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AIR POLLUTION AND ENERGY EFFICIENCY

Best practice for suppliers for assuring the quality of bunkers supplied to ships

Submitted by IBIA

SUMMARY

<i>Executive summary:</i>	This document offers in the annex best practice guidance for bunker suppliers developed by IBIA
<i>Strategic direction, if applicable:</i>	1
<i>Output:</i>	1.18
<i>Action to be taken:</i>	Paragraph 2
<i>Related documents:</i>	MEPC 71/5.6, MEPC 71/17; MEPC 69/21, MEPC 69/5/3, and MEPC 69/INF.7

Introduction

1 The Committee, at its sixty-seventh session, established a Correspondence Group on Fuel Oil Quality to develop draft guidance for assuring the quality of fuel oil delivered for use on board ships. The Correspondence Group, as instructed by the Committee, discussed elements of draft guidance on best practice for fuel oil providers, fuel oil purchasers/users and Member States/coastal States, and has informed subsequent sessions on progress. At its sixty-ninth session, the Committee encouraged the fuel oil supply industry to develop draft best practice for fuel oil providers, taking into account annex 1 to document MEPC 69/5/3 and submit this best practice for consideration by the Committee at a future session (MEPC 69/21, paragraph 5.14). At MEPC 71, the Committee reiterated its request to the fuel oil supply industry to submit pertinent proposals to MEPC 72. Responding to this request, IBIA has developed comprehensive best practice guidance for bunker suppliers for assuring the quality of bunkers supplied to ships.

Action requested by the Committee

2 The Committee is invited to consider the guidance set out in the annex in conjunction with its consideration of document MEPC 72/5/6.

Best practice guidance for suppliers for assuring the quality of bunkers delivered to ships

1. INTRODUCTION

1.1 These best practices are intended to assist bunker suppliers to ensure the quality of bunkers delivered to ships meet the agreed purchase specifications and applicable global and local regulations.

1.2 The majority of bunkers are ordered against ISO 8217 specifications, and are also required to conform to MARPOL Annex VI, and the minimum flashpoint limit of 60°C stipulated in SOLAS. Regulation 14 of MARPOL Annex VI sets maximum limits on sulphur at 0.10% in emission control areas (Regulation 14.4) while outside ECAs the limit will fall from 3.50% to 0.50% from 1 January 2020 (Regulation 14.1). Regulation 18.3 of MARPOL Annex VI includes requirements that fuel delivered to and used on board ships shall not include any added substance or chemical waste which jeopardizes the safety of ships or adversely affects the performance of the machinery, or is harmful to personnel, or contributes overall to additional air pollution.

1.3 The bunker supply chain from refinery to the point of delivery to a ship varies enormously; it can be long and complex. The final product may be a blend of components from multiple sources that may not be readily identified. It is therefore important to undertake checks and controls to ensure the end product meets relevant specifications and avoid any practices that may compromise the quality of fuel supplied to ships.

1.4 A number of international and local standards address some or all of these issues. Some of these are mentioned in the definitions and references and/or in the bibliography of this guidance. Where specific local or national standards and regulations exist, these should be followed.

1.5 IBIA believes our guidance on best practice for suppliers is ambitious. Many bunker suppliers would struggle to adhere to various aspects of these best practices due to a variety of factors, including but not limited to local or commercial constraints and a lack of cooperation from other parties. Nevertheless, this best practice guidance could contribute to improving standards and reduce the risk of bunkers delivered to ships failing to meet the buyer's quality specifications.

1.6 This guidance applies only to oil-based bunkers; it does not apply to supply of low flashpoint fuels such as LNG, LPG or methyl/ethyl alcohols, nor to pure biofuels.

2. DEFINITIONS & REFERENCES

2.1 Bunker(s): Fuel for ship consumption - consisting predominantly of hydrocarbons primarily derived from petroleum sources, may also contain hydrocarbons from synthetic or renewable sources. Bunkers are chiefly classified as distillate or residual fuel oils. Usually referred to as 'fuel oils' in IMO documents.

2.2 Bunker supplier/supplier: Manufactures or buys, owns and stores fuel oil and sells bunkers. May blend products to meet the customer's specifications. Distributes bunkers from pipelines, trucks and/or barges which are either owned or hired from third parties. Issues the bunker delivery note (BDN) but may not be the physical supplier, having contracted a third party (barge or truck provider) to deliver to the ship.

2.3 Bunker barge provider: Owner/operator of tankers or barges providing transportation services for a physical supplier. Usually issues the BDN on behalf of the supplier.

2.4 Truck provider: Owner/operator of tank trucks. Usually issues BDN on behalf of the supplier.

2.5 Cargo Officer/supplier's representative: Person appointed by the supplier to be responsible for the delivery of bunkers to the vessel from the bunker tanker(s), the shore tank(s) or the road tanker(s) and is responsible for the completion of the documentation to be provided to the receiving ship.¹

2.6 Bunker Buyer/Purchaser: In the context of this document, the buyer/purchaser broadly refers to the representatives of the ship receiving the bunkers, both in the ordering and contracting phase and in the operational phase (pre, during and post the physical delivery).

