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BUNKER MANAGEMENT AND OPERATIONS

1. SCOPE

The scope is to establish the responsibilities and guidelines for safe bunker management and safe bunkering operations in order to avoid unsafe practices which could result in a pollution incident with disastrous environmental consequences. Bunker management and bunkering operations include:

- a. Testing and maintenance of the bunker lines.¹
- b. Selection of fuel oil, diesel oil and lubricating oil grades
- c. Ordering of fuel oil, diesel oil and lubricating oil in bulk
- d. Operation planning, training and pre-transfer conference
- e. Delivery of fuel oil, diesel oil and lubricating oil in bulk
- f. Sampling and testing of fuel oil, diesel oil and lubricating oil
- g. Treatment on board
- h. Fuel Oil internal transfers
- i. Discharge or internal transfer of waste oil
- j. Record keeping

When any of the requirements of the Operations cannot be followed; e.g. perhaps due to local regulations or unforeseen circumstances, then the Ship Manager must be advised.

2. CODE

ISM

ISO 8217 2005/2010/2012²

ISO 8217:2017, PAS 23263³

Code of Federal Regulations (CFR), 33CFR 155.750,33 CFR 156.150, 46 CFR 35.25

Code of Practice for Bunkering, Singapore Standard SS 600: 2008


3. APPLICATION, RESPONSIBILITIES AND AUTHORITY

This applies to all vessels in the fleet.

¹ W 32 / 2020

² W 24 / 2021

³ W 50 / 2019

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The Chief Engineer is responsible for bunkering operations, including the loading, storage and consumption of all bunkers, he must be on board and in charge whenever bunkers are received. The 2EO is the designated accountable person in charge of all post-bunkering operations, which includes, heating, transferring, purifying, filtering and sampling process during treatment.


The Chief Engineer is also responsible for:

- a. Ensuring the maintenance and annual/periodic pressure testing of the bunker lines.⁴
- b. Keeping a record of all bunker tank Overfill alarms, High-High Level, High Level and Low-Level alarm set points these are to be kept on a spread sheet and to be included in the CEO hand over notes to the new CEO. In this way, the company hopes to ensure that the CEO is always aware of all the approved set points. High-High Set point should never exceed 95% of the tanks volume, if there is an overflow pipe connected to the tank the High-High level should be reduced accordingly. The HL alarm set point should be set at 5% less than the High-High level set point.
- c. Developing a plan to transfer, receive and feed from fuel tanks so that mixing of fuels from different origins is minimised whenever possible, bearing in mind that bunkers to be received could be incompatible with the bunkers already aboard.
- d. Witnessing the soundings on the bunker barge before and after delivery, or the gauging of shore tanks, and calculating quantities delivered to the vessel (or appointing a responsible Officer to do this)
- e. Ensure that the float activated over fill alarms are tested prior to bunkering on any tanks that are designated to receive the bunkers, and that all computer set points alarms are within company specified limits. High level alarm are not to exceed 90% of the tanks volume and High-High Level alarm at not to be set at more than 95% of the tanks volume. If there is an overflow pipe to an overflow tank, the high level alarm should trigger before the tank reaches the overflow point.
- f. All float triggered overfill alarms on all Bunker tanks (LO and HFO) are to be removed from the tank and be inspected at least once every 6 months, on joining a vessel the CEO should verify when this was last done by referring to [Mespas](#)⁵. (The inspection should cover electrical side, [level float](#)⁶ and magnets for loose or damaged fittings).
- g. Obtaining a representative bunker sample at the vessel's manifold using the continuous drip method. Sampling must be in force for the complete duration of bunker loading.
- h. Performing on-board analysis of fuel received. To incorporate Density; Water content; Compatibility; Viscosity; Fines. (If bunker test kit is available on board) Ensuring bunker quantity and quality according to the Company specifications and in line with Charter Party requirements

⁴ W 32 / 2020

⁵ W 03 / 2024

⁶ W 26 / 2024

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- i. Ensuring the “Bunkering of Fuels and Lub Oils in Bulk” Operations Checklist and other Records are completed as required by this procedure⁷
- j. Fill in the advised Hydrogen Sulphide (H₂S) and benzene levels which are obtained from the MSDS, on the Bunker Operations Checklist
- k. Monitor filtering systems and adequate control of maintenance of same. Ensure engineers are made aware of important of the filtering equipment on board. Ensure that 10micron filters are in use in HOT filters at all times, ultrasonic cleaners are used to clean filters, damaged filters to be replaced immediately.⁸
- l. Monitor quantity of fuel (24 hours) to confirm fuel not aerated (Cappuccino Effect).
- m. Check for water content of bunker tank content should there be suspicion on quantity or quality received.
- n. Ensure Fuels are being purified using the parallel flow method,⁹
- o. Follow the cleaning regime for tanks in [Mespas](#)¹⁰.

The Master and Chief Engineer are responsible for complying with all International, National and Local Regulations, Rules, Codes including Industry Guidelines where applicable to this procedure.

The Master has the ultimate responsibility for ensuring that sufficient bunkers, with adequate safety margin are on board.

The Chief Officer [along with the Chief Engineer](#)¹¹ is responsible for calculations of trim, stress and stability and assisting the Chief Engineer in ensuring compliance with all safety, environmental and security requirements as described within this procedure.

4. PRESSURE TESTING OF PIPELINES¹²

- a. Pressure testing of bunker pipelines is essential to maintain their integrity. This section provides information on company procedures to be adopted on board relating to pressure testing of all bunker pipelines.
- b. Code of Federal Regulations - 33 CFR 156.170
- c. The Chief Engineer is responsible for:
 - Preparing ship specific procedures and pressure testing of bunker pipelines.
 - Marking date of test and test pressure on bunker pipelines on deck.

⁷ W 04 /2018


⁸ W 02 / 2021

⁹ W 02 / 2021

¹⁰ [W 03 / 2024](#)

¹¹ [W 26 / 2024](#)

¹² W 32 / 2020 (Entire Section)

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- Making entries in Deck Logbook, Engine Logbook and Oil Record Book.
- d. Bunker pipelines are defined as any pipeline used for bunkering fuel, discharging fuel or internally transfers of fuel for the purpose of consumption on board.
- Bunker lines **on weather deck** should be tested to **100%** of their rated working pressure (Sometimes referred to as Maximum Allowable Working Pressure - MAWP) **at least annually** or after maintenance such as pipe replacement has been carried out. This can be done on board by the ship staff.
 - Bunker lines for the **entire system** should be tested to **1.5 times** their Maximum Allowable Working Pressure - MAWP at least twice within any five-year period. This is normally done during dry docking.

4.1. Precautions / Preparations when Carrying Out Pressure Tests

- Safety and precautionary measures are to be duly observed.
- Risk assessment shall be prepared prior pressure testing.
- Tool box meeting shall be carried out prior pressure testing
- Plan to test each bunker line individually.
- As far as possible, ensure that the vessel is at sea and outside territorial waters.
- Pressure testing of lines shall not be done during the hours of darkness.
- The test shall not be done on a rainy or overcast day or during heavy weather.
- Ensure anti-pollution gear is in readiness before starting the operation and all scuppers kept plugged.
- Monitor areas on deck in vicinity of the pipeline during pressure testing.

4.2. Procedures for Pressure Testing

As per 33 CFR 156.170, a static liquid (hydraulic) pressure test is required for marine transportation pipelines designated for the handling of any oil to ensure their integrity and safety. The actual testing of the oil transfer lines must be a hydrostatic test.


NOTE: Pressure testing using compressed air is not acceptable.

- Ensure a Risk Assessment and Permit to Work have been completed.
- A pre-check should be carried out to identify any poor or leaking flanges, pipes or gaskets which could rupture during the test. There should be sufficient crew members present and placed at intervals along the bunker line being tested with radios to monitor for leaks.
- Vessels should have two spare certified pressure gauges designated for bunker use only as critical spares. One of these gauges can be used to verify the accuracy of both pressure gauges fitted at the port and starboard bunker manifold. Record the

certificate number for reference. This should be done annually at the same time as the bunker line pressure test and recorded. If the in-accuracy of the gauge is greater than 10% the gauge should be replaced with one of the ready spares. A new gauge can be ordered as spare to ensure the inventory is maintained.

- Although the procedure only requires that the bunker line on the weather deck is tested (up to a point within the hull/superstructure), depending on vessel design it may be easier to pressure test the entire bunker line. This can be discussed with your Ship Manager.
- The procedure will depend on ship specific pipeline design and where the nearest valve is after the pipeline has passed into the vessel's superstructure/watertight deck/bulkhead, some vessels may only have fully welded sleeve joint type pipelines. The ideal medium to use is the fuel from one of the bunker tanks. If water is to be used there should be a drain fitted at the lowest point in the system to allow for drainage, splitting of flanges is not allowed as this defeats the objective of the pressure test. The disposal of water is also more complicated as more entries are required in the Oil Record Book to account for this.
- Depending on procedure chosen, after discussion with your Ship Manager, it may be necessary to lockout/tagout all fuel oil transfer equipment and close valves, sample cocks at the extremities of the line to be tested.
- The Duty Officer is to be informed. All scuppers must be plugged on deck, SOPEP equipment on standby and any safety recommendations as per Risk Assessment to be put into place.
- It is critical that an officer is placed at each bunker station with a radio and an officer is standing by at the transfer pump starter panel. If fitted all emergency stops to be tested prior to the test procedure. Remove the temperature gauge at each bunker manifold and fit a PN (10) rated ball valve to this with a steel riser pipe with goose neck at the top. Ensure that any potential flow from the goose neck is directed into a 210 ltrs drum using a flexible hose. Fill the line with the medium chosen, bleeding out any air through the goose neck.
- All effort should be made to ensure no air remains in the line, then using either the transfer pump, if a positive-displacement type it may be stopped when the required test pressure is reached, if a centrifugal type of pump is employed, constant running will be required to ensure the necessary pressure is maintained during the test. Or a bucket pump connected to the manifold flange can be used as an alternative once the line is full and purged to slowly bring the pressure up to the desired pressure.




