOs with high wax appearance temperatures (stay below 50°C)
- avoid VLSFOs close to or on the TSP limit
- minimize storage time of VLSFOs, in view of the shorter 'shelf life'
- avoid heating the fuel more than absolutely necessary to avoid disruption of stability reserve (minimize thermal ageing)

►Fuel Maintenance, Preparation & Cleaning (Settling, Purifying and Filtering):

There is no avoiding for the reception of dirty fuel. This is why fuel tanks must be opened up, inspected and cleaned to remove any sludge on a regular basis (including cat-fines).
Settling and service tanks must also be checked frequently for water, sediments and solids at the bottom drains, preferably on every watch. Experience shows that the ship's engineers focus mainly on the settling tank, which, at the correct temperature, is indeed a first stage to remove any unwanted water and solids, but the service tank should not be forgotten. In both tanks the fuel viscosity must be low enough to facilitate the solids and water to settle down to the bottom of the tank, hence proper heating is important.

Removal of water is of great importance to avoid microbiological infection causing sludge formation, but to date not many VLSFOs have suffered from this; despite the lower viscosity of VLSFOs consisting largely of distillates.
A vital component for ensuring the fuel that is pumped into the engines is clean, is the separator. A separator acts as a centrifuge, removing sludge, such as water, asphaltenes, metals, tar, rust, sand, etc. We distinguish the conventional purifier and clarifier, and the more modern automatic separator.
The various settings are of utmost importance. The purifier needs the correct gravity disc depending on density. The separator bowl is discharged at a set interval or automatically at regular intervals, removing water and solids (purifier). The sludge outlet should be regularly checked and adjustments on settings made when required.
Suffice to say that separators too must be maintained and cleaned at intervals laid down in the manufacturer's manual, or more often depending on the fuel's properties. To check the separator's cleaning efficiency, 'before' and 'after' samples may be taken for analysis.
Research has shown that the best practice rules for separators are a low viscosity fuel in the cleaning process – i.e. higher temperatures – in combination with low flow rates: the more time the fuel spends in the separator, the cleaner it will be.
In order to meet the engine's fuel consumption it is, therefore, recommended to run two separators in parallel. In general, the separation temperatures should be 60°C (20-40cSt), 70°C (40-50cSt), 80-85°C (50-80cSt) and 98°C (>80cSt). Yet the correct temperature ultimately depends on the VLSFO's properties, including WAT.
It will come as no surprise that filters too are indispensable. Separators do the heavy lifting, but they cannot remove all unwanted particles: a cleaning efficiency of 80% is considered good. Filters also need cleaning and replacing due to normal wear as well as caused by cleaning activities and detergents. When in doubt, replace!
Most vessels use self-cleaning filter systems. The automatic cleaning system is based on back flushing: the fuel flow is reversed to remove contaminants from the filter surface. These systems are generally fitted with a counter to keep score of the flush cycles, and this is a good indicator to recognize 'dirty' fuel. To keep larger cat-fines away from the engine it is recommended to use a 10-micron filter immediately before the inlet of the fuel injection pumps. This is the final safety catch!

Summary

The main actions to be taken can be summarized as follows:

- Thoroughly document fuel treatment and storage management
- Clean and maintain tanks, separators and filters at regular intervals
- Watch out for potentially instable VSLFO with poor cold flow properties
- Adjust temperatures to match fuel characteristics at the different locations in the system
- Operate separators in pairs; in series or parallel depending on the circumstances

Proper shipboard fuel treatment means avoiding damage and, in its wake, expensive disputes. And, documenting shipboard fuel treatment secures the legal position should a dispute arise.