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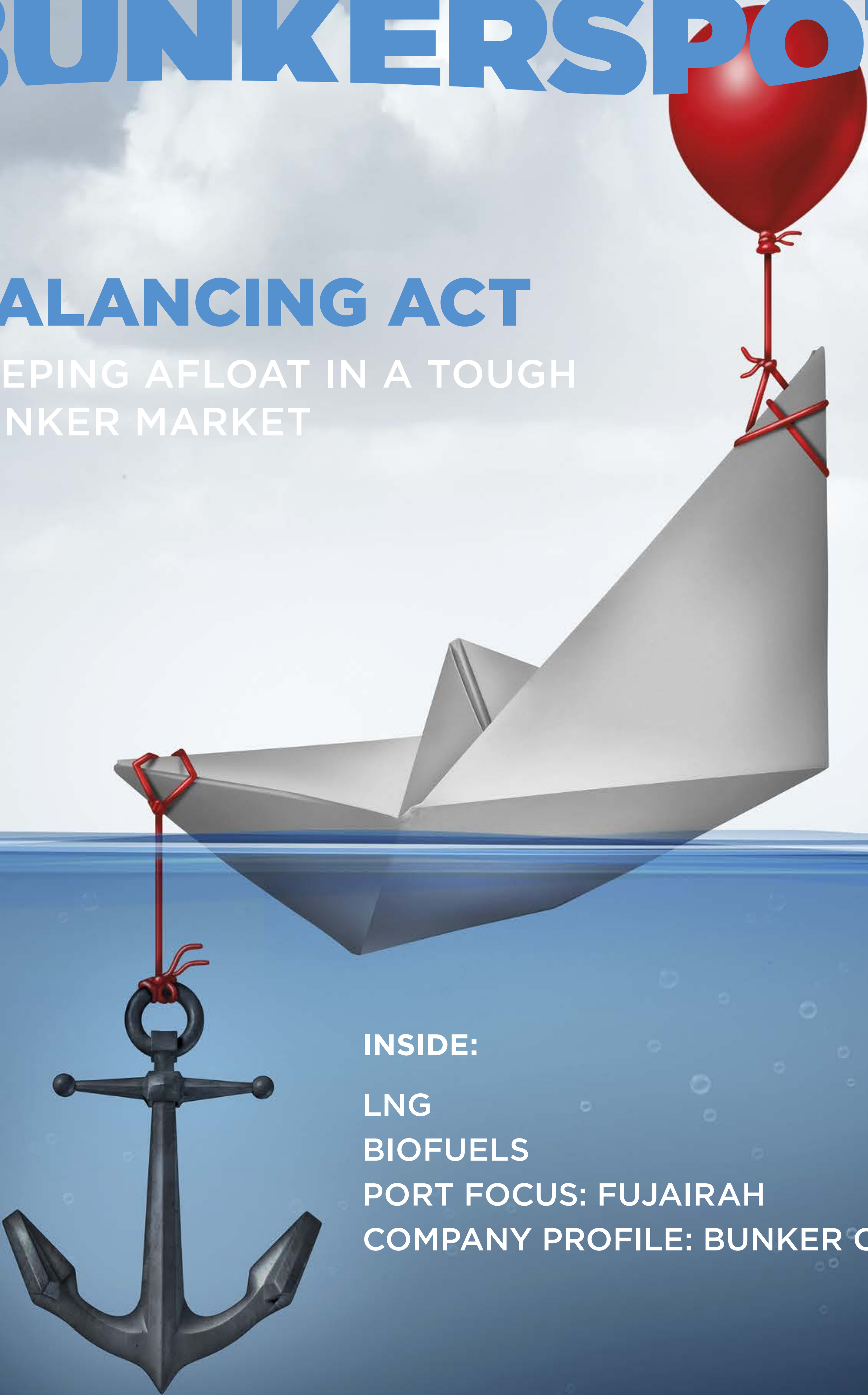
BALANCING ACT

KEEPING AFLOAT IN A TOUGH BUNKER MARKET



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Close investigation

When a fuel is found to be significantly contaminated, testing laboratories instigate a process of additional tests. Whilst acknowledging that analytical rigour is necessary, **Albert Leyson** of Drew Marine asks whether some testing of bunker fuels may now be more assiduous than is necessary

I am certain that all of you would agree with me that the maritime industry has never been criticised for having too few regulations. For as long as I have been working in the marine industry, since the mid-1990s, there has seldom been a year whereby a new regulation was not initiated, adopted, ratified, or entered into force.