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- Pressure to be maintained for 10 minutes in which time the crew should then inspect the line for leaks.
- Slowly reduce the pressure and drain lines well. If water was used as the hydraulic medium, this must be disposed of in the engine room sludge tanks and an entry made in the ORB.
- Each item of remote operating or indicating equipment, such as a remotely operated valve, tank level alarm, or emergency shutdown device, must perform its intended function.

4.3. Periodical Pressure Test (2.5 Years)

- Ensure a Risk Assessment and Permit to Work have been completed. A pre-check should be carried out to identify any poor or leaking flanges, pipes or gaskets which could rupture during the test. There should be sufficient crew members present and placed at intervals along the bunker line being tested with radios to monitor for leaks.
- Vessels should have two spare certified pressure gauges designated for bunker use only as critical spares. One of these gauges can be used to verify the accuracy of both pressure gauges fitted at the port and starboard bunker manifold. Record the certificate number for reference. This should be done annually at the same time as the bunker line pressure test and recorded. If the in-accuracy of the gauge is greater than 10% the gauge should be replaced with one of the ready spares. A new gauge can be ordered as spare to ensure the inventory is maintained.
- Remove the temperature gauge at each bunker manifold and fit a PN (10) rated ball valve to this with a steel riser pipe with goose neck at the top. Ensure that any potential flow from the goose neck is directed into a 210 ltrs drum using a flexible hose.
- Fill the line, bleeding out any air. All effort should be made to ensure no air remains in the line. This is best achieved by using the FO transfer pump (s) to fill the entire length of the bunker lines up to the manifolds (with fuel oil/diesel oil), purge the lines via manifold valves at the goose necks, then build pressure in the lines until 1.5 times the normal operating pressure is reached. It is critical that an officer is placed at each bunker station with a radio and an officer is standing by at the transfer pump starter panel. If fitted all emergency stops to be tested prior to the test procedure.
- Final pressure can be obtained using a bucket pump and diesel/water as the percentage of water will be negligible in the system.
- Once the desired pressure has been maintained for 10 minutes and the line integrity verified, the line pressure can be slowly reduced, and the fuel drained back to the tanks the fuel was pumped from.

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4.4. Record keeping:

The Date and test Pressure (in kg/cm² or bar) must be marked in contrasting paint on all pipelines on deck that have been pressure tested.

Results of the bunker pipelines pressure testing must be entered in Oil record book, Part I under code I, Additional operational procedures and general remarks. In the Engine room Log Book and Deck Log Book.

5. BUNKER REQUIREMENTS

5.1. Bunker Stem

Bunker stems are calculated by the Master in close co-operation with the Chief Engineer for the coming voyage.

The stems must always state the fuel or diesel oil specifications as per company minimum requirements and taking into account Special Fuel¹³ areas. Always ask the operator to get the COQ from the bunker supplier, and if possible the name of the barge that will be supplying. When this is received, send to SM so he/she can consult with Maritec to check for any history of this fuel and supplier.¹⁴

On arrival at the berth or anchorage where the bunkering is to take place the Chief Engineer shall request the terminal or supplier to provide a copy of the bunker specification prior to loading.

In the event of the actual specification being outside the specified parameters requested, the Chief Engineer shall inform the Ship Manager immediately and Charterers.

The Chief Engineer must not undertake to mix or blend fuels during the bunkering process unless authorised to do so by the Ship Manager.

5.2. Filling Tanks


It is the Company Policy that subject to local requirements, no fuel oil, diesel oil or lubricating oil tank shall be filled to greater than 85%¹⁵ of its capacity, unless this is done in consultation with the SM and an RA is put in place¹⁶

¹³ W 50 / 2019

¹⁴ W 24 / 2021

¹⁵ W 09 / 2018

¹⁶ W 02 / 2021

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5.3. Bunkers Quality Specification / Control

The Companies Fuel test specification is ISO 8217:2005/2010/2012/¹⁷2017¹⁸. The Company is contracted to test to 2010 standards, Commercial has to stem bunkers accordingly, note 2017 is the last option.¹⁹ The Contracted Sample Testing Company has been informed accordingly. The Contracted Sample Testing Company will conduct additional testing for chemicals in the bunker fuel together with the standard bunker fuel testing to ISO 8217: 2010²⁰ editions. Only designated grades of fuels, as per ISO 8217: and in accordance with engine builder's recommendations, should be delivered and used on board [managed vessels](#)²¹.

The appearance of Catalytic fines in bunker fuels is of mounting concern. Cat fines as they are commonly referred to are microscopic particles left over from the cracking of crude oil that end up in bunkers where they abrade and otherwise rapidly wear the cylinder liners, piston rings, fuel injectors and other parts of slow speed two stroke engines.

Cat fines range in size up to 75 microns – a micron is a millionth of a metre – so are often smaller than the diameter of a human hair or a grain of sand but are extremely hard ceramic compounds of aluminium and silicon. Crucially they are bigger than the oil film on the cylinder liner.

Hydrogen Sulphide (H₂S) is now a specified parameter 200ppm.

Sulphur content should not exceed 0.50²²%, and in the designated Special²³ areas the sulphur content should not exceed 0.10%.

The Chief Engineer must ensure that no other grade or substitute is accepted on board, unless approved by the Ship Manager. Consequently, alternative grades may only be considered with sufficient lead time.

On commencement of using the new fuels, engineers are to monitor the machinery performance and alarm us if any irregularities experienced.²⁴

Allow for settling for 24 hrs, then drain for water.²⁵

¹⁷ W 24 / 2021

¹⁸ W 50 / 2019

¹⁹ W 02 / 2021

²⁰ W 24 / 2021


²¹ [W 26 / 2024](#)

²² W 50 / 2019

²³ W 50 / 2019

²⁴ W 50 / 2019

²⁵ W 50 / 2019

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Purifiers²⁶ - on first allowing flow thru purifiers, monitor closely for loss of water seal etc. possibly for intermittent changes in density of fuel.²⁷ Ensure correct gravity disc size²⁸ is in place by physically measuring them, not taking the stamp on them as gospel. Regular cleaning of bowls, monitoring of sludge cycles, monitoring of sludge tank levels, etc²⁹

FSC samples- The Chief Engineer is to supervise the taking of these samples, a document guideline by Maritec is on board. [Mespas](#)³⁰ has a 12 monthly regime to do this test. The test is also to be done when the Cat-fines results are over 40micron, this is when the true efficiency of the purification plant can be seen. The purpose of this sampling, is to determine the efficiency of our purification plant. The industry standard is that only 50% of solids can be removed in a plant, so in a 40 micron fuel supply, only 20 micron is removed by purification. That allows the other 20 micron to get to the hot filters, these filters must then be able to handle the rest of the un-wanted debris. So, the purification plant is critical in ensuring that the fuel system remains clean.³¹

Filtering – Filters are to be maintained as per [Mespas](#)³² and/or as per condition performance of the filter at any one time. Take note of allowable differential pressures, alarms, leaking blow down valves, service schedules of the filters, efficiency of cleaning equipment, back flushing cycle frequencies etc.³³

Bunker tanks – will be cleaned every 60³⁴ months, settling and service tanks will be cleaned every 12³⁵ months. These follow a [Mespas](#)³⁶ regime and must be reported under the Hull module.³⁷

The Company does not allow the consumption of bunkers prior to confirmation that the analysis reports are positive. Should time periods be inadequate for receipt of laboratory tests, then the vessel Master and CEO are expected to inform the Ship Manager promptly, submit a Risk Assessment for review and approval for use of new bunkers prior to the laboratory analysis receipt on board. When requesting this, the MSDS and BDN of the bunkers must be included in the email.³⁸

²⁶ W 02 / 2021

²⁷ W 50 / 2019

²⁸ W 02 / 2021

²⁹ W 02 / 2021

³⁰ [W 03 / 2024](#)

³¹ W 02 / 2021

³² [W 03 / 2024](#)

³³ W 02 / 2021


³⁴ W 52 / 2021

³⁵ W 52 / 2021

³⁶ [W 03 / 2024](#)

³⁷ W 02 / 2021

³⁸ W 50 / 2019

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In the event that the bunkers fail to meet the analysis guidelines, the Ship Manager will liaise with the Contracted Sample Testing Company to seek any interim measures (increase in temperature etc.) which may allow the safe use of bunkers.³⁹

5.4. Bunker Compatibility and Stability.(See PAS 23263:2019 (In Memos))⁴⁰

A frequently encountered fuel problem on board vessel is that of fuel incompatibility. That is, the fuels come from a different "family". Incompatibility of bunkers is noticed primarily by the stratification of the fuels, which takes place after a settling period in the bunker tank. Stratification is the formation of "layers" of separation among two incompatible components of the⁴¹ fuels.

The consequences are not readily apparent. The Chief Engineer is cautioned to look out for:

- a. A drop in fuel burning efficiency or reduction in engine horsepower. This may be determined as a result of careful analysis of the vessel's engine abstracts.
- b. Irregular exhaust gas temperatures, under otherwise "normal" circumstances
- c. System blockages⁴² due sludge formations.
- d. Blocking of or excessive frequency of back flushing of fuel filters
- e. Overloading of the fuel purifiers such that they require frequent overhauling and cleaning.

The Chief Engineer should be aware that such a potential problem may exist and keep a sharp lookout for trends and developments in order to effect positive remedial measures.

6. BUNKER QUANTITY

The Master and Chief Engineer shall calculate the bunker requirements for the coming voyage taking into account:

- a. Fuel amount currently on-board.
- b. Fuel required to perform the next voyage including safety margin
- c. Cargo hold⁴³ cleaning
- d. Ballast changing
- e. In/out of port manoeuvring

³⁹ W 50 / 2019

⁴⁰ W 50 / 2019

⁴¹ W 50 / 2019

⁴² W 50 / 2019

⁴³ W 50 / 2019

- f. Other consumption (cargo operations, weather and/or traffic conditions/Special Areas⁴⁴, etc.)
- g. Actual, expected weather and sea conditions.

From this information, the Master will determine bunker requirements. This will include safe reserves identified to the table in Section 1.5.1. The Master will revert to Commercial Operators in copy to the Commercial Managers and the Ship Manager⁴⁵ confirming the above.

