



Bunker fuel quality problems

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Reported fuel quality problems

Recently an unusually large number of engine breakdown incidents have been reported on board vessels that have stemmed bunkers from Houston, USA and surrounding areas.

The problems have been mainly in the fuel injection system of both main and auxiliary engines across a number of manufacturers, and in all cases the fuels in question have been the RMG380 grade residual fuel oil. Failures such as sticking or seizure of the fuel pump and fuel injector have been reported, although there have also been some reports of clogging of fuel filters and purifiers.

Subsequent laboratory analysis carried out by various recognised testing facilities have reported possible contaminants in the fuel: in particular, phenolic compounds (4-Cumyl Phenol), fatty acids in smaller proportions, and a number of other compounds that are not usually found in blended fuel oils. These are said to be the constituents for industrial epoxy resins added in for their “sticky” property. These constituents of the bunkers are suspected to be the cause of the sticking fuel pumps and fuel injectors.

The source of the contaminants has yet to be established but is suspected to have been introduced through the lighter cutter stocks that are commonly

blended to make the heavier residuals usable as fuel oil on board ships.

Source of fuel quality information

The Club understands that approximately 80 - 100 vessels are now considered to have been affected after taking bunkers in the Houston area. Similar problems have also been reported on vessels with bunkers stemmed in the Panama Canal. However, no direct connection with the bunkers from Houston area has yet been established.

The magnitude of the problem has prompted the USCG to issue an alert highlighting the presence of the deleterious compounds.

The recent reports by LR FOBAS and USCG are included below for reference. As is a link to the VPS newsletter highlighting the presence of phenolic compounds.

<http://www.v-p-s.com/latest-news/6th-june-2018-bunker-bulletin-cause-and-effect>

Many Members routinely carry out standard bunker analysis in accordance with ISO 8217 but it is important to be aware that these standards will not be able to identify these contaminants. Instead, various advanced tests such as gas chromatography-mass spectrometry (GC-MS) and/or infrared spectroscopy have been carried out by the recognised laboratories to identify possible contaminants.

MARPOL Annex VI Reg. 18 and ISO 8217:2010 Clause 5.5 prohibits the inclusion of deleterious materials in bunker fuel which can cause damage to machinery, the environment or personnel. A declaration to this effect is usually contained within the Bunker Delivery Note. It is therefore not considered necessary for vessels to regularly carry out these advanced tests for possible contaminants.



According to ISO 8217:2010 Annex H, fuels with high acid numbers occasionally cause accelerated damage to engines, primarily within the fuel injection system, although there is no recognised correlation between acid number and corrosive activity of fuel. However, according to the standard the presence of a strong acid compound even at low level has a correlation to the corrosive nature of fuel. As a consequence LR FOBAS encourages testing of the acid number of fuels due to the presence of fatty acids which does not form part of the standard ISO 8217 testing.

Problems associated with bunkers often manifest themselves as blocked fuel filters or excessive accumulation of sludge in purifiers, but in recently reported cases the problem has been predominantly with the fuel injection system; notably in components having small clearances.

Precautionary recommendations

Vessels that have recently stemmed bunkers in the referenced areas are urged to consult the agency carrying out the standard bunker analysis for further information on the fuel quality issues. Moreover, consideration should also be given to carrying out the advanced testing that can identify the contaminants.

The Club recommends that vessel staff should be made aware of the potential issues with bunkers and advised to immediately inform owners and seek guidance in case of any signs of problems.

Where possible, vessels are advised to change to an alternate fuel until the quality of fuel can be established by the advanced testing methods described. Vessels may also consider taking a fresh stem of bunkers at a different facility.

In cases where a vessel is unable to stop using the fuel, the Club recommends implementing a continuous programme of monitoring and inspection.

It is further suggested that all contingencies should be considered in anticipation of an imminent propulsion and/or power failure.

Any corrective action that might have been recommended should be carefully considered and such action should be based only upon the recommendation of a recognised specialist laboratory. Any changes made as a result should always be logged, along with the time and date of the changes made. Accurate and frequent monitoring and recording of parameters should be carried out.

Any alterations made to settings and actions taken, for example transfer of bunkers, tank levels, cleaning or replacement of filters, overhaul of purifiers, etc., should also be recorded.

Members should also be aware that it is not always straightforward to identify the root cause of a failure or engine problems. There are a number of other elements in fuel oil that could cause problems in engines such as asphaltene coagulation due to fuel instability (dependent on the Reserve Stability Number of fuel), catfines due to ineffective purification, or poor lubrication properties of low sulphur fuels causing problems due to improper fuel change over procedures. At the same time an extraneous value of a particular property as defined in the ISO 8217 standards might not necessarily be the cause of engine problems. Conversely, a positive result from the bunker sample analysis in accordance with ISO 8217 standards, or even an advanced analysis, may not be sufficient to eliminate fuel quality as not being detrimental to the engines. A detailed process of elimination is therefore almost always required.

Analysis of samples of fuel oil from various locations on the vessel is required for comparison with the bunker analysis for a possibility of co-mingling or pre-existing contaminants in the bunker tanks.



It may also further involve metallurgical analysis of the components to identify the chemical compound that could possibly be the cause of problems such as a sticking fuel pump or injector. The Club recommends that parts replaced after a breakdown or maintenance should be labelled and retained.

Similarly, residues from fuel injector, fuel pump, fuel filter, purifier and under piston/scavenge space should be collected, bagged and labelled for any future analysis that might be required. Data such as the engine performance and maintenance records before the failure will also be required and so it is imperative that vessel staff maintain accurate records and logs.

Members are recommended to take note of any suggestions made by an accredited testing laboratory on the basis of the standard ISO 8217 analysis and how such suggestions were implemented and the actions logged.

In cases where extraneous values are found then it is important to retest the samples to establish the reproducible values as per CIMAC guidelines on the interpretation of fuel analysis.

The Club also recommends that Members review the terms of bunker requisitions to specifically include a requirement that bunkers comply with the ISO 8217 standard and that suppliers should be encouraged to carry out advanced analysis to ensure the absence of deleterious material.

General recommendations

The Club recommends that Members periodically carry out a review of the on board fuel management procedures and verify that the procedures are being followed diligently and records properly maintained. The review should include:

- verification that segregation of bunkers is being carried out,
- planned maintenance is up to date,
- sufficient spares are maintained on board,
- performance of the engines, purifiers, viscotherm (calibration), fuel heaters is periodically evaluated and recorded.

The importance of a representative sample during bunkering cannot be under estimated and all vessel crews involved in the bunkering operation should be well trained and aware of the appropriate procedures when collecting samples. Drip samples should always be collected at a vessel's manifold and by a type approved drip sampler.

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