2.7 ISO 8217 Petroleum products – Fuels (class F) – Specifications of marine fuels. Specifies the requirements for fuels for use in marine diesel engines and boilers, at the time and place of custody transfer, prior to conventional onboard treatment (settling, centrifuging, and filtration) before use.

2.8 MARPOL Annex VI - Regulations for the Prevention of Air Pollution from Ships. Part of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78).

2.9 SOLAS Convention: International Convention for the Safety of Life at Sea, 1974, as amended. Sets a minimum 60°C limit for flashpoint and contains a requirement to provide Safety Data Sheets (SDS).

2.10 ISO 4259 - Petroleum and related products -- Precision of measurement methods and results, Determination of precision data in relation to methods of test.

2.11 ISO 13739 – Petroleum products -- Procedures for transfer of bunkers to vessels
This International Standard specifies procedures and requirements for the transfer of bunkers to vessels involving bunker tankers, road tankers and shore pipelines. It applies to pre-delivery, delivery and post-delivery checks and documentation.

2.12 ISO 3171 - Petroleum liquids -- Automatic pipeline sampling -- Recommends procedures for crude oil and liquid petroleum products being conveyed by pipeline.

2.13 ISO 3170 - Petroleum liquids – Manual sampling. Specifies the manual methods to be used for obtaining samples of liquid or semi-liquid hydrocarbons, tank residues and deposits from fixed tanks, railcars, road vehicles, ships and barges, drums and cans, or from liquids being pumped in pipelines.

¹ As per ISO 13739
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2.14 ASTM D4057 - Standard Practice for Manual Sampling of Petroleum and Petroleum Products

3.15 ISO/IEC 17025 - General requirements for the competence of testing and calibration laboratories. Specifies the general requirements for the competence, impartiality and consistent operation of laboratories.

3.16 CIMAC – The International Council on Combustion Engines. Promotes the exchange of scientific and technical information between engine manufacturers and fuel users.

3. GOALS/OBJECTIVES

The following is a summary of key goals and objectives for bunker supplier best practices:

- .1 Bunkers delivered at the point of custody, which can be the receiving ship's rail or manifold, to meet the buyer's ordered specifications. This may be ISO 8217 or other standards as specified and mutually agreed with the buyer.
- .2 Bunkers delivered to be in compliance with sulphur limits specified by the buyer. These may be in accordance with Regulation 14 of MARPOL Annex VI or other regulations (local or regional).
- .3 Bunkers delivered to be in compliance with regulation 18.3 of MARPOL Annex VI which contains requirements that fuel oil delivered to and used on board ships shall not include any added substance or chemical waste that jeopardizes the safety of ships, adversely affect the performance of the machinery, is harmful to personnel or contributes to additional air pollution.
- .4 Bunkers delivered to meet SOLAS Chapter II-2 requirements regarding flashpoint.
- .5 Safety Data Sheets (SDS) and other relevant documentation detailing the fuel properties to be provided to the buyer.
- .6 Bunkers to be delivered to the ship in a safe and efficient manner, preventing practices that may compromise safety and crew health or the quality as delivered to the receiving ship.
- .7 Reliable sampling to be performed during delivery in accordance with locally accepted best practices.
- .8 Seek transparency/traceability and ensure quality control throughout the bunker supply chain.
- .9 Mitigating quality risks throughout the supply chain to avoid disputes.
- .10 Encourage interactions and clear lines of communication regarding procedures to be followed between bunker suppliers and bunker buyers from the point of order up to the point of delivery.

.11 Encourage effective dispute resolution through collaboration and communication between parties.

4. BEST PRACTICES

4.1 - Overview/general requirements

4.1.1 Best practice to ensure the quality of bunkers delivered to ships meets the relevant specifications begins with sourcing appropriate refinery streams and/or hydrocarbon streams from synthetic or renewable sources to produce bunkers to relevant specifications (e.g. ISO 8217 distillate or residual grades). The end product should be homogeneous and stable.

4.1.2 To ensure that the product conforms to relevant specifications the final blend should always be tested against the relevant standards in a qualified laboratory and the test results should be documented.

4.1.3 In order to maintain quality control throughout the supply chain, it is important to have documentation to help identify product origins back to the manufacturing source and the various links in the chain to enable traceability, especially if problems arise to help pin-point the source of the problem and take remedial action.

4.1.4 Once a bunker blend has been produced and tested, appropriate storage and cargo handling in shore tanks and onboard cargo and bunker supply tankers should be adopted to maintain product integrity.

4.1.5 If further blending is required, the new product should be tested again prior to delivery. If this is not possible, the supplier should be able to provide an accurate specification based on known blend component parameters and warrant that the resulting blend is homogeneous and stable.

4.1.6 The supplier is responsible for providing the required representative samples of the product delivered to ships and the required documentation including the bunker delivery note (BDN) and safety data sheets (SDS).

4.1.7 Further details of these general requirements are provided below.

4.2 – Quality control during production of bunkers

4.2.1 Marine fuels, or bunkers, are blends of hydrocarbons. It is preferred that blending takes place in shore tanks to make sure the end product is homogeneous and the quality can be tested and confirmed prior to delivery to ship.

4.2.2 Whether the bunkers are produced at a refinery, a tank terminal, on a tanker at anchorage or by in-line blending during delivery, the bunker supplier should ensure control of individual blend component quality. This includes knowing their individual properties through accurate data, and the component origins, supported by relevant documentation.