6.1. Minimum Bunker Reserves

The Master, is responsible to ensure adequate bunkers are on-board for the intended voyage, there are required reserves for contingencies, including allowances for un-pumpable quantities. Discretion is to be exercised if operating at reduced or economical speed and especially when prolonged adverse weather and/or port delays may be anticipated. Attention must be made for special areas requirements.⁴⁶

Guidelines in calculating safe margins of reserve bunkers are given below:

Main Engine minimum reserves, at full power, for all passages, excluding un-pumpable quantities, the following guidelines may be used:

Sea Passage Duration (Days)	Additional Bunker Reserves
1 to 5	50%
6 to 10	40%
11 to 20	30%
Over 20	20%

Minimum quantity of diesel oil on-board at the beginning of a voyage, calculated as:

Diesel Oil min. quantity = (Voyage days+5 days reserve) x (Diesel Gen. cons/day + Manoeuvring (in/out of port) + 5% of total D.O. capacity as an un-pumpable quantity).

The 5-day reserve is an industry standard requirement to cover for the possibility of the vessel being called upon for “Search and Rescue” requirements during the voyage.


The Master, in consultation with the Chief Engineer, is responsible to ensure adequate bunkers are on-board for the intended voyage, there are required reserves for contingencies, including allowances for un-pumpable quantities. Discretion is to be exercised if operating at reduced or economical speed and especially when prolonged adverse weather and/or port delays may be anticipated. Attention must be taken of requirement for special fuel areas.⁴⁷

⁴⁴ W 50 / 2019

⁴⁵ W 50 / 2019

⁴⁶ W 50 / 2019

⁴⁷ W 50 / 2019

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If the quantity of bunkers remaining on-board varies significantly from that last reported or expected, the Ship Manager must be advised immediately.

Marine Gas Oil, if required for Emergency Diesel Generator should be stemmed through the Ship Manager in [Mespas](#)⁴⁸. Minimum Quantity to be maintained on-board is 1.5 times the capacity of the Fuel storage tank for the Emergency Diesel Generator.

6.2. Unavailability of Correct Specification Bunkers. FONAR Report.⁴⁹

In the event that bunkers of the correct grade, type or sulphur content are not available in a port or at a bunker station, the Ship Manager must be informed immediately this information becomes known to the Master.

The Ship Manager will, with the Charterers devise a plan to rectify the problem. Should there be no viable option, the Ship Manager will inform the [Marine Director](#)⁵⁰.

The [CEO](#)⁵¹ will, as a last resort, allow a FONAR (Fuel Oil Not Available Report) process to be investigated. Should all parties involved, agree to the procedure, and a full risk assessment has been carried out, grant permission for a FONAR application to be submitted to the relevant authorities.

It must be stressed that this is a deviation from company environmental commitment, and will not be granted without full investigation of all other options to obtain a compliant fuel.

No non-compliant fuel may be allowed aboard until the company has completed the FONAR investigation and application to the relevant parties. The Ship Manager will instruct the Master accordingly.

6.3. Meeting Quality Specifications

The Company does not allow the consumption of Bunkers prior to confirmation that the analysis reports are positive. Should time periods be inadequate for receipt of laboratory tests, then the vessel Master and Chief Engineer are expected to inform the Ship Manager promptly, submit a Risk Assessment for review and approval for use of new bunkers prior to the laboratory analysis receipt on board.


Due to the more regular occurrences of fatty acids presence in bunker supplies these days, The Company has provided instructions to dose the bunker tanks with ADERCO 2055G as the conditioner. WSS Dieselpower and Marichems FOT ULS must remain the additive for lubricity. The ADERCO is to be dosed directly into bunker tanks once the tanks are stripped

⁴⁸ W 03 / 2024

⁴⁹ W 50 / 2019 (Entire Section)

⁵⁰ W 26 / 2024

⁵¹ W 26 / 2024

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of all bunkers. The lubricity control to be added to settling tank via the suction strainer during internal transferring.⁵²

To enable compliance with the above instruction, for the range of expected time duration (Expected + 50%), Vessel should evaluate

- a. Old Bunkers ROB (including the reserves)
- b. Actual days / distances of steaming with Old Bunkers at Full / Economic Speed
- c. Interim ports where the vessel can bunker (keeping into account the distance from the Vessel's passage). The Interim ports evaluated would also include the last bunkering port if the distance is less or equal to calculated.
- d. Interim ports of refuge (keeping into account the distance from the Vessel's passage). This may be used as a last resort; in which a bunkering barge may be asked to proceed to re-fuel the vessel at the port of refuge.

In case of across ocean passages, a contingency plan of mid-ocean bunkering using the suitable bunkering vessel may also be evaluated.

6.3.1. Vessel's Newly Bunkered Fuel Specifications has failed.

This information is relayed to the vessel by the Ship Manager. The Ship Manager would liaise with the Contracted Sample Testing Company to seek any interim measures (increase in temperature etc.) which may allow the safe use of bunkers; howsoever if the bunkers have been assessed to be unsafe the vessel maybe instructed to deviate to the bunker nearest port.

- a. Vessel would have to inform all concerned parties in regard to the failure of Vessel's bunkered fuel meeting the specifications and the deviation to proceed to the interim port for re-bunkering or Port of refuge
- b. All endeavours should be made to proceed at the instructed speed, to the nearest port of call.


6.3.2. Dealing with OFF SPEC Fuel⁵³

The specifications of the fuel bunkered should be such that the following risks are to be avoided as best possible;

- a. Environmental compliance issue.
- b. Safety of the crew, vessel and the cargo
- c. Wear and tear on machinery or risk of commercial losses.

⁵² W 24 / 2021

⁵³ W 24 / 2021 (Entire Section)

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According to these different risks there are different categories that an "Off Spec fuel" can fall into, and according to the category the response situation would differ.

i. Sulphur Off Spec

The Sulphur content in the fuel oil is governed by statutory requirements.

A fuel is said to meet the Sulphur limit, within the applicable test variance, if a single test result does not exceed:

- 0.53% Sulphur for a fuel supplied to a 0.5% sulphur limit and
- 0.11% Sulphur for a fuel supplied to a 0.10% sulphur limit.

It is important to note that the test variance only applies to the first sample and the first test results. Any subsequent tests that follow as a result of Off Spec fuel, will have to comply with the absolute value of the Sulphur limit i.e. 0.50% Sulphur for a fuel supplied to a 0.5% sulphur limit.


If the limits are exceeded, immediately contact your Ship Manager by phone followed by email keeping Vessel's operator and Technical Dept in copy. For safety reasons do not commence consuming this fuel oil, you will effectively be violating the MARPOL Code and the vessel could be the subject of a Port State Control detention.

ii. Flash Point Off Spec

Any fuel oil bunkered should have a flash point in excess of 60° Centigrade.

If the limits are exceeded, immediately contact your Ship Manager by phone followed by email keeping Vessel's operator and Technical Dept in copy. For safety reasons do not commence consuming this fuel oil. When you receive this result the following are to be complied with:

- vent all tanks,
- put up no smoking signs near all vent outlets,
- no hotwork will be allowed in these areas,
- inform management,
- send additional samples at next port,
- if vessel is at sea and the fuel needs to be used then do so with Flag State approval,
- put the supplier on notice,
- man the engine room at all times.

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It must be noted that flash point does not reflect on the overall quality of the fuel.

iii. Operational parameters Off Spec

These parameters could be either Density, Viscosity, MCR, Ash, Water content, Catfines (Al+Si), High Pour Point, sulphur content when not governed by regulatory requirements (e.g. vessel provided with exhaust gas scrubber) and others.

The allowable test variance for these parameters is in accordance with ISO 4259 as interpreted in the document “Application of ISO 4259 to ISO 8217 Specification Limits”

If any of the limits are exceeded, immediately contact your vessel’s Ship Manager who will guide you further and keep the Technical dept copied in.

iv. Procedure for handling Off spec fuel

In the event that the laboratory test of the first sample shows that the fuel is off-spec on one or more of the parameters listed, it shall be evaluated by the vessel's Ship Manager as to whether the fuel can be consumed if appropriate precautions are taken. This proposal is to be finally approved by Senior Management.

If regarded possible to use the fuel, it should be evaluated whether there is expected to be an increased loss related to the handling/**treatment processes or other added costs, then this info to be given to the Technical dept.** Typically fuel with excessive Sulphur, low Flashpoint, Catfines or Total Sediment exceeding limits shall not be used.

In order to verify the test result of the first sample and thereby determine whether de-bunkering is required, additional testing may be requested by the Technical Dept in agreement with the Supplier. In this event, a retained sample listed on the BDN should be sent to another laboratory, selected in agreement with the supplier, for joint testing.

In the event of signs that chemicals or other unwanted substances are present in the received fuel, more sophisticated test methods may be required. In any such case please inform the Ship Manager, and Technical Dept immediately.

v. Guidelines for running separators with high density fuel oil

- The Chief Engineer is responsible for checking and supervising proper precautions in cases of high-density fuels.

- High density fuel oil is in this case defined as fuel oil with a density $1000 \text{ g/l} \leq d \leq 1010 \text{ g/l}$ (max). High density fuel can result in technical problems, such as high cylinder wear if fuel separation is not effective.
- Prior to separation of the high-density fuel oil the result of the fuel oil analysis is to be received and reviewed.
- If the separators are running efficiently a higher density can be accepted without increasing wear on cylinders.
- The temperature to be maintained at 98°C in order to give the biggest margin between density of fuel oil and water and in order to reduce the viscosity as much as possible, with minimum throughput. Use the Maritec guide if an alternate temperature has been advised.

vi. Guidelines for consuming fuels with higher levels of Catfines (Al+Si)

For Al+Si the Company maximum allowable limit at engine entry is about 15 mg/kg & carry over of abrasive Al+Si material may lead to damage to fuel pumps, injectors & cylinder components. Reduction of abrasive material to satisfactory lower levels will largely depend on the capability, effectiveness & management of the onboard fuel treatment plant.

