Frequently Asked Questions on the application of latest international marine fuel quality standard ISO 8217:2024

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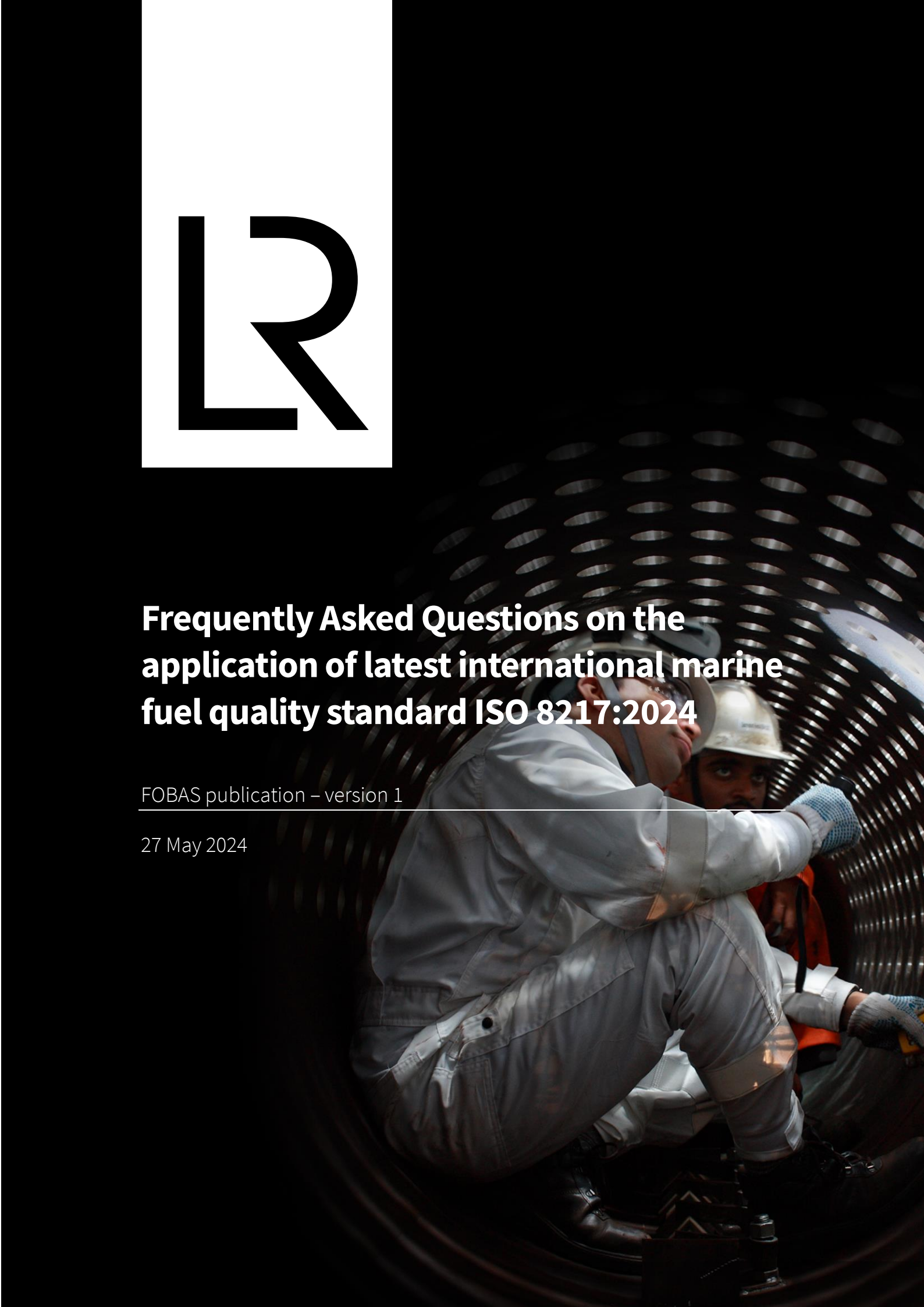