Time after time, many of us have probably opted to accept only those regulations that were compulsory. However, we should be mindful as it is these very same regulations that aim to safeguard our shipping assets from the challenges of operating in the open sea and to protect our shipmates from harm and preserve the marine environment where both mariners and ships operate.

As we all know, the marine bunkering community is no stranger to regulations. Within this industry sector, there are working groups and technical committees from various organisational bodies that are comprised of stakeholders who represent the entire marine fuel value chain. Stakeholders from the bunkering community include those found upstream, such as refiners and bunker suppliers, to those found downstream, such as engine operators who need to feed a steady supply of fuel to their propulsion and generator engines. In addition, there is everybody else in between who might play a role throughout the marine fuel value chain, and they include a global multitude of surveyors, additive suppliers, bunker tanker operators, testing laboratories, and the like.

For those of us not in the know, these working groups and technical committees gather regularly to address the regulatory and standardisation needs required of their craft. In general, standardisation is the essential process of developing 'consensus-based' standards that promote innovation and solutions to challenges within various business domains. Key players within these domains, which include those working for the bunker industry, normally provide a forum for resolving commercial problems.

Forums have proven themselves useful in solving problems which could arise as commercial products exchange hands from one stakeholder to another. In the case of bunkers, the relevant forums have been key in resolving issues that pertain to how fuel is delivered, handled, and used on board for propulsion and power generation.

Specifically, per the most cited forum, the International Organization for Standardization's (ISO) technical committee for classifications and specifications, ISO/TC28/SC4, bunkering standards, can cover marine bunker terminology, fuel specifications, methods of sampling, measurement, analysis, etc. Similarly, working groups such as the International Council on Combustion Engines' CIMAC WG7|Fuels prepare recommendations, which may include providing technical input to ISO/TC28/SC4 and providing guidance that would ensure optimal fuel handling and combustion.

For a case in point, let us recall some of the after-effects of ISO's release of ISO 8217:2017 Petroleum Products – Fuels (class F) – Specifications of marine fuels last year. This sixth and latest edition of the global marine fuel standard introduced the addition of three new distillate fuel specifications (DF grades) that can include up to 7.0% volume of fatty acid methyl ester (FAME) content. The additional bio-derived fuel grades have been included because they are renewable and can result in reduced greenhouse gases (GHGs) and sulphur emissions (SOx), according to the marine specification.

However, in my opinion, the legitimate inclusion of FAME via the new DF grades essentially permitted its movement within the marine bunker supply chain. As a result, the probability of having FAME in the traditional fuel grades (RM grades and DM grades) will likely increase. Furthermore, I firmly believe that as the demand for low sulphur fuel and the adoption of the new fuel specification continue to rise, the inadvertent inclusion of FAME, which naturally contains low sulphur, as a component of traditional bunker grades will also likely increase in frequency.

At this point, I respectfully invite naysayers to dispute my opinion. Then again, perhaps my candidness should be curbed, because apparently the rules of the road in terms of what defines FAME as 'contamination' beyond the formerly 'acceptable' *de minimis* amount of 0.1 volume % FAME per the previous edition of ISO 8217:2012 has been fortuitously, if not conveniently, changed. Typically, when regulations are modified or improved, they are superseded with a stricter version or an increased tightening of its original form or limit in this case. As it were, perhaps the working groups had anticipated our concerns regarding the increased inclusion of FAME in traditional bunkers and correspondingly increased the 'acceptable' *de minimis* amount from 0.1 to 0.5 volume % FAME. The exact wording can be found within ISO 8217:2017 in the informative Annex A, where it states:

> *'…with exception of DF grades, fuel producers and suppliers should ensure that there is no deliberate blending of FAME into the fuel, adequate controls are in place so that the resultant fuel, as delivered, does not exceed the "de minimis" which is now taken to be a level of approximately 0,5 volume % FAME, and the fuel is compliant with the requirements of Clause 5.'*

While Annex A is quite specific as to what concentration of FAME is allowable, the general requirements from Clause 5 are much broader. As an example, Clause 5 states the following:

> *'The fuel shall be free from any material at a concentration that causes the fuel to be unacceptable for use in accordance with Clause 1 (i.e. material not at a concentration that is harmful to personnel, jeopardises the safety of the ship, or adversely affects the performance of the machinery).'*

One might conclude that the general requirements from Clause 5 are simply too broad. As such, its requirements could be subject to interpretation which can potentially lead to commercial misunderstandings between parties.