- Vessel to inform Ship Manager, when this fuel with High Al+Si is in use.
- M/E & Aux engine performance should be taken before the High Al+ Si fuel is put in use.
- Fuel should remain in settling tanks for maximum possible time with elevated temperatures as far as possible, to facilitate gravitational separation of Al+Si through settling.
- Both settling & service tanks to be drained at regular interval (4 Hrs). A log can be maintained for temperature & draining routines.
- It is recommended to use 2 separators in parallel or in series (depending on what make and type of separators the vessel has) under optimum conditions of flow & temperatures. Fuel temp should be maintained at 98°C to enhance separator efficiency. All ships, must determine this with their Ship Manager, and ensure these machines run like this at all times, unless shut down for maintenance. Ensure the separators are at least 1000hrs apart in several hours to allow for maintenance.
- De-sludge cycle on purifiers may be increased to optimise bowl cleanliness & separation efficiency in removing Al+ Si from the fuel.
- backflush cycle of auto filters to be reduced to 30mins to reduce the possibility of fuel starvation downstream to the engines.

- Fuel samples to be landed for lab analysis. Samples can be taken from drain of Settling tank, inlet & outlet of purifiers to check element concentration of Al+Si. A full FSE to be taken and sent for analysis as soon as the vessel gets feedback of high cat fines.
- Attention should be given to any increase in fuel rack position needed to maintain the set engine load, and the Technical Superintendent should be alerted if there are any signs indicating increased wear rate on fuel pumps/injectors.
- Scavenge inspection & under piston inspection should be carried out at every possibility to note if there are any signs of abrasive wear on the piston rings & liners.
- An on-board FE test must be done for 3 consecutive days upon commencing use of this fuel
- Some engines have a fuel quality offset, which adjust the fuel timing automatically once you punch in the CCAI result from the analysis.

For Al+Si the usual maximum allowable limit at engine entry is about 15mg/kg and carry over of abrasive Al+Si material may lead to damage of fuel pumps, injectors, and cylinder components. Reduction of abrasive material to satisfactory lower levels will largely depend on the capability, effectiveness, & management of the on-board treatment plant.

6.3.3. Filters and Filter Management⁵⁴

When analysis feedback indicates cat fines above 20mg/kg, the vessel must immediately ensure that it's filtering system is all in good order. Open the filters, clean and replace it with the clean stby 10micron set. Clean the spare set and change regularly or as soon as the vessel sees pressure differentials increasing.

The company policy is to have 10micron filters on the hot filters/auto filters/manual filters just before the engine.

Any old 20, 25 and 50 micron filters need to be discarded, and not kept on board for emergency use.

Fuji-Jet type filters are retro-fitted on all vessels. These are fitted in SERIES to the existing filters. In some ships it will be fitted as first in line, and in others it will be second in line and close to the engine. In both cases, filtering is through both filters, and at no stage must one filter be looked upon as being a stby filter only. They are both to be in use at all times.

⁵⁴ W 24 / 2021 (Entire Section)

In case of emergency, and the filter is giving a problem, temporary by-passing on the single filter is allowed just until the vessel rectifies the issue. If for some uncontrolled reason both filters are giving a problem at the same time, which requires by-passing then engine use is allowed only if in close quarters situation and during manouvring. All other times, the engine is to be stopped, the filters brought back on line, then normal engine use allowed.

Spare set of filter repair kits and cartridges to be kept in stock for all filters.

The [Mespas](#)⁵⁵ scheduled jobs to be followed in maintaining these filters, and cleaning to be with ultrasonic cleaners only. Cleaning is normally left to the most junior person in the engine room, note these crew are to be trained and supervised at all times.

6.3.4. Purifier Efficiency Test⁵⁶

The potential damage arising from Cat Fines is well known. Small particles can damage fuel injection components, abrading the fuel injection nozzle and distorting the spray pattern, resulting in the fuel oil becoming unevenly distributed. They can also progress into the combustion chamber itself, leading to excessive piston rod, piston ring and cylinder liner wear. Larger particles, unable to progress past the fuel injection pump due to the small internal clearances, can cause localised damage - typically scoring of the plunger and barrel.

To reduce the likelihood of fuel with high levels of catalytic fines from progressing further, a combination of settling, purification and filtration is adopted. As the time available for settling in tanks is limited, especially given the impact that the requirement for segregation of fuels with different sulphur levels has had on tank usage, the likelihood of catalytic fines settling out has reduced. It is vital therefore that a vessel's separators operate at optimum efficiency, minimising the need for filtering – which should always be regarded as the last line of defence.

Typically, three things trigger purifier efficiency monitoring;

- When laboratory analysis indicates that exceptionally high levels of catalytic fines have been found in bunkered fuel.
- When operational problems with propulsion systems are encountered.
- As part of a planned maintenance routine.

To facilitate the taking of samples for purifier efficiency monitoring, Maritec provide the purifier test labels along with the standard sample kits. Vessels must send in their request to Maritec for the standard sample test kits as part of annual supply.

⁵⁵ W 03 / 2024

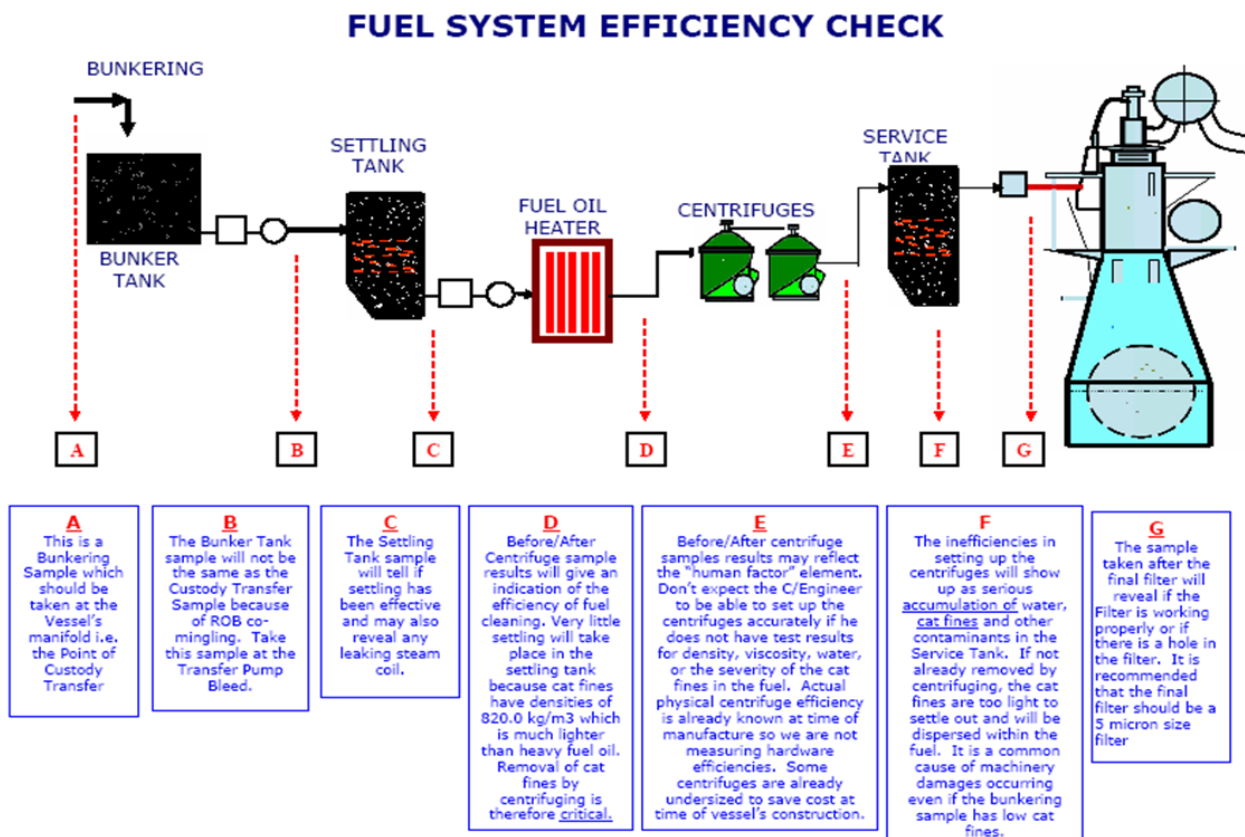
⁵⁶ W 24 / 2021 (Entire Section)

A comparison can then be made of the analysis results, with special attention being paid to the levels of catalytic fines and water content. The results of the analysis, together with advice and comment from Maritec, are then issued to the Ship and to the Office, enabling appropriate action to be taken.

Purifier efficiency test should be conducted minimum once a year and results to be analysed together with your Ship Manager. Additional efficiency tests can be carried out as deemed necessary by the Manager/vessel.


6.3.5. FSC – Fuel System Efficiency Check⁵⁷

The company has contracted Maritec to conduct annual efficiency tests on the system. For this, there are FSC kits on board. A [Mespas](#)⁵⁸ routine is in place to control this activity. But an FSC can be done at anytime, when instructed to do so or when the fuel system is giving a problem that necessitates the vessel to do one. Samples are taken from below depiction.



⁵⁷ W 24 / 2021 (Entire Section)

⁵⁸ W 03 / 2024

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6.3.6. Recommendations/pro-active measures⁵⁹

- a. When interpreting the reports please ensure that the whole report is considered, particularly to check for comments provided. Especially the Chemical screening, it does not show up as an alarm/Red, but any chemical present needs to be addressed as a non-compliance, and action is to be taken.
- b. Although some reports will state in the subject 'OK ALL ON SPEC', we do still see warnings or necessary comments for certain parameters at elevated levels.
- c. For parameters which exceed the specification limit, further advice will always be provided.
- d. Pay attention to the Acid number mentioned in the fuel analysis report. Normally this should be in the range of 0.2 - 0.3 mg KOH/g and bunkers with higher values than 0.5mg KOH/g should be brought to the notice of the Ship Manager.
- e. Purifier efficiency test to be carried out as a minimum once per year, or when bunkers have high levels of cat fines. Discuss with Ship Manager before doing them. Ignore all other instructions issued before.
- f. Drains from the auto backflush filters and/or fuel oil drain tank should not be transferred to the bunker tanks.
- g. The minimum stock of 100 Litres of fuel additive should always be maintained on board. There are a few products that the company typically uses from WSS, Marichem and Aderco. These products are used in dilution directly into bunker tanks and/or sometimes via dosing pumps into the service tank. Guidance on each use is thru the bunker testing company Martec.⁶⁰
- h. If bunkers need to be consumed before analysis results are received, the vessel is to be proactive and request the COQ, MSDS, bunker supplier name, bunker barge names to be requested and we will request Maritec to do a background check. This must always be done if the vessel knows that the sample cannot be landed at the bunker port. This inadvertently means that the ship will be consuming the fuel without an analysis result in place.
- i. Maritec is also contracted to do Chemical screening on our FO bunkers. This is to test for presence of aromatic chemicals used in the process of reducing the Sulphur in the fuels. When these are found present in the vessel bunkers above the threshold values, Maritec will give the vessel guidance to operate safely.