4.2.3 Blend components should be tried and tested so that their typical properties and suitability for bunker fuel production, and how they combine with other components, is well understood, with particular attention being given to the compatibility between blend components. Blending operatives should have appropriate knowledge of blending bunkers.

4.2.4 Where there are any uncertainties as to the nature and quality of a blend component, any issue should be identified and resolved before its use in the production of bunkers.

4.2.5 Ways for bunker suppliers to ensure the quality of blends include:

- Maintain a database of suitable and unsuitable blend components based on experience, industry knowledge and reported incidents.
- Development and/or use of appropriate blend modelling tools
- Test new/unfamiliar blends rigorously against the requirements of ISO 8217 in its entirety

4.2.6 The blend should not contain extraneous, potentially deleterious, materials as defined in Clause 5 in ISO 8217 and Regulation 18.3 of MARPOL Annex VI. This does not preclude the use of additives intended to improve specific fuel characteristics such as cold flow properties or combustion properties.

4.2.7 Any additive used should be known and have a proven track record in marine fuel application. Any new additive should be thoroughly evaluated to ensure it is fit for use in marine fuel application (for example, be approved by engine manufacturers).

4.2.8 Key data of the blend components include, but are not limited to, viscosity, density, flash point and sulphur. Sufficient data should be available on blending components to ensure the final blend fully meets the requirements of the type of bunkers being made, for example according to a grade listed in table 1 or 2 in ISO 8217.

4.2.9 Blend proportions as determined from component data need to be correctly calculated and set and thereafter maintained during production of the specified product.

4.2.10 To ensure the end product is stable, the producer must ensure that all blend components are mutually compatible to avoid precipitation of solids. This can be done through testing compatibility of the blend components.

4.2.11 The final blend, whether produced at a refinery or in a tank terminal should be tested at a qualified laboratory. The sample sent for testing should be taken in accordance with guidelines for obtaining a representative sample (bottom, middle and top of the tank). Details for correct sampling are dealt with in the section 4.6 on Sampling.

4.2.12 Blending during delivery is not recommended. Where the fuel supplied to a ship is in-line blended from two or more component streams it is not possible to test the final product prior to delivery. Hence, such blending should only occur if the supplier can warrant that the final blend meets the buyer's specifications and that the blend will be homogeneous and stable.

4.2.13 For in-line blending performed during delivery, the quality/properties of all components should be well known and documented and the blend components proportions accurately calculated and then reliably measured and documented. Using an automated and calibrated in-line blending system is recommended.

4.2.14 If it is anticipated that the product will be close to a limit maximum/minimum, the producer must keep in mind the precision of individual test methods when setting blend targets to ensure the product meets the specification limit with sufficient confidence. This is covered in more detail in section 4.7 on Testing and test interpretation.

4.3 – Quality control in the supply chain

4.3.1 Fuel quality can be compromised at several points in the supply chain, up to and including delivery to ship. It is therefore recommended that the supplier establishes, documents and maintains a Quality Management System (QMS) covering all stages from taking custody of the product until the product passes the point of custody transfer to the receiving ship.

4.3.2 If part of the supplier's supply chain is performed by other parties, such as terminal operators and operators of supply vessels or trucks, these should be identified in the QMS and the supplier should strive to ensure control and/or maintain oversight over the supply chain.

4.4 – Cargo transport, storage and transfer

4.4.1 The quality of a bunker fuel or blend components may change compared to its origin during transportation, cargo transfers and during storage. The supplier should seek to prevent the quality known from the original test report and/or certificate of quality (COQ) from being compromised through working closely with third parties as follows.

Tankers

4.4.2 Ensure the ship is certified to carry this type of cargo (e.g. clean/dirty petroleum products). Seek information about previous cargoes in case remaining residues could contaminate the product. Seek guarantees that the cargo tank has been properly cleaned if the previous cargo presents a risk of cross-contamination.

Tanks (at refinery or independent storage)

4.4.3 Ensure that storage tanks are suitable for the type of cargo to be loaded, and that storage tanks are in good condition (e.g. no rust) before a new cargo is loaded. If tanks are not empty before loading new cargoes, ensure the resulting blend is properly mixed so that it is homogeneous and stable and that the new blend is properly tested using samples from the bottom, middle and top of the tank.

4.4.4 Ensure good housekeeping during storage. This includes keeping products at the right temperature and preventing water ingress into the tank. Any water that accumulates should be removed to avoid conditions leading to microbial/bacterial growth that can severely

compromise the bunker quality.

4.4.5 Pipelines at terminals may be used to transfer several types of cargo (known as multi-product pipelines). If this is the case, seek verification that pipelines have been adequately cleared to prevent cross-contamination that may affect the overall quality or compromise the product specification.

Bunker tankers/barges

4.4.6 Prior to loading, seek verification from the operator of the loading terminal that the product transfer pipelines have been properly cleared to prevent cross-contamination with the previous products transferred via the pipeline.

4.4.7 Avoid products being loaded into the same cargo tank on the barge from different shore tanks, unless you have guarantees that the shore tanks contain product of the same grade and with the same COQ.