Ultimately and for clarification, we must look once again into Annex A where it indicates that fuels containing FAME should be ensured compatibility with the

> *ship's storage, handling, treatment, service and machinery systems, together with any other machinery components (such as oily-water separator systems).*

'The single point that I would like to stress is that even though a traditional fuel may meet the stipulated fuel specification including the *de minimis* levels of FAME, the fuel may still lead to increased maintenance and other operational problems'

In fact, within Annex A, there exists sufficient detail that explicitly identifies four potential complications with respect to the storage and handling of distillates with FAME. These complications include the tendency for fuel oxidation and long-term fuel storage issues, the FAME laden fuel's increased affinity to water and risk of microbial growth, the deposition of FAME material on exposed surfaces (including on filter elements) and degraded low-temperature flow properties.

In the June/July 2017 issue of *Bunkerspot*, I highlighted the latter issue of distillate fuel which could have inadequate cloud point and cold filter plugging point properties, and I also provided the solution, whereby treating such fuel with cold flow improvers would improve its cold flow properties ('Cold flow', p74-77). As an aside, I would like to address those steadfast ship operators, who remain sceptical and still do not believe in fuel additive treatment, by referring to a subpart in Clause 5 which states,

> *'…additives that improve some aspects of the fuel's characteristics or performance are permitted.'*

For further information regarding fuel additive treatment, please refer to CIMAC Heavy Fuels Working Group's *Recommendation Number 25|2006: Recommendations Concerning the Design of Heavy Fuel Treatment Plants for Diesel Engines.*

For the three other remaining issues, I have previously addressed these issues and their potential solutions in the June/July 2016 issue of *Bunkerspot* ('FAME academy', p43-46). I would like to point out that this article was written at a time when the draft version of ISO/DIS 8217:2015 was still being solicited for ballot comments. While my commentary about regulations in a trade magazine is not in any way formal and is obviously ineligible for use as an official ballot comment, I would like to reiterate one important point from that article.

The single point that I would like to stress is that even though a traditional fuel may meet the stipulated fuel specification including the *de minimis* levels of FAME, the fuel may still lead to increased maintenance and other operational problems. This point should resonate further now due to the higher *de minimis* limit of 0.5% volume that has been set for FAME in traditional fuels. To further illustrate my concern, I will refer to Annex A one last time, where it concludes that,

> *contact of materials such as bronze, brass, copper, lead, tin and zinc with FAME should be avoided as these may oxidise FAME thereby creating sediments.*

Therefore, to serve as a precaution for bunker buyers, who may have already chosen to stipulate the new DF grades on their bunker stems, it may be worthwhile to vet the metallurgy of the entire ship's fuel system and its subcomponents for compatibility with FAME. As an additional measure to mitigate the aforementioned risk, the use of a multi-functional fuel additive such as Drew Marine's AMERGY ULS-D should also be considered. AMERGY ULS-D was ►

specifically designed to handle off-spec fuel that has been mixed or contaminated with bio-derived components which includes FAME as well as other contaminants that can result in sediments and other types of deposits.

By happenstance over the past three years, I have noticed an increasing trend whereby ship operators have requested Drew Marine's assistance in how to deal with conventional fuels that have been positively identified with FAME contamination or a combination of FAME with other types of contamination.

Whenever I received such requests, I would, in confidence, request copies of the analysis reports of the fuel in question so that I could ascertain the severity of the contamination and review the overall quality of the fuel. After I have evaluated all pertinent analysis reports, I would subsequently recommend the most cost-effective fuel additive as appropriate.