⁵⁹ W 24 / 2021 (Entire Section)


⁶⁰ W 52 / 2021

These fuels will normally ask for purification to be done at very low temperatures, which makes it difficult to separate solids like Al+Si.

- j. It is important to do an onboard Fe test within first 24 hrs of operating on new batch of bunkers. Excess cat fines will show up in this test as increased iron levels, so it is paramount this is done when changing to newly bunkered fuels.
- k. Perform compatibility tests between all fuels, even the segregation of the bunker tanks is applied.
- l. L. Receive new fuel into empty tank(s) and avoid mixing with old fuel as far as practical. In any case when new fuel is co-mingled with residual fuel in a tank(s) quantity of old fuel in final mixed fuel shall not exceed 10% per tank of total.
- m. Prior to transferring new bunker fuel to the settling tank, any remaining bunker fuel in the settling tank(s) should be consumed to minimum suction level.
- n. When new fuel is to be taken in use keep a lower level in the service tank until the changeover has been completed. This is to prevent any overflow from the service tank back to settling tank.
- o. Please keep technical department informed in case the vessel needs to consume bunkers prior to receiving the analysis reports. In this case, please make sure that the bunkers are pre-tested.
- p. [Mespas⁶¹](#) has scheduled jobs for cleaning of tanks. All main storage tanks to follow the 60 month programme, whilst Settling and Service tanks to follow annual intervals for cleaning. These tanks also need to be cleaned once high cat fine fuels have been consumed, and before the vessel bunkers new fuel into those tanks.
- q. [Vessels fitted with jet type of fuel oil filters fitted will run them in series with their existing filters⁶²](#). These are more efficient and only needs to be opened once every 5 years by makers reps for inspection/cleaning.

⁶¹ W 03 / 2024

⁶² W 26 / 2024

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7. BUNKER PROCEDURES


7.1. Bunker Plan

A bunkering plan shall be completed prior to commencement of bunkering operations and shall be reviewed and signed by all personnel assigned to assist in the bunkering operation.

Once the review process has been completed, the bunkering plan shall be posted in a conspicuous position and a copy retained in a designated file together with the Declaration of Inspection (U.S.A. ports) if applicable.

As a minimum, the bunker plan shall include:

- a. the tanks to be bunkered and the quantity in each, with approximate dips and ullages according to initial advised densities when the operation is complete;
- b. the tanks to be bunkered and the quantity in each, with approximate dips and ullages according to the actual fuel density loaded for when the operation is complete;
- c. the type of product to be bunkered and its material safety data sheet;
- d. the local regulations covering bunkering operations;
- e. pipeline diagrams showing all valves and their open and closed statuses;
- f. the procedures for emptying and plugging save-alls;
- g. the number of people needed for the bunkering operation;
- h. the duties of each person directly involved in the bunkering operation;
- i. the maximum loading rates and pressure for the anticipated sequence of the operation;
- j. who is responsible for tending moorings during the operation;
- k. the procedure for topping off tanks;
- l. the procedure for clearing barge or shore lines;
- m. the procedure for closing down the pipeline system when loading is complete;
- n. the procedure for opening bunker tank sounding pipes and openings;
- o. the precautions taken to manage the risks associated with hydrogen sulphide in fuel oil bunkers;
- p. the correct wearing of PPE equipment
- q. the procedure for reporting any oil spills into the water; Refer to HSE Procedures Manual section 4.7
- r. The emergency procedures, including stopping the loading operation and clean-up procedures.

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- s. The instruction to close sounding pipes, close valves and blank flanges of bunkers systems once an operation is complete.

7.2. Pre-Bunker Meeting

The Chief Engineer, together with all personnel assigned to assist in the bunkering operation shall carry out a review of the procedures. This will take place at least 24 hrs before receiving actual bunkers.

The Pre-Bunker meeting shall include but not limited to the following items:

- a. Bunkering Plan.
- b. Oil Spill prevention, including consequence and penalties in event of infringement.
- c. Oil Transfer Procedures including individual watch keepers' responsibilities.
- d. Communications on-board and communications between supplier and receiver.
- e. Duties of the responsible person at the point of transfer and deck watch.
- f. Emergency shutdown procedures.
- g. Role and availability of Chief Engineer for the duration of the bunkering operation.


The meeting is to be recorded in engine room logbook and underlined in red. In addition, the Master shall make a deck logbook entry noting that the Chief Engineer in charge of the bunkering operation conducted the review. Minutes of this meeting are to be recorded.

7.3. Pre-Transfer Meeting

The Chief Engineer shall ensure that a pre-transfer meeting takes place between himself and the bunker supplier before commencing bunkering operations.

The pre-transfer meeting shall cover but not limited to the following agenda:

- a. Name of delivery vessel or terminal.
- b. Estimated date and time of bunker transfer.
- c. Identification of product to be transferred.
- d. Sequence of transfer.
- e. Connection of loading arms or hoses.
- f. Transfer rates for starting up, during and completion should be included to ensure maximum allowable working pressures/rates are not exceeded.
- g. Watch arrangements including the names of the personnel involved with emphasis of the necessity for 'Teamwork' in order to avoid 'One Man Errors'.
- h. Emergency Shutdown Procedures and Emergency Signals.

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- i. Communications including predetermined frequencies for radio communications during transfer.
- j. Transfer plan posted in accordance with vessel transfer procedures.
- k. Transfer, 'topping off' and shutdown procedures agreed.
- l. Estimated date and time of completion.


Details of the pre-transfer meeting shall be entered in both the deck and engine room logbooks noting that the persons in charge of the bunkering operation conducted it.

7.4. Safety and Anti-Pollution

The Chief Engineer shall in conjunction with the Chief Officer/OOW, ensure that the safety and anti-pollution requirements contained in the "Bunkering Safety Check List", have been implemented prior to commencing bunker operations. Safety, health and the environment guidelines shall also be adhered to.

As a minimum, the following safety and anti-pollution measures shall be observed throughout the bunkering operations:

- a. Oil spill equipment and salvage pump readily available on deck.
- b. Scuppers plugged.
- c. Bunker tank lids closed.
- d. Portable fire extinguishers deployed at bunker manifold.
- e. SOPEP/SMPEP Kit placed at the bunker manifold.
- f. SOPEP/SMPEP Store clear, unlocked and accessible.
- g. Hoses connected to fire main.
- h. All 'save-alls' empty and plugged prior to commencing bunker operations.
- i. Safe access to vessel provided.
- j. No smoking / electronic devices and visitor notices displayed.
- k. Bending Moments (BM) and Shear Force (SF) checked by Chief Officer on the loading computer.
- l. 'B' Flag, red light or other signal displayed as required by local regulations.
- m. Vessel securely moored if applicable.
- n. Check communications are compatible and reliable.
- o. All equipment to be used, including hoses, pipelines, fittings and air vents on tanks have been inspected and found to be in good order with no temporary repairs. Pressure test of pipelines and fittings with date of test must be in compliance with company and regulatory requirements.

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7.5. Bunker Delivery Note (BDN)

Regulation 18 (3), MARPOL Annex VI stipulates that details of the fuel oil shall be recorded by means of a bunker delivery note.

The BDN has to contain at least the following information (as laid down in Appendix V of MARPOL Annex VI):

- Name and IMO Number of receiving ship.
- Port.
- Date of commencement of delivery.
- Name, address and telephone number of marine fuel oil supplier.
- Product name.
- Quantity in metric tons.
- Density at 15 °C kg/m³.
- Sulphur content (% m/m).
- A declaration signed and certified by the fuel oil suppliers representative that the fuel oil supplied is in conformity with regulation 14 and 18 of Annex VI.

Sulphur content of any fuel oil used on board shall not exceed 0.50% for use outside special emission control area. While operating within an emission control area, the sulphur content of fuel oil used on board ships shall not exceed 0.10%.

BDN is an important document to ascertain the Sulphur content by the authorities. If the data is not correctly mentioned in it, the problem may be faced.

Check the sulphur content and other details upon receipt of BDN and if any error or data is found missing, it is to be brought to the attention of supplier, [ship operator and Ship Manager immediately](#)⁶³.

7.6. SOLAS - Mandatory MSDS for MARPOL Annex I cargoes and for bunkers

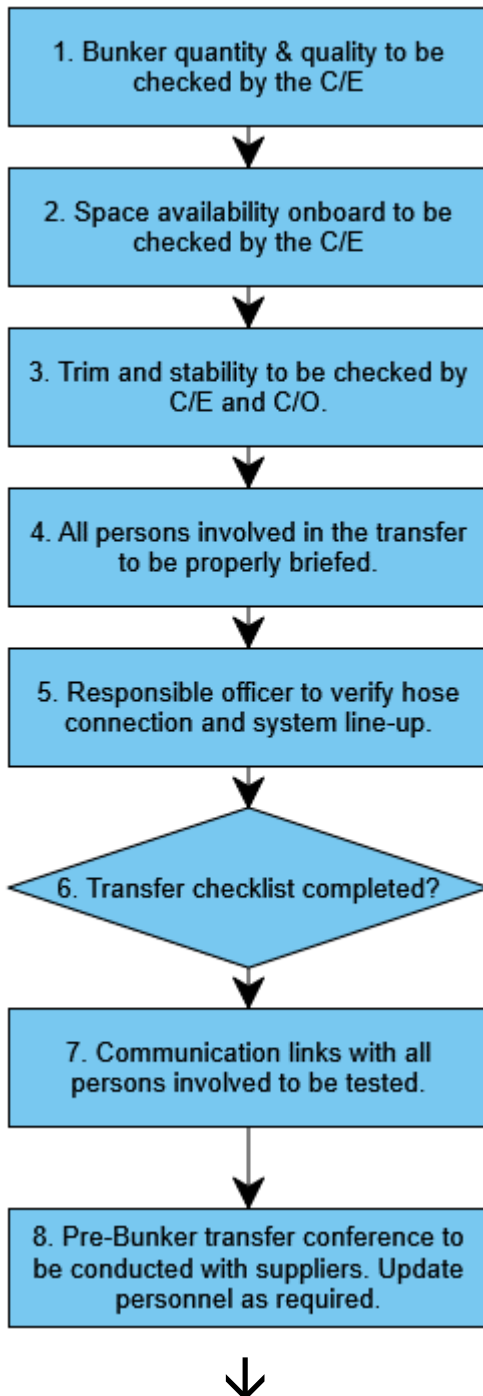
Each ship must be provided with Material Safety Data Sheets (MSDS) for oil cargoes (MARPOL Annex I cargoes) and for marine fuel oils (bunkers) as defined in MARPOL. The MSDS have to be provided prior to loading such oil as cargo in bulk or as marine fuel oil.

