BARKING UP THE WRONG TREE?

An epidemic of ships experiencing fuel-related problems with seemingly on-spec fuels this year, starting in the US Gulf, has led to feverish speculation about the root causes with many predicting that this is a precursor for worse to come in 2020. Something is afoot, but facts are hard to pin down and we must be careful about jumping to conclusions, says IBIA’s Unni Einemo

Have you ever observed dogs chasing squirrels? In the excitement, as squirrels flee to safety up a tree, but then proceed to jump to another tree, dogs can get confused. There are squirrels around, but sometimes you see dogs barking up a tree that has no squirrels in it. They are, literally, barking up the wrong tree.

In the frantic chase for culprits when bunker fuels are found to cause operational problems on ships – despite having met ISO 8217 specifications during routine testing against the standard – there is a risk that something similar could happen. It has happened before, which we’ll get to later.

What do we know?
While we do not have exact numbers, anecdotally it would appear that more than 100 vessels have experienced broadly similar operational problems which have been attributed to bunker fuels. The first reports of severe operational problems came after ships started to use fuels lifted in the US Gulf area, chiefly Houston, mainly lifted during March, April and May this year. Later, in June and July, similar issues were reported by ships lifting bunker in Panama and Singapore and possibly other locations. The issues associated with problem fuels have manifested in the form of sticking of fuel injection systems components (mainly pumps), excessive sludge formation, or both. In some cases these issues have been so severe as to cause a loss of main engine power.

For the most part, fuel testing agencies have indicated that the fuels met ISO 8217 specifications during routine testing against the standard. It was only when vessels began encountering problems that they commenced forensic-level investigative fuel analysis. Reports from testing agencies have identified certain commonalities between these fuels indicating they contain chemical contaminants from non-petroleum sources. The most commonly reported findings include phenols, fatty acids, and markers typically associated with Tall Oil. These have been found in variable concentrations; sometimes only at trace levels.

That’s all we actually know. As to whether the fuels causing problems are all showing the same chemical contaminants or are likely to have originated from the same source, there are some people who think they do, others are not so sure. So we cannot say for certain if we are dealing with one original problem source that has since been exported to other locations, or if these types of problems have sprung up in parallel from different sources. It is remarkable, however, how long the supply of these problem fuels has lasted, which has caused those on the receiving end much frustration. This in turn has created demands for answers and firm action, but while it is easy to get upset and make demands, there are no easy answers.

Multiple theories
We cannot say with certainty whether all of the reported cases share the same root cause(s). Reports from testing agencies are not conclusive as to what is in the fuels and what caused the problems, and their investigations are continuing.

A common view is that the fuels causing sticking of fuel pumps contain adhesive chemical compounds and that these may have been introduced into the supply chain via inappropriate cutters stocks used in the production of bunkers at one or more refineries and/or terminals. However, this is speculation and we may never know exactly. In similar cases in the past, the source of the contaminant has generally never been adequately identified, but the root cause was by and large a lack of control of the quality of cutters stock used in the marine pool.

There is also the possibility that the problems stem from cross-contamination due to a new product cargo being loaded into multi-purpose storage tanks that were not sufficiently emptied and cleared. Another view is that the cases are not all related and that where only sludge formation has been reported, it could have been caused by incompatibility between a new product and existing residues remaining in tanks.
Blame game & quality control

It seems very likely that the problem fuels contravened Clause 5 in ISO 8217 and Regulation 18.3 of MARPOL Annex VI which broadly state that fuels shall not contain any material in a concentration that adversely affects the performance of machinery – in other words, it contains harmful contaminants.

Proving that there is something in the fuel that contravenes Clause 5 is not straightforward and requires non-standard, forensic levels of testing, typically using Gas Chromatography/Mass Spectrometry (GCMS) and/or Fourier Transform infrared Spectroscopy (FTIR), which is time-consuming and processing the results can take weeks, especially when there is a spike in demand for such testing.

It is likely that some questions may be raised about previous bunker fuels carried on vessels and the on-board fuel management procedures, hence ship owners would be well advised to carefully document procedures and retain all relevant fuel samples.