Basically, FTIR uses light from the infrared part of the electromagnetic spectrum to excite the unique chemical compounds that are present in the sample. Subsequently, it analyses each of the infrared peaks and associates them with predefined substances. But in order to identify specific contaminants, the peaks of each contaminant must be identified, using reference spectra of various substances. After each contaminant has been positively identified, the height or area under the specific infrared peak is used to determine the amount of that substance since its size is proportional to its concentration.

Once the type and amount of contamination has been determined by the laboratory, it would be reasonable to expect that several types of corrective actions could take place (i.e. initiate a bunker claim, use the fuel with or without an additive, debunker, etc.). However, the truth of the matter is that the process has become much more complicated due to additional testing.

> 'It seems to me that the latest test methodologies employed have gone above and beyond standard fuel testing and have reached analytical techniques that were once reserved for forensic investigations'

Granted that in certain cases when a fuel is found to be significantly contaminated, the respective testing laboratory would typically initiate additional testing to get to the bottom of the problem. To fully understand the exact nature of the fuel contamination, laboratories have implemented a basic two-step assessment using the unique measurement capabilities that is offered by Fourier-transform infrared spectroscopy (FTIR) scanning.

The first step in FTIR scanning typically involves testing of all the submitted fuel samples. This initial scan serves as a quick and inexpensive screening test to determine whether or not a fuel conforms to a specific reference scan. Normally there would be one reference scan or baseline spectrum for each grade of marine fuel.

An FTIR scan that conforms to the respective fuel grade reference scan would be given a 'pass' rating. An FTIR scan of a fuel sample that does not conform to its respective reference spectrum would proceed to step two. At this stage, the FTIR spectra of the fuel sample is compared with known spectra of various substances in order to determine the specific contaminant as well as the amount of contaminant present.

As the old saying goes, 'you cannot manage or control what you are unable to properly measure.' Apparently over the last decade or so, fuel testing laboratories have been increasing their use of advanced analytical techniques to ascertain whether a fuel will cause problems on board. It seems to me that the latest test methodologies employed have gone above and beyond standard fuel testing and have reached analytical techniques that were once reserved for forensic investigations.

Then again, testing laboratories could argue that they have yet to exhaust all their available analytical capabilities which can be used to further scrutinise particular fuel samples, especially those samples which have been pre-screened (via FTIR) to contain contaminants. The belief or perhaps the question that begs to be answered is – would it be possible to predict how a particular fuel would behave after it has been subjected to certain operating stresses such as heat, pressure, or even combustion?

To elaborate on this notion, let us consider one such technique which utilises gas chromatography mass spectroscopy (GC-MS). GC-MS is the preferred analytical method that is used in highly specialised fields such as toxicology, forensics, and environmental research. Yet, when used for fuel analysis, GC-MS could completely unlock any fuel's inherent building blocks. GC-MS is capable of positively identifying and quantifying precise fuel properties (i.e., volatility, polarity, presence of functional groups, etc.), including any contaminants that may be present right down to their individual atomic/molecular composition.

Per ISO 8217:2017, marine fuels are comprised of unique blends of hydrocarbons (e.g., originating from petroleum crude oil, oil sands, shale or from synthetic or renewable sources) or blends of these hydrocarbons with FAME where permitted. As such, GC-MS should be able to discern known hydrocarbons and detect nonconforming substances quite easily. Nonetheless, I am reminded about such substances every time I am asked whether or not Drew Marine possessed a specific type of 'foo foo dust' to counter the ill effects, as if by magic, of all the peculiar substances that were considered to be out of the norm.

To that end, I must call out ISO 8217:2017 Annex B, where it reviews deleterious materials and states:

> *It is therefore not practical to require detailed chemical analysis for each delivery of fuels beyond the requirements listed in Table 1 or Table 2.*

As a reminder, Table 1 and Table 2 list the fuel specification maximum and minimum limits by test parameter and test method for marine distillate and residual fuels, respectively.

Let us keep things simple. If the fuel is off specification, then please consider treating the fuel with a fuel additive to improve the fuel's characteristics or performance.

To conclude, I call out to one of Albert Einstein's less notable quotes: 'Not everything that counts can be counted, and not everything that can be counted counts.'

Drew Marine provides technical solutions and services to the marine industry with a range of advanced marine chemicals, and equipment.

Contact Drew Marine to learn more about next-generation fuel additive solutions.

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