IMO has recommended a format and content for the MSDS (**IMO Resolution MSC.286 (86)**).

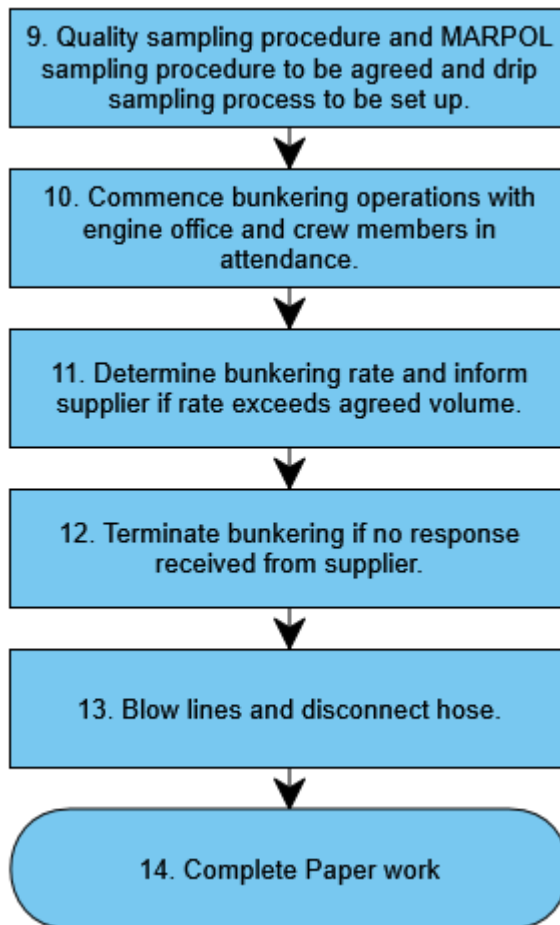
PSC inspectors can be expected to verify that ships have the required MSDS.

If MSDS is not provided for fuel oil prior loading, please issue the Protest letter to bunker barge/terminal and inform [the ship operator and Ship Manager immediately](#)⁶⁴.

7.7. Bunker Procedure Flow Chart



⁶⁴ W 26 / 2024



7.7.1. With reference to the flow chart above

- a. All persons taking part in the bunkering operations must be properly briefed. The briefing will include details of soundings and ullages, loading rates, loading sequence, communication procedures, reduction of topping rate, if necessary, and emergency stop procedures.
- b. The Chief Engineer will ensure the bunker hose is properly secured to the correct bunker line and the system line up is correct, Bunker hose connection on board vessel should always be the responsibility of ship staff. One the hose crosses the handrail; it is all our responsibility for spills etc. Connection of the hose should always be done by Ship Staff under the guidance of a Senior Officer. All connections shall be fully bolted on the flange, with a new gasket in place.
- c. The Chief Engineer will check that all requirements are carried out, and sign the pre-transfer shore/ship, ship/ship checklists as appropriate,
- d. All persons involved in the bunkering operation should have portable radios and communication links must be verified both on board and with the bunker supplier.

- e. The Chief Engineer will conduct a pre-transfer meeting with the bunker supplier, Bunker loading plan and Ships staff must be updated as appropriate.
- f. Quality sampling and MARPOL sampling procedures to be agreed. Continuous drip samples will be taken and monitored during the entire bunker operation. All precautions will be taken to ensure that no water or foreign matter can enter the sample bottle.
- g. During the bunker operation, there will be at least one Engineer or a trained crew member to manually ullage all bunker tanks. One crew member to act as manifold watchman. Should a high high level in any tank in the system alarm, ALL bunker operations must cease immediately until Chief Engineer is satisfied it is safe to resume.
- h. Determine the bunkering rate as soon as possible and inform supplier to reduce if it exceeds agreed volumetric rate.
- i. Stop the bunkering whenever unsafe condition such as high loading rate becomes evident. Resume bunkering when appropriate steps have been taken to ensure safe operation.
- j. If the bunker supplier requests to blow the bunker hoses/ lines back to the ship after completion of the bunkering, the ship can only agree to this after the following conditions are in place:
 - i. At the bunker opening meeting the ship shore checklist, the supplier must indicate if he intends to blow thru the lines with air⁶⁵.
 - ii. On completion of the bunker operations before blowing, a set of soundings to be taken by ship's crew. If there are discrepancies, ship shall not blow thru until this is resolved⁶⁶.
 - iii. The ships manifold bunker valve shall be completely closed before the blowing starts.
 - iv. If possible, the most slack tank⁶⁷ with low filling volume shall be opened rather than using a near full bunker tank. All bunker tanks are to be monitored to ensure no valves are passing in the system.⁶⁸
 - v. When blowing starts, a crew member shall partially open the manifold valve and stay with the valve until the blowing process is completed. Under no circumstances shall the manifold be opened fully during the blowing. Be particularly careful if the manifold valve is a butterfly type valve. Butterfly valves are difficult to regulate.
 - vi. The ullage level in the tank being blown back to shall continuously be monitored during the blowing process.

⁶⁵ W 07 / 2019

⁶⁶ W 07 / 2019

⁶⁷ W 07 / 2019

⁶⁸ W 07 / 2019


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- vii. A crew member shall be stationed near the bunker vent heads during the blowing and alert the person at the manifold valve if there are any signs of over filling.
 - viii. All crew members involved shall be equipped with radios to ensure instant communication with each other during this critical point of the bunkering.
 - ix. The volume of bunkers in the hose shall be calculated to ensure it will safely fit in the receiving⁶⁹ tank.
 - x. Cheng is to confirm with the barge that the operations is over and then instruct the ship's crew to close all valves.⁷⁰
- k. A proper record of the bunkering operation is to be made in the engine logbook and should include times for:
- i. Barge alongside.
 - ii. Hose connected.
 - iii. Bunkering Start time.
 - iv. Bunkering Completion time.
 - v. Hose disconnected.
 - vi. Barge departed.
 - vii. Quantity received.
- l. The Oil Record Book Part 1 and the Annex VI Bunkering Log must be correctly completed.
- m. On completion, a Bunker Delivery Note (BDN) must be supplied stating the following information:
- i. Ship name and IMO number.
 - ii. The port.
 - iii. Delivery date.
 - iv. Full details (name, address, telephone number, etc.) of the supplier.
 - v. Product name, e.g. RMG-380, DMB.
 - vi. Quantity in metric ton.
 - vii. Density at 15 °C (NOT API or S.G. at 60 °F or Relative Density 60 °F).
 - viii. Sulphur content, % mm.

⁶⁹ W 07 / 2019

⁷⁰ W 07 / 2019

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- ix. A signed/ certified declaration that the fuel conforms with Regulation 14(1) and 8(1) of Annex VI.
 - x. MSDS Sheet attached.
- n. If this information is unavailable or incorrect, a letter of protest must be issued, with a copy to charterers and to the office. A copy is to be filed together with the BDN.
- o. The BDN will be supplied together with the suppliers' samples and the MARPOL sample
- i. Each Bunker Delivery Note (BDN) supplied by the bunker supplier must relate to an individual consignment of bunkers. For instance, if two barges are used for delivery the each must have its own BDN.
 - ii. The BDN is a statutory document and must be retained on-board for three years and be available for inspection by Port/ Flag State control.
 - iii. For each BDN and each barge there must be an accompanying representative sample of the delivered fuel.
 - iv. The fuel oil sample must be delivered to the ship by the bunker supplier and must be sealed and signed by the Chief Engineer and representative of the supplier.

8. QUANTITY CONTROL⁷¹

8.1. Mass Flow Meter Bunkering (MFM)

MPA has mandated the use of MPA-approved MFM system for Marine Fuel Oil (MFO) delivery in the Port of Singapore. All bunker tankers with MFM approved system shall follow the MFM bunker delivery procedure. It is important for all Chief Engineers to familiarise themselves with the MFM procedure and key points about the MFM bunker tanker. It is a Coriolis metering device, consisting of a flow sensor and transmitter which primarily measures the mass flow by means of the interaction between a flowing fluid and the oscillation of a tube or tubes. It also provides measurement of the density and the process temperature and pressure. A MFM system comprises the MFM, its ancillary devices, pipelines and sealing points. The basic principle of operations of MFM is to give measurement of air presence during the batch delivery through mass flowmeter. It is recommended that within one delivery, total value of aerated portion should not be more than 2% of the non-aerated portion. There is a Checklist in the system to assist with taking bunkers in Singapore and anywhere else in the world that MFM have been introduced. The form is - 3.3.5A Mass Flow Meter Bunkering Checklist.

⁷¹ W 01 / 2018 (Entire Section)

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8.1.1. Totalizer

The MFM system bunker meter computer (BMC), which is located at the bunker tanker, has 2 totalizers:

- a. Resettable – forward and reverse (reading for each delivery or loading by bunker tanker)
- b. Non-Resettable – forward and reverse (accumulative readings since installation of MFM on the bunker tanker).

8.1.2. MFM System Seals Checklist

The MFM and bunker piping (loading and delivery) on the bunker tanker is sealed with a unique serial number by an authorized verifier appointed by MPA. This is intended to ensure that all bunker measured by the MFM goes only to the receiving vessel, through the flow boom without any bypass. Before bunkering, the sealing diagram and seal verification report must be made available, and upon request, verified.