4.4.8 It is recommended that a representative sample is taken during the loading of the bunker tanker/barge. If possible, taking of the sample should be witnessed and countersigned by a representative from the bunker tanker/barge and a representative of the loading terminal. Ideally, the sample should be taken in accordance with ISO 3170/ASTM D4057 (manual sampling standard) or in accordance with ISO 3171 (pipeline auto-sampling).

4.4.9 Ensure good housekeeping during product storage and handling on the barge. This includes keeping fuels at the right temperature and preventing water ingress into the tank from external sources or condensation.

4.4.10 The strainer in cargo pumps should be cleaned periodically, and always cleaned before changing its use to a different grade of cargo. Maintenance of the cargo pump should be carried out according to the manufacturer's specification requirements/recommendations and duly documented (keeping records).

4.4.11 When loading the bunker supply tanker/barge (or truck), the following precautions are recommended:

A – Avoid loading different product batches into the same cargo tank.

B – Ensure the cargo tank is empty before loading a new cargo into it.

C - Seek information about previous cargoes in case residues from a previous cargo could contaminate the product. Seek guarantees that the cargo tank has been properly cleaned if the previous cargo presents a risk of cross-contamination.

4.4.12 An example is when chemical tankers/barges are used to transport slurry oil and may later transport a residual fuel oil cargo intended for bunker supply. Slurry oil is a refinery stream and may contain extremely high levels of cat fines (Al+Si) and unless the cargo tank is thoroughly drained and cleared prior to loading a residual fuel oil cargo, this may contaminate the bunkers loaded into the barge and cause bunkers to be off-spec for Al+Si content.

4.5 – Delivery to ship (bunkering operations)

4.5.1 Delivery to ship can be directly from a shore tank (at refinery or terminal) via pipeline, from a bunker tanker/barge coming alongside the ship at berth, at anchorage or off-shore, or from a road truck or rail car at berth. Local regulations for the transfer of bunkers for all of these delivery options are always applicable. It is recommended to follow procedures detailed in ISO 13739; this guidance covers only some key principles.

4.5.2 If more than one grade of bunkers is to be supplied, the order in which the grades are to be supplied should be agreed between the cargo officer and the ship's representative, usually the chief engineer. To avoid contamination of product during delivery, it is recommended that the lighter/lowest sulphur grade is supplied first followed by the heavier/higher sulphur grade.

4.5.3 Ensure proper clearing of all supply pipelines and hoses prior to a new delivery, paying particular attention if the supply pipeline/hose is going to be used to supply a different product specification than the previous delivery.

4.5.4 Carry out line clearing of bunker hose(s)/pipelines at the end of the pumping operation. Once line clearing is completed, the contents in the hose should be drained back into the bunker tanker's cargo tank.

4.5.5 There should be segregated pipelines/hoses and bunker connections for supply of materially different types of product, e.g. for residual and distillate grades, and for high and low sulphur bunkers to prevent cross-contamination of products. This is essential to prevent the contamination of low-sulphur products that may render it non-compliant with regulatory limits.

4.5.6 If, despite advising against it, the same pipeline/hose is to be used for both low and high sulphur grades, and if the receiving ship's representative agrees, it is recommended to flush the line thoroughly with a lower sulphur grade at the end of a delivery involving high sulphur grades to assist in ensuring the pipeline/hose is free of all higher sulphur residues prior to the next delivery.

4.5.7 Collection of a representative sample should be performed for each separate grade being delivered from the same tank terminal and bunker tanker/barge. If more than one tanker/barge is used to supply the ship, a separate set of representative sample(s) should be taken and a separate BDN issued.

4.5.8 All bunker deliveries should comply with these sampling requirements except for delivery from a road tanker, where it common industry practice to use the truck loading sample(s) as the representative samples for the delivery.

4.5.9 All bunkering operations carry health and safety risks risk to crew on both the supply vessel and receiving ship. All parties involved should take due care to prevent skin contact with bunkers and exposure to hazardous fumes.

4.6 – Representative Sampling

General

4.6.1 Sampling is an integral part of quality control and vital in protecting the interest of all parties involved. Samples may be used as evidence both for commercial, regulatory or even criminal disputes and in court cases. The objective is to obtain samples that are truly representative of the product being transferred, both during delivery to ship and further upstream in the supply chain as appropriate prior to the bunker delivery.

4.6.2 To ensure samples are representative, the ideal is for a single primary sample to be drawn continuously throughout the entire product transfer by either an automatic sampler or manual continuous drip sampler. While this is recommended, there are situations where this is not possible or impractical in which case samples obtained by different means (e.g. from a tank) can be mutually agreed.

4.6.3 It is recommended to use procedures detailed in ISO 13739 for all bunker deliveries to ship; the standards in ISO 3171 for automatic pipeline sampling; and either ISO 3170 or ASTM D4057 for manual methods for obtaining samples.

4.6.4 The sample taken during delivery or from a tank must be collected in a clean container of sufficient quantity to be divided into the required number of sub-samples which in turn must be sufficient to carry out the required tests, typically 500-750 ml per sub-sample.

4.6.5 The contents of the single original sample should be decanted into the required number of clean sub-sample containers in accordance with ISO 13739. This will typically involve agitating the bulk container and partially filling each sub-sample container in turn to a quarter or a third of their capacity, then repeating the process (agitating and decanting) until all the sub-sample containers have been filled.