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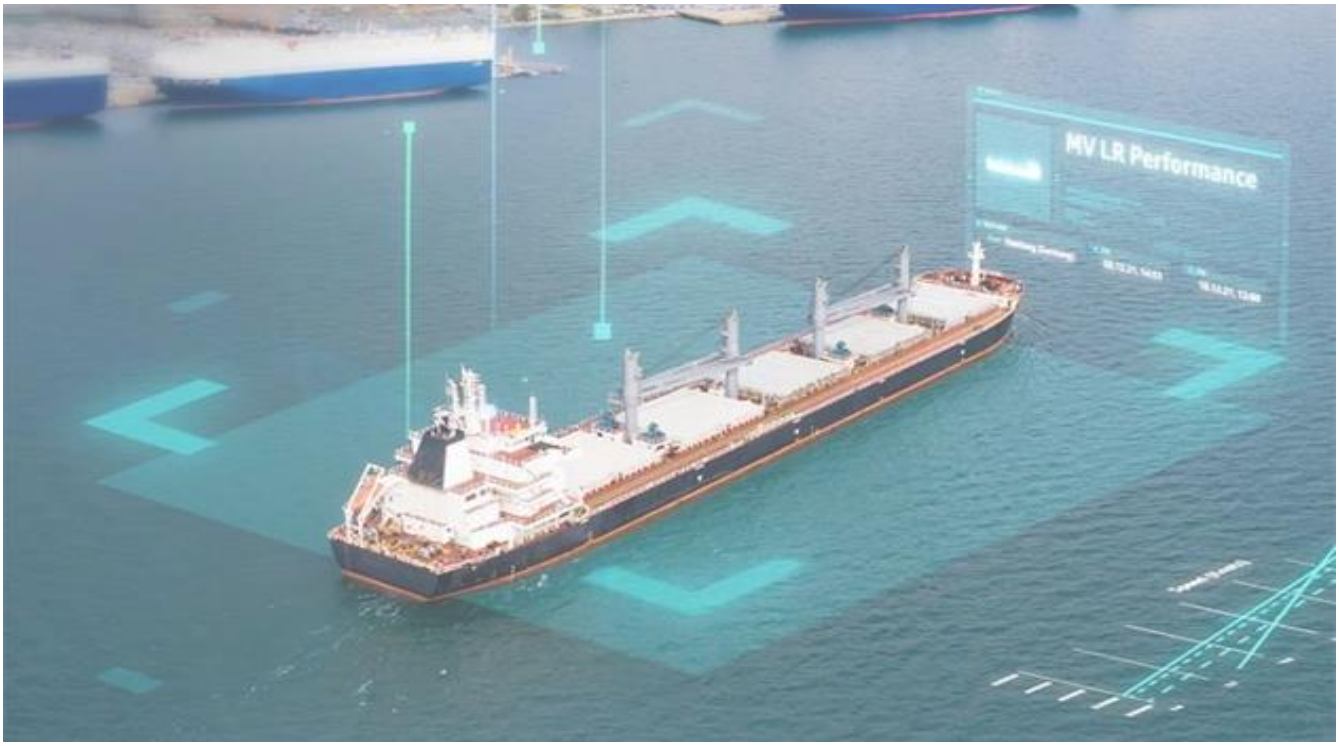

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1. Introduction

This document has been prepared to address Frequently Asked Questions (FAQ) from a ship operators' perspective as marine fuel buyers on the latest version of ISO 8217 (7th edition). ISO TC28/SC4/WG6 is a working group which has the task to develop, review, and update international marine fuel quality standard ISO 8217. The working group is comprised of subject matter experts representing ship owners, associations, national standards bodies, classification societies, fuel testing services, engine designers, fuel treatment equipment manufacturers, marine fuel suppliers, fuel additive suppliers and the petroleum industry.

2. Overview of the 7th edition

The increasing demand of environmental legislation is leading a marine fuel transition towards oil products derived from synthetic and renewable, recycled or alternative sources. There are a number of significant changes as compared to the 6th (2017) edition both in terms of extent and content. The most noticeable change is to the residual grades in that these will now be divided into three separate tables – one covering 4 RM grades not exceeding 0.50% or 0.10% sulphur, another for what will be termed RF fuels covering 5 grades of unrestricted % FAME content – it being for the purchaser to specify the required proportion, e.g., B30, and a third one of 5 RM grades above 0.50% sulphur. Hence in each category there has been a rationalisation of the number of grades. Similarly for the distillates each of the grades, apart from DMX, has a corresponding FAME blend version of unrestricted % mass or volume. In the case of the FAME blends, residual or distillate, the % mass or volume is to be advised to the receiver at delivery, the FAME used is generally to have met either the EN 14214 or ASTM D6751 specification requirements and the net specific energy is to be reported by the supplier.