8.1.3. MFM Flowrate

It is important to ensure that the flowrate for delivery is within the calibrated flow range of the MFM system.

Qmin is the minimum flow rate the MFM system is qualified to operate, in compliance with required accuracy.

Qmax is the maximum flow rate the MFM system is qualified to operate, in compliance with required accuracy.


Check the Qmin and Qmax value of the bunker tanker MFM system to determine your pumping rate.

Qmin > Pumping Rate < Qmax (This information is available on the specification plate on the MFM system)

8.1.4. MFM System Integrity

The following are requirements on system monitoring during bunker operations:

- a. MPA Approval Letter: Check approval date, bunker tanker name and license number (SB)
- b. Meter calibration is to be done every 3 years and the validity of this certificate is to be within 3 years of the issue date.

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- c. Check expanded error of measurement is within (+/-) 0.5%. Note the instrument number on the report matches the specification plate number.
- d. Also check that zero verification has been done every 3 months in the first year and 6 months in subsequent years. Always request the latest zero verification report. Check the validity and device conformity. Note the instrument number on the report and matches the specification plate number.
- e. System re-test (Seal Verification Report) is necessary when critical MFM seals are broken. Critical seals are those that may have direct impact on the meter reading. Notify MPA and seek their advice before bunkering.
- f. Critical alarms such as meter failure, power failure, and equipment communication failure should not trigger during bunkering. In the event of any such alarm, stop bunkering immediately, notify the MPA and resume SS600 for the delivery of the balance quantity. 2 BDN to be issued for delivery by MFM and SS600 respectively.
- g. SS600 is the Singapore Standard Code of Practice for Bunkering.

8.1.5. Bunker Metering Computer (BMC)

Check all the relevant parameters of the batch delivered from the bunker meter computer (BMC) including but not limited to: date/time of commencement and end of delivery, readings of totalizer log, average value of aeration limit/air index and tube damping/drive gain. There should not be any stoppage during the delivery and also check the alarm log to confirm no critical alarm was activated.


8.1.6. Bunker Metering Ticket (BMT)

Ticket printed at the end of bunkering operation that reflects the quantity delivered to the vessel.

8.1.7. Bunker Purchase by MFM delivery

Ensure the supply bunker tanker MFM system rated Minimum Measured Quantity (MMQ) meets your quantity nomination. The smaller quantity nomination will be more of concern.

It is the bunker tanker operator's responsibility to assign correct size of MFM system or bunker tanker suitable for the supply. Pre-agreement with the bunker seller to provide MFM metering profile and data in the event of bunker disputes for an independent investigation.


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8.2. Quantity Disputes

This scenario happens when the vessel has received lesser quantity than the MFM delivered quantity. In some cases, there can be a reverse order where the vessel has received more quantity and observed aerated fuel in the receiving tanks whereby the actual quantity could not be measured accurately.

8.2.1. Recheck Procedure on MFM

- a. Re-validate the meter totalizer readings.
- b. Check that there was no stoppage during the delivery and no critical alarm was activated.
- c. Recheck all sealing points based on the latest seal verification report and confirm all seals listed are intact.
- d. Confirm that all relevant lines have not been modified as stated in the piping diagram.
- e. Examine and obtain a copy of the bunker tanker meter totalizer log showing all the totalizer movements related to the bunker delivery. Recommendation from last terminal loading to current date. Examine and obtain latest copies of MFM documentation:
 - Meter calibration certificate (Forward).
 - Meter calibration certificate (Reverse).
 - Metering system diagram and sealing points.
 - Meter seal verification report.
 - Meter zero verification report.
 - Cargo system piping diagram.
 - MFM system approval letter from MPA for custody transfer.
- f. Last certificate of quality or equivalent document by the cargo provider (terminal or ship).
- g. Request Cargo Officer to provide raw data and bunker metering profile covering the entire bunkering operation.
- h. Check all the relevant parameters of the batch delivered from bunker meter computer (BMC) including but not limited to: date/time of commencement and end of delivery, readings of totalizer log, average value of aeration limit/air index and tube damping/drive gain.
- i. Record all the relevant details and findings of the dispute in a Statement of Fact (SOF). This document should be completed and acknowledged by the chief engineer, cargo officer and bunker surveyor, if engaged.

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- j. If the dispute remained unresolved, Chief Engineer to issue a Note of Protest to be acknowledged by all 3 attending parties.
- k. Submit all information collected to your office for them to seek an independent validation on any non-conformity to TR48 procedure that could affect the accuracy of quantity measurement. Alternatively, if the vessel has sufficient time in port, activate MPA Hotline for assistance: 1800-2865377. MPA will send a MFM Verifier within 3 hours to assist the investigation.
- l. Maritec is the only survey company appointed by MPA as MFM Verifier for Hotline activation.


Important Timeline:

Quantity Dispute must be reported to relevant party within 14 days.

Quality Dispute must be reported to relevant party within 30 days.

8.3. Pre-Bunkering

- a. Vessel shall complete the opening gauge on the bunker tanks before the arrival of the bunker tanker.
- b. Conduct Safety Checklist for compliance.
- c. Check the bunker quantity ordered and correct fuel grade by checking the fuel characteristic on the Bunker Requisition Form.
- d. Note COQ density is for quality specs and not meant for quantity determination by MFM delivery.
- e. Check Qmin and Qmax info on the specification plate to determine the pumping rate.
- f. Pumping rate must be **Qmin > Pumping Rate < Qmax**
- g. Cargo officer or barge Master is to ensure that **no tank stripping is allowed** during bunkering.
- h. Bunker line filling at the beginning or tank stripping at end of bunkering, where the quantity may fall below Qmin, should be performed at the shortest time to minimize error of MFM measurement. Tank stripping and line clearing to be done only at the end of bulk delivery with the permission from Chief Engineer and attending bunker surveyor if engaged.
- i. Verify the MFM system integrity:
- j. MPA approval letter – note bunker tanker name and license number.
- k. Calibration Certificate – check loading and delivery calibration certificates are within 3 years validity.
- l. Latest Zero Verification Report – check the validity and device conformity.
- m. Seal Verification Report – inspect and match the seal on MFM system and checklist.
- n. is identical as per the latest seal verification report.


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- o. If there is a missing, broken or different seal found, do not start bunkering, but notify MPA as soon as possible for advice.
- p. Take photos and record your findings on the seal checklist before signing.
- q. Witness the resetting of the totalizer by the Cargo officer and if the MFM system inspection is in compliance with TR48 requirement.
- r. Record the non-resettable totalizer readings onto Meter Record Form Section A.
- s. Witness and record reset of the resettable totalizer to zero. Take a photo with indication of date and time.

8.4. Bunkering

Pumping shall start immediately once all parties recorded the totalizers reading and witnessed the reset.

- a. Check that the agreed pumping rate is maintained by the bunker tanker and monitor the aeration, drive gain, flow rate at regular intervals during bunkering.
- b. Monitor the bunker operation closely and ensure there is no tank stripping activities concurrently with bunkering. This is to reduce air entrainment during the delivery process.
- c. Tank stripping and line clearing to be done only at the end of bulk delivery with express permission from Chief Engineer and attending bunker surveyor.
- d. Pay attention to the critical alarm in case there is a failure on the meter, power or communication equipment during bunkering.
- e. The indication is an audible alarm with a red flashing light on the BMC.
- f. Some examples of critical alarms are: control valve failure where manual control is required, communication failure to flowmeter, flowmeter pulse line failure, flowmeter failure, power up of controller caused by power failure.
- g. Action when the critical alarm is activated:
- h. Stop the pump and record the totalizer readings onto the Meter Record Form.
- i. Record stoppages with reasons on the Statement of Fact.
- j. Take a photo of totalizers and critical alarm.
- k. Calculate the quantity delivered by MFM system and tally the quantity on the bunker meter ticket (BMT).
- l. Conduct closing tank gauging on vessel to determine quantity received.
- m. Check any quantity shortage before signing the BDN quantity by MFM delivery and issue Letter of Protest (LOP) if necessary.

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8.5. Post Bunkering

- a. Ensure line clearing process is completed, wait for confirmation that there is no back flow of bunker and that the meter has stopped measurement. All parties to agree on the completion of bunkering before proceeding with the post-delivery inspection.
- b. Inspect the seals on MFM system. Again, ensure all seals remained intact with all parties present. Complete section B (After Delivery) of the MFM System Checklist and sign after inspection. Please notify MPA immediately if there is any missing seal and seek their advice accordingly.
- c. Be present to witness the cargo officer stop meter totalizer after the seal inspection and print the bunker metering ticket.
- d. Bunkers to be allowed to settle for min 24 hrs before any attempt to transfer. Check soundings of all tanks within 24hrs of bunkering ops completion, any discrepancies to be reported⁷²
- e. Ensure that there is a follow up with the agent that the sample has been sent to our contracted Lab.⁷³
- f. Once analysis report has been received and all found to be in order, consumption can commence.⁷⁴
- g. Ensure any guidance from Maritec is followed diligently, fuel purifiers temperatures are set to max when required, flow rate set to min as required for sea consumptions.⁷⁵
- h. FO tanks, sett/serv tanks to be drained of water every watch and logged in log-book.⁷⁶
- i. Cleaning of filters/strainers to be on going and as and when it is seen that the gauges are indicating dirt build up.⁷⁷
- j. FSC kits to be used on board when the fuel has been seen to be problematic. An ANNUAL check is to be done as per [Mespas](#)⁷⁸ routine.⁷⁹

8.6. Vessel Measurement on Quantity Received

- a. Resume closing tank gauging on vessel to determine the quantity received.
- b. If there is a quantity difference between vessel and the totalizer readings, proceed with the dispute resolution procedure.
- c. Confirm BDN figures tally with BMT, Meter Record Form and Vessel Measurement before signing.

⁷² W 24 / 2021

⁷³ W 24 / 2021

⁷⁴ W 24 / 2021

⁷⁵ W 24 / 2021

⁷⁶ W 24 / 2021

⁷⁷ W 24 / 2021

⁷⁸ W 03 / 2024

⁷⁹ W 24 / 2021



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9. QUALITY AND SAMPLING

9.1. General

The Company have contract with CONTRACTED SAMPLE TESTING COMPANY for Fuel Analysis for all bunker samples.