4.6.6 The entire process, including sealing and labelling the sample containers, should be witnessed by representatives for both parties (the party supplying a cargo or product and the receiving party) and the resulting unique sample seal numbers recorded on the relevant documentation (e.g. the BDN) and countersigned by representatives for both parties.

4.6.7 Employing the services of an independent surveyor to oversee and witness the process may also be considered, in which case all sample seal numbers pertaining to the sampling shall be recorded by the bunker surveyor in the sample witnessing and receipt as per ISO 13739 (Annex U).

Sampling in the supply chain

4.6.8 Sampling and testing should be carried out and documented at each point of product custody transfer throughout the supply chain.

4.6.9 A representative sample should be collected when loading bunker supply vessels (bunker barges and tankers, including road tankers and rail wagons) from shore tanks,
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floating storage facilities and tankers. The preferred method is a sample drawn throughout the loading at the point of custody transfer. The sampling should be witnessed and the resulting sample containers sealed, labelled and countersigned by representatives for both the cargo recipient and the tank terminal.

4.6.10 In the event the terminal representative is known to refuse to countersign, consider using an independent surveyor to witness and sign the sample documentation.

4.6.11 The supplier should retain the cargo transfer samples for at least 30 days but three months is recommended. In the event of a quality dispute arising, samples should be kept until the dispute has been resolved.

Sampling during delivery to ship

4.6.12 Procedures defined in ISO 13739 should be adopted. It states that a single sample shall be drawn continuously throughout the delivery, from either end of the bunker hose, using an automatic sampler or a continuous drip sampling device. Ideally, all the sub-samples, including the MARPOL sample, should be derived from this single, primary sample.

4.6.13 IMO Guidelines in Resolution MEPC.182(59) state that the supplier should provide a MARPOL sample drawn by the supplier's representative at the receiving ship's bunker inlet manifold. In some jurisdictions local regulations stipulate the sampling location for all samples shall be at the receiving ship's inlet bunker manifold unless this is impractical for safety reasons. Other jurisdictions leave decisions on the sampling location, including for the MARPOL sample, to the supplier and buyer to agree upon. At least one jurisdiction requires all samples, including the MARPOL sample, to be drawn at the bunker barge outlet manifold.

4.6.14 Regardless of sampling location(s), the key factor is ensuring that the sampling process results in a representative sample which is correctly drawn and witnessed by representatives for both the receiving ship and the supplier, and an independent surveyor if used.

4.6.15 If for safety or practical reasons the witnesses cannot move between the receiving ship and the barge to be physically present, the process may be observed visually using binoculars and/or could be recorded using safe cameras.

4.6.16 To facilitate effective remote witnessing of sampling, visibility of the sampling equipment on bunker barges can be improved by marking the sampling zone with high visibility tape or paint.

4.6.17 While the ideal is to draw all sub-samples from the same primary sample, the buyer and supplier may mutually agree to follow IMO guidelines for taking the MARPOL sample at the ship's manifold while the primary sample from which the commercial samples are obtained are drawn at the barge.

4.6.18 The final resulting sample containers should be sealed, labelled and countersigned by representatives for both parties.

4.6.19 As stated in ISO 13739, for road tanker delivery, truck loading samples are common industry practice and may be designated as the representative samples for the delivery.

4.6.20 The supplier's representative commercial samples should be retained by the supplier for a minimum of 30 days, but three months is recommended. In the event of a quality dispute arising during the sample retention period, the samples should be retained until the dispute has been resolved.

4.7 – Testing and interpretation of test results

4.7.1 Testing should be carried out on samples from each point of product custody transfer throughout the supply chain and documented so the analysis report is matched to the product origin. This is a key part of a QMS to enable transparency and traceability and assist the supplier to identify the origin of potential problems and take steps to remedy and prevent further quality issues.

4.7.2 Sample analysis should be done according to the relevant internationally recognised test methods at an independent laboratory accredited to ISO 17025 or an equivalent standard.

4.7.3 ISO 8217 is the most widely accepted international marine fuel quality standard. It references the test methods to be used for each parameter for which there is a limit.

4.7.4 ISO 8217 is intrinsically linked to ISO 4259 for test result verification, stating ISO 4259 shall be used in dispute resolution. ISO 4259 covers the calculation of precision estimates and their application to specifications.

4.7.5 Every test method has an inherent uncertainty defined by its precision, notably repeatability ('r' – tests on the same sample using the same equipment in the same laboratory by the same operator) and reproducibility ('R' – tests on the same sample but in different laboratories). For a single test result, R is used to calculate a 95% confidence level for each test method. For commercial marine fuel transactions, the 95% confidence testing boundary is given by ISO 4259 as 0.59 times R, expressed as 0.59R.

4.7.6 ISO 4259 is applied in a different way for analysis performed on the receiving ship's fuel sample (e.g. for a ship's fuel testing programme) and the supplier's retained commercial sample. If a ship's sample yields a test result falling outside both the specified limit and 0.59R (the 95% confidence boundary), the buyer can claim that the sample tested has failed to meet the specified limit and require that the supplier's retained commercial sample should be tested. In the event of the supplier's retained sample being tested, the result of a single test must not fall outside the specified limit. If the test result from the supplier's retained commercial sample falls outside the specified maximum/minimum limit, the product has not met that specification limit.