Each of the category tables now include specific reference to the clauses 5 to 10 of the standard. The principal change to the residual grades is that these all now also include a minimum viscosity, in addition to the existing maximum. Otherwise generally the limit values, for both the distillates and residuals, have not fundamentally altered although in the latter case there has been a redistribution across the reduced number of grades. A new requirement has been added that all marine fuels shall be free of organic chlorides.

To enhance control of asphaltene stability in the case of sulphur limited RM grades and the RF grades ($\leq$ 0.50% S) it is now required by the supplier to test and report in terms of total sediment by thermal ageing to the same limit as before but additionally however the accelerated and existent values are also to be reported.

In addition, the standard now makes reference to the 'Viscosity Gravity Constant' (VGC) which may be used for information as to whether a residual fuel tends towards being paraffinic or aromatic in nature – a topic which has been further described in Annex K of the new standard.

3. List of FAQs

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4. Answers to FAQs

1. What are the main changes in latest edition of ISO 8217 compared to the previous version?

The main changes compared to previous version has been outlined in the "Foreword" of the new standard which are as follows:

- terms and definitions (Clause 3) have been updated with 26 terminologies used defined
- the Scope and the General requirements in Clause 5 have been amended
- Table 3 (Biofuel RM grades) has been added
- former Table 2 (RM grades) has been split into two tables i.e., Table 2 (<0.50% sulphur RM grades) and Table 4 (>0.50% sulphur RM grades)
- Clauses 9 and 10 have been added to cover FAME products and test methodologies respectively
- new Annexes F (cold flow), H (Stability of RM fuels) and K (Characterisation of RM fuels) have been added (see question 14)
- existing annexes have been reviewed and updated
- Minimum viscosities for RM grades have been included (see question 15)
- changes to the distillate fuels, include the following:
    - the requirement to report the fatty acid methyl ester(s) content (FAME) of DF grades has been changed, allowing up to 100% FAME
    - the distinction between winter and summer quality for cloud point and cold filter plugging point has been removed
    - the requirement to report the net heat of combustion for DF grades has been added
    - a minimum cetane number requirement for DF grades has been added
    - the requirement for oxidation stability for DF grades have been added.

2. Why the new standard has four tables?

Since the publication of the 6th edition of ISO 8217, regulatory changes (especially the 2020 MARPOL Annex VI outside ECA-SOx sulphur reduction to 0.50%) and the requirement to decarbonize shipping have resulted in new blend formulations and an introduction of biofuels in the marine market. As the nature of these new fuels/blends is more diverse compared to traditional fuels, they require a different focus and additional quality control parameters, as such it was decided to separate the different types of fuels as described in section 2 of this document. Due to testing and handling experience since the introduction of VLSFO in 2019, it became clearer that the more paraffinic VLSFOs had different properties and needed an adapted test slate and limits compared to traditional HSFO. As such, the previous residual fuel table 2 was split into individual VLSFO (Table 2 — Residual marine fuels with sulphur content below or at 0.50 % by mass) and HSFO (Table 4 — Residual marine fuels with sulphur content above 0.50 % by mass) tables. Moreover, Table 3 was added specifically for RM biofuel blends.

3. Why only FAME and paraffinic diesel are allowed instead of all biofuel sources?

FAME along with paraffinic diesels (e.g., HVO, GTL, BTL) are established fuels on the market i.e., have defined specification of EN14214/ASTM D6751 and EN15940 respectively. Other biofuels from other sources and manufacturing processes do not have to date specification to which ISO can refer to hence excluded and not allowed. Nevertheless, the door is open for any new type of biofuel which however needs to go through a comprehensive pre-sea trial and sea trial to demonstrate new blends suitability of onboard ship. Seek direction and acceptance from Class, flag Administration and OEMs.

4. What additional test parameters have been included in the standard to fully characterise the biofuels?

FAME content (by mass) and net heat of combustion (physical method – ASTM D240) have been introduced for both residual and distillate biofuel blends as additional parameters. Moreover, for distillate biofuel blends, Cetane Number limit has been set in place of cetane index for FAME blends because the cetane index calculation methodology does not apply where there is presence of FAME. However, providing the calculated Cetane index is above 40, then it can be assumed that the Cetane number limit has been met. For an actual Cetane number, the Cetane number test needs to be caried out. Additionally, oxidation stability requirement has been included for DF grades (see question 5).