However, when testing agencies have identified unusual chemical components and say that these are not naturally present in bunker fuels, the question quickly becomes: who is to blame for these contaminants being in the fuel?

Where certainty is lacking this affects liability; this is why the alleged fuel contamination cases are such a controversial topic, especially regarding which parties should be held accountable. Presently, there is no consensus and many stakeholders are reluctant to share their findings – especially as compensation claims that run into millions of dollars begin finding their way into courts. We may never get a definitive answer as the legal implications are immense.

Speculation is nevertheless rife and includes suggestions ranging from the deliberate introduction of contaminants into the supply chain, to negligence around quality control, bad luck and poor procedures. IBA recognises that generalisations may not apply in all cases and that speculating as to the root cause(s) may result in suggestions that fault lies with parties who are later proven to have acted fully in accordance with best industry practice. Generally perceived wisdom can occasionally prove to be unfounded. There may be some chatter in the market, but IBA has not directly been presented with any evidence of malpractice or negligence by specific companies. It is unlikely that we will, given the substantial legal and financial risks of releasing details to third parties.

Some have called for IBA to bring allegations to the attention of authorities. It is important to understand that to do that, allegations must be corroborated by solid evidence. Anybody that has evidence should contact the relevant authorities directly, though we suspect most who do will be keeping their powder dry until they can present evidence to help them with commercial settlements through insurers and/or courts.

What we can say is this: All suppliers selling product to meet ISO 8217 have a duty to test those cargoes in advance. Once again we call on the industry to observe the advisory in IBA’s “Best practice guidance for suppliers for assuring the quality of bunkers delivered to ships”, in particular the sections dealing with quality control in the production of bunkers and the subsequent supply chain.

Chasing squirrels

Testing against ISO 8217 did not flag up the off-spec fuels reported in the US Gulf, Panama and Singapore, so what can the market do to protect itself?

The trouble is that while the relationship between the parameters for which there are defined limits in ISO 8217 and operational issues is well understood, when it comes to un-specified contaminants – of which there can literally be thousands – this relationship is not well understood. If it was, a limit and recognised test methods would be specified in ISO 8217.

Cases have occurred in the past when seemingly on-spec fuels caused problems and the cause was subsequently deemed to be chemical contaminants. Sometimes the troublesome contaminant has been successfully identified, on other occasions it was not. Moreover, the concentration at which the contaminant can be deemed to be harmful is a question that has clearly not been answered to everybody’s satisfaction, or it could be quantified and added to the standard.

To go back to our original metaphor: dogs chasing squirrels often identify that there are squirrels up a tree and mark it accordingly. But are these squirrels causing any harm?

This is a very pertinent question as often, fuels with certain chemical compounds appear to cause problems for some ships, but not for others. The same issue has been heard regarding fuels provided in the US Gulf, with some saying that there were times when several ships have been provided with fuel from the same batch, but only some encountered operational issues.

While those that did have problems went on to have the fuels tested for contaminants not specified in ISO 8217, those that didn’t may not have seen any reason to do so.

What’s missing is a reference database because today, “no one knows which components are commonly found in harmless fuels nor at which concentration,” says a White Paper written by Bureau Veritas’ fuel testing arm VeriFuel in 2017. The same paper cites an interesting example.

“Styrene was, for a while, identified by some fuel testing companies as an unusual and potentially harmful component in bunkers. It has the ability to polymerise and form polystyrene, and polystyrene has been known to cause filter blocking,” the VeriFuel paper noted. However, studies later showed that styrene in marine fuels does not polymerise, and what’s more, an investigation of vessels that, unknowingly, had bunkered fuels containing styrene, revealed that none experienced any issues consuming the fuel. Only on the rare occasions that polystyrene (not styrene) was present in the fuels, filters were blocking. Yet, some fuel testing agencies have reported styrenes as “unusual and potentially harmful” components when, perhaps, this may have been a case of barking up the wrong tree.

There have been cases in the past where specific contaminants have been identified as the culprit but until the industry can agree at what concentration they pose an unacceptable risk and the appropriate test methods to identify them, setting standards remains as elusive. Just like squirrels elude the dogs that chase them.