4.7.7 For the bunker producer/supplier, the recommendation is that the blend target should not be the actual specification limit, but rather the limit minus (or plus if it is a minimum limit) an appropriate safety margin. For the bunker producer/supplier to ensure that the product

meets the specification limit with 95% confidence, the blend target should be the limit minus 0.59R for a maximum limit (or plus 0.59R for a minimum limit).

4.7.8 Further information can be found in a 2016 guidance document from CIMAC freely available online at the following link:

http://www.cimac.com/cms/upload/workinggroups/WG7/CIMAC_WG07_2016_Feb_Guideline_Interpretation__Fuel_Analysis_Test_Results_Final.pdf

4.8 – Documentation

4.8.1 Documentation is a crucial part of the QMS in order to achieve transparency and traceability in the supply chain. This includes records of custody transfer of cargoes, certificates of quality (COQ), sample seal numbers and quality analysis reports.

4.8.2 Suppliers are responsible for providing bunker delivery notes (BDNs) to the receiving ship and safety data sheets (SDS, formerly known as MSDS - Material Safety Data Sheets) in line with the requirements of SOLAS Regulation IV/5-1.

4.8.3 It is the supplier's responsibility to ensure that the bunkers delivered to ship are in conformity with the details provided on the BDN and SDS.

4.8.4 In addition to the minimum requirements (BDN and SDS), suppliers are recommended to provide other supportive documentation such as copies of COQs and quality analysis reports and information on properties that may affect how the bunkers behave during storage and handling on the receiving ship. This might assist the ship to store and handle the fuel in a safe and efficient manner.

Cargo custody transfer

4.8.5 For cargo custody transfers, documentation should include at least the following:

- .1 Certificate of receipt identifying the owner of the cargo prior to custody transfer and the new owner
- .2 Name of tanker or tank terminal supplying the cargo to the new owner
- .3 Certificate of quality accompanied by laboratory analysis report
- .4 Sampling sheet recording sampling location(s), sampling method(s) and all sample seal numbers

Sample labels

4.8.6 Sample labels should comply with Regulation 18.8 of MARPOL Annex VI, as detailed in resolution MEPC 182(59) adopted on 17 July 2009. The following information is required on all sample labels:

- .1 location at which, and the method by which, the sample was drawn;
- .2 date of commencement of delivery;
- .3 name of bunker tanker/bunker installation;
- .4 name and IMO number of the receiving ship;

- .5 signatures and names of the supplier's representative and the ship's representative;
- .6 details of seal identification; and
- .7 bunker grade.

4.8.7 To facilitate cross-reference it is recommended that details of the sample seals are also recorded on the bunker delivery note.

Safety data sheets – SDS (Formerly known as material safety data sheets - MSDS)

4.8.8 SOLAS Regulation IV/5-1 requires that safety data sheets) are provided to a ship prior to loading MARPOL Annex I type cargoes and marine fuel oils.

4.8.9 SDS are to intended to inform crew on the receiving ship of all health, safety, handling and environmental risks associated with the cargo/product. Details of the required information are set out in Resolution MSC.286(86) adopted on 5 June 2009.

Bunker delivery note - BDN

4.8.10 The bunker delivery note (BDN) is the official receipt stating the grade and quantity of bunkers supplied to the receiving vessel. In addition to its commercial function, regulation 18.5 of MARPOL Annex VI and Appendix V of Annex VI stipulates information to be included in the BDN.

4.8.11 Appendix V has been amended to allow for supply of fuel oils exceeding the sulphur limit values of the regulation to ships using abatement technology (equivalent means) for compliance. The amendments enter into force on 1 January 2019, reflected in the following overview of information to be included in the BDN in accordance with the MARPOL regulation:

4.8.12 Both before and after 1 January 2019:

- Name and IMO number of receiving ship
- Port
- Date of commencement of delivery
- Name, address and telephone number of the marine fuel oil supplier
- Products name
- Quantity in metric tonnes
- Density at 15°C (kg/m³)
- Sulphur content (% m/m)

4.8.13 Up to 31 December 2018:

A declaration signed and certified by the fuel oil supplier's representative that the fuel supplied is in conformity with regulation 18.3 and the applicable subparagraph of regulation 14.1 (global limit) or 14.4 (ECA limit) of MARPOL Annex VI

4.8.14 From 1 January 2019:

A declaration signed and certified by the fuel oil supplier's representative that the fuel supplied is in conformity with regulation 18.3 and that the sulphur content of the fuel oil supplied does not exceed the limit value given by regulation 14.1 or 14.4 of MARPOL Annex

VI, or the purchaser's specified sulphur limit value (in % m/m).

The latter clause is to be completed by the fuel oil supplier's representative based on the purchaser's notification that the fuel oil is intended to be used either in combination with an equivalent means of compliance in accordance with regulation 4 of Annex VI, or that the ship is subject to a relevant exemption to conduct trials for sulphur oxides emissions reduction and control technology research in accordance with regulation 3.2 of MARPOL Annex VI. An example of how the supplier's MARPOL declaration may look is provided in Annex 1.

4.8.15 Additional details, beyond the MARPOL requirements, may be included on the BDN according to local requirements and the commercial requirements of the supplier.