5. Why are there two different oxidation stability tests in table 1?

Previous ISO 8217 edition includes oxidation stability test method ISO 12205 for distillate grades. According to the scope of ISO 12205, the test method is not applicable to fuels containing residual components, or any significant component from a non-petroleum source. This test method is therefore maintained for DM grades only however for distillates containing FAME (DF grades), EN 15751 has been introduced specifically developed for biodiesel fuels. This test method is applicable for biodiesel blends from 2% to 100% FAME.

6. What are the main differences between EN 14214 and ASTM D6751 as both are referenced in ISO 8217?

EN 14214 “Fatty Acid Methyl Esters (FAME) for use in diesel engines and heating applications — Requirements and test methods” is the standard used in the European Union and is more related to the formulation of a product. This means that tests to determine ester content and glycerides concentration are included as spec parameters. ASTM D6751 “Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels” is a standard predominantly used in the US and is more performance orientated.

Both standards serve the same purpose by providing sufficient quality guarantees for the FAME to be blended into the marine fuel pool where ASTM D6751 is more defined by operational requirements whereas EN14214 has more quantitative compositional requirements.

It is important to note that The FAME being used as blend component shall conform to a chosen specification, PLUS the finished product shall also conform to the chosen ISO 8217 grade. It is however

impossible to "see" the FAME quality after blending, therefore, the FAME quality must be established through declaration by the supplier prior to blending.

7. Is it possible to determine the biofuel source through ISO 8217 testing?

It is not possible to know the type of feedstock used to manufacture the biofuel blend through ISO 8217 testing. This piece of information should be provided by the supplier on the fuels Proof of Sustainability certificate/declaration.

8. If I am ordering B100 FAME fuel to be used in residual fuel system, will it come under table 3?

No, it will be categorised under table 1 (distillate grade), additionally it has to comply with EN 14214 and/or ASTM D 6751 standard.

9. Why is it important to perform physical method to determine heat of combustion for biofuel blends instead by calculation?

For conventional petroleum hydrocarbon fuels ISO 8217 has a calculation for net specific energy and gross specific energy for both Residual and Distillate fuels – using the tested density, sulphur, water, and ash contents. This has been shown to be sufficiently precise for ships to gauge their fuel consumption and, where the engines require, to be mapped into the engine control system. In view of the variability of the new fuel blends and the importance of energy management this has become of greater importance, but the formula used within the standard is only applicable for fossil fuels. Biofuels per definition have a lower calorific value, so this will have an impact, proportionally to the blend ratio.

Where the petroleum fuel blend includes a percentage of a biofuel, now becoming a more frequent request to meet carbon emission reduction targets, the formula included in ISO 8217 for the calculation of the energy value will be inaccurate, and the figure is usually too high. At present there is no official calculation method available, so where a ship needs a specific and as precise as possible value then the ASTM D 240 determination of the heat of combustion by Bomb Calorimeter should be used. Noting that energy value of FAME is typically 37 MJ/kg compared with a residual fuel of about 41 MJ/kg.

10. Why are organic chlorides not tested every time?

It is well recognised in the marine fuel supply industry that all fuels should be free of organic chlorides due to its detrimental effects on machinery equipment. In view of the severity of this, it is the responsibility of the supplier to perform suitable checks to prevent any contamination of organic chlorides in the fuels, that is why it is not considered an absolute necessity to test each batch of fuel for organic chlorides unless specifically requested or advised.

11. What are the changes in sediment testing and reason for those changes?

Suppliers are now required to test for total sediment potential (TSP) for fuels under table 2 and table 3 (VLSFO and Bio blends) as the alternative total sediment accelerated (TSA) cannot be relied upon to determine whether TSP will have or have not met the limit. The requirement therefore is on the supplier to provide the TSP result of the fuel as supplied and for additional information provide TSA and TSE

results. It should be understood that for high sulphur fuel categorised under table 4, TSA test remains applicable although in case of dispute, TSP remains the reference test method. More information on the interpretation of total sediment test results is available in CIMAC guideline *03 |2024 - Overview and interpretation of total sediment test results in the context of ISO 8217:2024*.

12. Why are there no further tightening of catfines (Al + Si) limits?

Statistically, there was no reason to change any of the catfines limits, as there have been little to no reports of off-spec catfines causing operational challenges, especially for the VLSFOs, the most widely used fuel grade. This is due to their generally lower density and viscosity. Settling and separation of catfines is, according to Stokes law, even more effective compared to traditional, higher density and viscosity product, like HSFO, as the comparatively heavy particles separate more easily.