At present, empirical evidence from US Gulf cases seems to suggest a link between the operational issues on ships and certain phenolic compounds. But does this mean all phenols are harmful? And do we know at which concentration they cause problems? We don’t. Shale oil, for example, contains phenols and according to ISO 8217 hydrocarbons from shale are among the sources from which fuels can be derived. If shale oil was inherently problematic as a source of bunkers, would we not have seen more widespread and frequent operational issues? Or is this something that needs to be carefully investigated as fuels derived from shale oils become more common?
Fears about 2020 fuel blends

With the market already fearful about the quality of fuel blends provided to meet the new 0.50% sulphur limit in 2020, many have predicted that contamination cases like the one seen in the US Gulf and beyond during the spring and summer of 2018, are going to get much more frequent due to blending to ensure sulphur limit compliance. Some have even suggested that the US Gulf cases were linked to experimental blending of low-sulphur fuels. This has not, however, been supported by the testing agencies we have heard from, who have said the products identified as causing problems were high sulphur fuel oil (HSFO) sold as an RMG380 grade under ISO 8217 specifications (typically either the 2005, 2010 or 2012 edition of the standard).

While IIBA does not underestimate the challenges that will face the market when suppliers need to find new blend recipes to produce fuels to comply with the 0.50% sulphur limit, we would like to emphasise that the contamination cases that have rocked the market this year are completely unrelated to low sulphur fuel oil blending. Moreover, it is important to understand that today’s bunker fuels; both HSFOs and distillates, are also by and large blends. Blending has been going on for decades to ensure bunkers meet the relevant ISO 8217 specifications. Traditionally, the blend target would be to bring viscosity, density and metals within the relevant specifications. In recent years, due to environmental regulations, sulphur has also become a blend target.

In this regard, nothing is changing in 2020; low sulphur fuels will still be blends and the blend components need to be permissible under the scope of the ISO 8217 standard. According to ISO 8217-2017, fuels can be hydrocarbons from petroleum crude oil, oil sands and shale; hydrocarbons from synthetic or renewable sources, similar in composition to petroleum distillate fuels, and blends of the above with a fatty acid methyl ester(s) (FAME) component where permitted.

The blend composition will change, as refinery residual that make up the biggest share of bunkers today are typically too high in sulphur. This may cause some teething problems before bunker fuel producers have identified the ‘recipes’ that work best, but it should not open the door to including cutter stocks with contaminants.

What can be done?

Owners that have been unfortunate enough to bunker these problem fuels have been getting help and advice from fuel testing agencies in managing the situation.

In some cases, it was too late and the damage was done while in others it was possible to find operational remedies to at least get the ship safely to the next port.

For ships that have lifted bunkers in areas during the time when contaminated fuels were known to be supplied, it is strongly recommended to get a solid overview of the quality of the fuel prior to using it by allowing time for tests going beyond routine ISO 8217 quality tests. Ship operators that decide to use fuels from the affected areas without this precaution should pay close attention to fuel oil system components, in particular fuel pumps and filters to act quickly if there are signs of problems. They should further consult technical managers/chief engineers within their own company and/or from other technical service providers, including bunker suppliers.

An issue that has been highlighted is that the methodology for the application of non-standard, forensic levels of testing varies from one laboratory to the next which means that the results cannot always be compared and there may be questions around the reliability of the results.

The closest we are to a standard method is ASTM D7845-17, which has been developed to quantify chemical species at low levels in marine fuel oils and cutter stocks by multidimensional GCMS, but it has limitations. Indeed, using the ASTM D7845-17 is not sufficient to identify all the chemical species that may cause operational issues and hence give more full protection against breaches of Clause 5 of ISO 8217 and Regulation 18.3 of MARPOL Annex VI.

IIBA has many corporate and individual members employed in the laboratory testing industry, and we have called on them to participate in a Working Group to address the current issue and the potential solutions. We have had a good response to this and while IIBA fully recognises and respects the work done by ISO, ASTM and CIMAC in identifying appropriate test methods, we hope to assist in the development of globally consistent methods and protocol which, along with our Best Practice guidance for bunker suppliers regarding supply chain control, can bring better understanding of what happened this year and how to prevent it from happening again.