4.8.16 The BDN must be signed by both the supplier's representative and the receiving vessel and retained by the supplier for at least three years as per the requirements of MARPOL Annex VI Regulation 18.9.3

Supporting documentation

4.8.17 Certificate of quality (COQ)

Apart from density and sulphur which are required to be recorded as the tested figure on the BDN, very little detail regarding the quality of the bunkered fuel is actually legally required. Information on fuel properties provided on the SDS is typically generic in nature, stating for example that the flashpoint is >60°C. Suppliers should, where possible, provide bunker buyers with copies of the product's certificate of quality (COQ) and associated laboratory analysis reports verifying the details on the COQ. These may include more detailed information on specific quality parameters which would be helpful to the crew on the receiving ship in applying appropriate fuel management, including pre-treatment prior to use.

Fuel properties/handling advice

4.8.18 The supplier should provide information on properties that may affect how the bunkers behave during storage and handling on the receiving ship, in particular if the product supplied differs in handling characteristics from traditional/mainstream bunkers.

4.8.19 Information to be included should include anything that leads to special fuel management and handling requirements such as heating, special attention to pre-treatment in separators and centrifuges, and any known compatibility issues particular to the product.

4.8.20 Suppliers should report cloud point (CP) and cold filter plugging point (CFPP) in DMA/DFA and DMZ/DFZ winter grades in line with the reporting requirement introduced in the sixth edition of ISO 8217. There are no limits specified in ISO 8217:2017; only a requirement to report values. This information helps the ship's crew determine if the fuel will need heating. As stated in ISO 8217, responsibility for ordering a product with appropriate CP and CFPP for the ship's operational needs rests with the buyer.

Licensing

4.8.21 In those States/ports that operate established licensing regimes for bunker suppliers, the bunker supplier should provide evidence to confirm the licence(s).

QMS

4.8.22 Suppliers should have quality management systems in place and be able to provide evidence to bunker buyers if required. In cases where a supplier has its own internal QMS, it should be able to provide a summary to bunker buyers upon request. Ideally, the QMS documentation should include references to the standards which the supplier will adhere to along with any independent third party accreditation of the QMS or elements of the QMS.

4.9 – Contracting

4.9.1 Selling and buying bunkers is a commercial activity involving contracting parties, which in the case of bunker suppliers and bunker buyers can include a variety of parties. The “contract” in this instance covers both the supplier’s general terms and conditions and the actual purchasing order.

4.9.2 The contract specifies the product(s) to be supplied, quantity and details of how the supplier will fulfil the contractual agreement, and should include claim/dispute clauses. Dispute handling/resolution arrangements in case of dispute should be specified.

4.9.3 *Elements to be covered when contracting*

Bunker specifications and any requirements for bunkering procedures should be stated in the contract agreed between the supplier and the buyer. It should:

- .1 State the quantity ordered, the required maximum sulphur content and that the fuel is to meet the applicable requirements of MARPOL Annex VI regulation 18;
- .2 Include a detailed technical specification for the fuel along with acceptable quality parameters;
- .3 Where the fuel is specified with reference to ISO 8217 Petroleum products -- Fuels (class F) -- Specifications, the contract should clearly state which edition is to be used (i.e. 2005, 2010, 2012 or 2017). Using the latest edition is encouraged where possible;
- .4 For non-ISO 8217 standard fuel oils, as a minimum the contract should specify that the bunkers provided meet the requirements of regulations 18.3.1 and 18.3.2 of MARPOL VI, and SOLAS Chapter II-2. If the product is close to an ISO 8217 grade, but will not meet specific parameters, those exemptions should be mutually agreed in advance and specified in the purchase order and contract.

4.9.4 If the bunker buyer orders fuel with a sulphur content exceeding the limit in MARPOL Annex VI, the supplier must obtain a notification from the bunker buyer that the fuel will be used with an approved alternative means of compliance such as exhaust gas cleaning as required in appendix V to MARPOL Annex VI (see section on the BDN for further details). It is recommended that this notification is obtained in writing from the buyer at the point of enquiry and confirmed by the buyer in the purchasing order. The supplier should ensure the notification is communicated to the supplier’s representative overseeing the physical delivery (e.g. the cargo officer).

4.9.5 The contract terms and conditions should stipulate how the laboratory analysis will be carried out in the case of disputes.

4.9.6 It is recommended to specify that the laboratory should be independent and certified to ISO 17025 or an equivalent standard.

4.10 – Dispute resolution

4.10.1 Dispute handling/resolution arrangements in case of dispute should be specified in the contract (see section 4.9 on Contracting).

4.10.2 The ISO 4259 standard (Petroleum products -- Determination and application of precision data in relation to methods of test) should be applied.

4.10.3 As outline in the section on testing and interpretation and subject to the express provisions of the sale contract, if the ship's own fuel testing programme from a ship's sample yields a result failing to meet the limit specified (after allowing for the 95% confidence margin), the buyer can require the supplier's retained commercial sample to be tested. Breaking the seal of that sample should be witnessed by representatives for both the supplier and the buyer. If the test on the supplier's retained commercial sample fails to meet the specified maximum/minimum limit, the product has not met that specification limit. ISO 4259 provides a comprehensive dispute procedure. .