13. Why are Wax Appearance and Disappearance Temperature (WAT & WDT) tests excluded from the specification?

Both test methods provide potential useful information on the use of a product, operationally, onboard a vessel, however this will always need to be reviewed within the framework of the wider operational conditions. Further, the test provides a temperature when waxes appear and disappear, but has no indication on the amount of wax, nor the effect on the fuel; ASTM D8420 does not quantify the amount of wax, nor determine the size of the crystals formed, which means that one can have a high WAT & WDT but will not necessarily experience operational issues. Noting also that fuels should not be overheated during storage and so the 'pour point' remains the critical temperature to maintain the fuel at or above, below which the fuel will become unpumpable and re-liquifying is not a straightforward process. If any presence of wax crystals forming, the fuel can still be pumped through to the settling tank where the temperature is elevated and should dissolve back. FOBAS however has developed a more performance related test method to address potential issues of high melting point waxes that may be present in low viscosity fuel. This test SWPP (Sediment and Wax Precipitation Point) provides a temperature above which any presence of wax would have been dissolved preventing sludging effect on the purifier.

14. What are the new annexes and their reason for inclusion?

Annex F, H and K are new annexes.

Annex F provides greater clarity on cold flow properties and testing thereof. The introduction of VLSFO and biofuels in the marine market has resulted in cold flow properties becoming more significant especially in the context of storage and handling of these fuels.

Annex H provides information on the stability of marine fuels and on the different test methods that can be used for testing of sediment in residual marine fuels.

Annex K on the characterization was introduced to respond to a request from the IMO to investigate the possibility to provide the shipping industry with an informative indicator to define whether a residual fuel tends to be more aromatic or paraffinic in nature.

15. Why minimum viscosity levels have been introduced for grades for residual fuel?

There have been reports of ships receiving fuels with unexpectedly low viscosity when the ordered grade was a high viscosity fuel such as RMG 380. Moreover, setting minimum viscosity provides a clearer delimitation between the grades with number of options to choose from in the new standard.

16. Some suppliers say they cannot meet the minimum viscosity limit for the ordered grade. How should a buyer manage this and operationally, can the buyer still take the fuel?

If suppliers cannot meet the minimum viscosity limit, this should be handled in the same way as for any other parameter, where the supplier advises the buyer that the bunker to be supplied will be of a lower viscosity. The grade ordered should be the preferred grade for the engine and cleaning system onboard, but most engines are capable of handling a whole range of fuels from the ISO grades, so as such, if one particular grade isn't available, the customer and supplier need to agree on which grade to be supplied. It's also possible to buy fuel to a specific grade with a viscosity exception.

17. Any reason why Table 2 has no RMD80, however Table 3 have kept RMD80 grade?

The bio component in the residual blends is likely to reduce the viscosity and hence will tend to fall into the 80mm^2/s realm.

18. Why is the list of compounds only limited to Organic chlorides, Polymers and Inorganic acids in Annex B of the standard?

GC-MS (Gas Chromatography & Mass Spectrometry), the most commonly used method for detecting unknown chemical species, is ultimately a research and development tool, with many different in-house methods in use. When testing, it isolates different chemical compounds some of which may be previously unseen in marine fuels. There needs to be a due diligence process in place to actually prove that the compound is in fact new, plus it is actually present in a concentration high enough to be connected to any reported problems when using individual fuels. Due to cause and affect not being proven between onboard challenges and test results, coupled with a lack of systemised, standardised test methods to compare like results and benchmark feedback, it is difficult to add specifically named compounds, as if associated incorrectly, they become an unwilling, unproven focus which ultimately can condemn good fuel and reduces availability.

19. Why is it important to use the latest edition of ISO 8217?

The latest edition of the standard is based on the most up-to-date information in fuel formulations, test method types and limits, recent fuel statistics, operational experiences being fed back from the users, and adapts to the actual fuel quality available in the market today. Particularly for this version, the change to allow FAME up to 100% plus the addition of two new tables, including a "VLSFO" table, allows the buyers and users to pinpoint exactly the fuel quality they need in today's difficult market. These important changes warrant the adoption of this edition to capitalise on the benefits.

20. What happens to the older versions of ISO 8217?

ISO 8217:2024 states that: 'This seventh edition cancels and replaces the sixth edition (ISO 8217:2017), which has been technically revised'. However, the standard is used in a commercial transaction between buyer and seller and in those areas where the available fuel quality may not be according to the new standard, the bunker purchase is often commercially agreed compared to an older, outdated ISO 8217 edition.

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