4.10.4 In the event the product quality supplied fails to meet the agreed specification, proven by test results in accordance with those stipulated in the contract, the bunker buyer may have a legitimate claim against the bunker supplier. Regardless of the strict contract terms that may apply, it is clearly in the interests of all concerned to endeavour to resolve the matter in a prompt and amicable manner.

4.10.5 The bunker supplier is responsible for ensuring the product is free from extraneous, potentially deleterious, materials which would render the fuel in conflict with Clause 5 in ISO 8217 or Regulation 18.3 of MARPOL Annex VI. If such substances are detected in the custody transfer samples after delivery to ship, the bunker supplier has a *prima facie* responsibility towards the bunker buyer and should cooperate to resolve any issues arising (further detail below).

4.10.6 If the cause for the failure of the product to meet specification lies with parties other than the contracting bunker supplier, for example the original bunker blend provider or the bunker tanker/barge operator delivering the product on the contracting supplier's behalf, it is up to the supplier to seek compensation from these parties.

4.10.7 If a product that has been delivered is proven by test results to be off-specification, but has not yet been used, the supplier should enter into constructive dialogue with the buyer and support the buyer with regards to remedial action. Wherever the nature and extent of the parameter(s) that is/are off-specification means the fuel can still be safely handled and used on the ship with the right treatment and other precautions, this is likely to be the most cost-effective and least hazardous course to follow.

4.10.8 If the nature of the off-specification parameter(s) in the fuel delivered is deemed to pose an unacceptable risk to the safe operation of the ship or prevent the ship from complying with any applicable regulations, the supplier, subject to the terms of the supply contract, may be liable for the cost of debunkering (removing the fuel from the ship) and the fuel replacement cost.

4.10.9 In cases where a ship experiences operational problems suspected but not specifically proven to be caused by the fuel, the supplier should offer any assistance they are capable of to the buyer in trying to determine the root cause. This may involve, for example, information on product origin to help build knowledge of cargo sources that may be associated with unusual or unexpected operational issues.

5 - BIBLIOGRAPHY & ACKNOWLEDGEMENTS

This guidance has drawn on both published and unpublished work from a number of experts and been reviewed by multiple industry stakeholders. It has also drawn on information in a number of international and local standards, including the following:

- CIMAC Guideline 2016, The Interpretation of Marine Fuel Analysis Test Results
- Draft best practice for fuel oil purchaser/user for assuring the quality of fuel oil used onboard ships (as submitted to MEPC 72)
- Draft work packages from the ARA Fuel Quality forum, an informal group of interested parties seeking to identify risks in the supply chain and ways to mitigate those risks.
- ISO 13739: 2010 – Petroleum products -- Procedures for transfer of bunkers to vessels
- ISO 8217:2017 – Petroleum products -- Fuels (class F) – Specifications
- MEPC Correspondence Group on Fuel Oil Quality
- MEPC.1/Circ.864 – Guidelines for onboard sampling for the Verification of the sulphur content of the fuel oil used on board ships
- Resolution MEPC.182(59) – 2009 Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI
- SS 524: 2014 - Singapore Standard: Specification for quality management for bunker supply chain (QMBS)
- SS 600:2014 - Singapore Standard: Code of practice for bunkering

6 - INFORMATIVE ANNEXES

Informative annexes may be added to this guidance to assist bunker suppliers in achieving its goals and objectives. At the moment this is limited to an example of the supplier's MARPOL declaration on the BDN, but it may be extended in the future to include a list of undesirable blend components which, while not given specific limits in the ISO 8217 standard, are in conflict with Clause 5 of the standard.

APPENDIX 1

EXAMPLE OF TEXT THAT MAY BE USED TO COMPLY WITH REGULATION 18.5 OF MARPOL ANNEX VI, APPENDIX V: INFORMATION TO BE INCLUDED IN THE BUNKER DELIVERY NOTE **AS OF 1 JANUARY, 2019**

SUPPLIER'S DECLARATION

This is to certify that the fuel oil supplied is in conformity with regulation 18.3 of MARPOL Annex VI and that the sulphur content does not exceed:

- ☐ *3.50% m/m or 0.50% m/m (delete as appropriate) as per the limit value in regulation 14.1 of MARPOL Annex VI;*
- ☐ *0.10% m/m as per the limit value in regulation 14.4 of MARPOL Annex VI; or*
- ☐ *the purchaser's specified limit value of _____ (% m/m)*

EXAMPLE OF TEXT THAT MAY BE USED TO COMPLY WITH REGULATION 18.5 OF MARPOL ANNEX VI, APPENDIX V: INFORMATION TO BE INCLUDED IN THE BUNKER DELIVERY NOTE **AS OF 1 JANUARY, 2020**

SUPPLIER'S DECLARATION

This is to certify that the fuel oil supplied is in conformity with regulation 18.3 of MARPOL Annex VI and that the sulphur content does not exceed:

- ☐ *0.50% m/m as per the limit value in regulation 14.1 of MARPOL Annex VI;*
- ☐ *0.10% m/m as per the limit value in regulation 14.4 of MARPOL Annex VI; or*
- ☐ *the purchaser's specified limit value of _____ (% m/m)*

Alternatively, bunker suppliers could provide separate BDNs for each grade rather than using a tick box system, with text conforming to the respective tick boxes shown above.