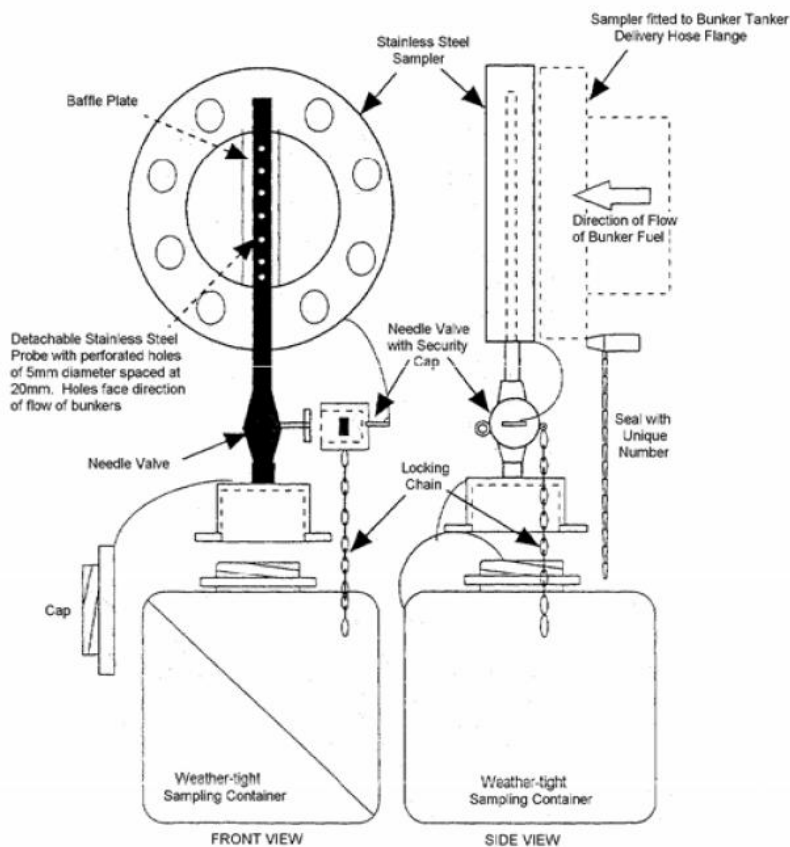
The bunker analysis results will be advised to the vessel and the company.


Vessels are equipped with the sampling kit and empty plastic bottles for the samples.

Sample bottles need to be ordered well in advance via [Mespas⁸⁰](#) The Ship Manager should be informed each time samples have been taken, mentioning how many samples have been sent for analysis. Vessel must provide agent details and AWB details to enable follow up.

9.2. Sampling Procedures

The custody transfer sample shall be taken at the manifold (thereby ship's manifold is the point of custody transfer) of the vessel. The sample collected in this manner shall constitute the representative sample of the bunker operation.



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The Chief Engineer shall ensure that the sampling container is clean and with transparent wall so that continuous drip is visible.

Sampling instructions shall be followed meticulously.

Ensure that the Line Sampler is ready for use with a new collection container.

Complete a 'Request to Witness Sampling' form, and give top copy to the supplier or supplier's representative. Retain copy for the ship's file. If the supplier or supplier's representative declines to attend the witnessing of sampling, this fact shall be recorded in the ship's logbook.

Take sample by adjusting the Line Sampler flow valve to give a slow continuous drip throughout the bunkering period. Use the security seal facility to prevent tampering. Ensure that approximately 5 litres are collected from each barge or over the bunkering period if from one source.

Once the sample has been collected, seal the container and shake vigorously to mix the sample thoroughly, then fill 3 sample bottles, 4 if the vessel is required to supply the Marpol sample, to indicator line, and seal.

NOTE: Security seals must have a unique identification number.

Cap and seal the sample bottles recording unique security seal numbers in the Chief Engineers report form and in the ship's logbook. One sample will be given to the supplier one sample retained on board and one sent to CONTRACTED SAMPLE TESTING COMPANY. NB if the supplier did not supply a Marpol sample then an additional bottle should be filled and retained on board, the bottle seal number should be recorded on the BDN and counter signed by the supplier.

Complete sample bottle labels and sign for them in front of, and together with the supplier or supplier's representative. Fix label to the bottle.

If offered a sample by the barge crew, and you have not witnessed correct sampling procedures, ensure that it is stamped 'For Receipt Only – Source Unknown'. In addition, sample labels presented before bunkering operations commencement, must not be signed.

Forward samples as per test laboratory instructions, and one to the supplier or supplier's representative. If the supplier or supplier's representative discards the sample this fact shall be recorded in the ships' logbook.

The ship's sample and Marpol sample shall be retained on-board in a secure location. Details of the Marpol Sample and the independent sample analysis report from the contracted

sample testing company should be recorded in the MARINE FUEL OIL SULPHUR RECORD BOOK.

Where fuel delivered is found to be unsuitable for use, the Ship Manager must be informed immediately and a report submitted as soon as practical. The aforementioned actions are of the utmost importance in that the terms and conditions under which bunker fuels are supplied normally contain strict time limits for the notification of claims.

Typical time limits are:

Quantity claims and disputes	7 days
Quality claims and disputes	7 days
Other claims and disputes	28 days

Apart from the laboratory sample, at least three additional representing ship samples of about 1 litre are to be taken of each fuel quality supplied. This can be broken down into the following:


- a. 1 CONTRACTED SAMPLE TESTING COMPANY sample bottle labelled for ship to be kept on board for a period of at least 12 months
- b. 1 CONTRACTED SAMPLE TESTING COMPANY sample bottle labelled for supplier given to the fuel supplier
- c. 1 Sample bottle to be kept on-board as MARPOL 73/78 Annex VI fuel oil sample for a period of at least 12 months, this can be supplied either by the ship or supplier but sampling must be witnessed and seal number recorded on the BDN
- d. Supplier will supply an additional sample to the vessel over and above the Marpol sample
- e. Also: 1 set for surveyor (when applicable)

10. SAMPLE STORAGE AND INVENTORY

Samples are to be kept in a safe storage location, outside the ship's accommodation and where personnel would not be exposed to vapours which may be released from the sample. Further, the retained samples should be stored in a sheltered location where they will not be subject to elevated temperatures, preferably at a cool/ambient temperature, and where they will not be exposed to direct sunlight.

A dedicated cargo sample locker would be considered an adequate storage space, alternatively, a suitable locker (with ventilation ensuring adequate air flow) and a fixed firefighting system installation or portable fire extinguisher would be considered as an adequate storage space.

Within the storage space it is preferable for the samples to be contained within a locked cabinet or cage to prevent tampering.

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The cabinet must be constructed of oil resistant material with suitable cells or divisions to prevent shifting of the sample bottles at sea.

An inventory system is to be maintained (e.g. log book) to keep track of the retained samples. This will allow the vessel to keep track of their samples and to remove samples that are greater than one-year old.

NOTE: As long as the fuel is no longer on board and the sample is older than one year the sample can be disposed. Samples can be disposed into the engine room sludge tanks. A record must be made in the Marine Fuel Oil Sample Record Book (Against the relevant line item and BDN) and in the Oil Record Book.

11. INTERNAL TRANSFER OPERATIONS


11.1. Daily Internal Transfers

The Chief Engineer must ensure that any engineer placed in charge of a transfer operation is experienced and has had ship-specific training in all aspects of the operation, including knowledge of the limitations of the ship's monitoring and control systems. **Internal transfer operations must be initiated by an engineer and must never be left unattended under any circumstances. On completion of a transfer the engineer will stop the pump by hand and verify that the pump has stopped. The automatic stop⁸¹ set up should be as per original ships drawings. Some vessels are fitted with a failsafe to stop the pump if the tank level exceeds a set volume, this fail safe is not to be relied upon as the means to stop the pump.**

Due to the size of the fuel oil settling tanks on most vessels these days' daily transfers are un-avoidable occurrence. The engineer in charge of the transfer operations may not under any circumstances, perform any other duties that may interfere with this task. Automatic shut off valves, remote gauging systems and high-level alarms must not be solely relied upon as a means to identify when the operation should be stopped. Where practical, manual soundings should be used as a means to identify the level inside a tank. It must be noted that some vessels do not have a manual sounding point and may rely on a visual indicator as a means to identify the level in the tank.

As it is not always practical to make a tank sounding prior to transfer due to the location of the tank or for instance during UMS operation where the sounding point is on deck and would require the duty engineer to proceed outside the accommodation at night to affect the sounding. It is the requirement for the watch keeper to sound the settling tank once per day during daylight hours and compare it to the remote reading to verify the accuracy of the remote reading. Both readings are to be logged in the ER log book on a daily basis. Any

⁸¹ W 24 / 2021

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engineer on watch can then verify that the remote gauge is read accurately when a transfer is required.

The following Checks should be done on a daily basis to ensure a safe operation:


- a. Daily manual sounding of all fuel tanks and results to be compared against remote readings, any inaccuracy of more than 10% is to be reported to the Chief Engineer.
- b. The settling tank remote reading and the sounding are to be logged in the ER log book as a means to verify accuracy.
- c. Check tank vent flame screens are clean, save-alls on deck are empty i.e. no water inside.
- d. Check temperature of fuel to be transferred complies with FOBAS recommendation.
- e. Inform Chief Officer of storage tank that is in use and the approximate quantity that will be transferred on the day so he can plan vessel stability.
- f. Ensure alarm set points are correct and alarms are functioning correctly (no alarms to be set above the overflow pipes any suspect set points are to be discussed with the Chief Engineer, under no circumstances are any of the engineers allowed to make changes here with verify with the Chief Engineer).
- g. Ensure the pump strainer is clean.
- h. Ensure the correct suction valve of storage tank in use is open and that all other suction valves are closed including overflow tank.
- i. Ensure that the pump suction and discharge valves are open, and the pump is lined up to the correct tanks.
- j. Ensure discharge valve to deck is closed.
- k. Some vessels may be equipped with an auto stop function as a safety device, if fitted this should be tested at least once per day.
- l. Make a record the transfer in the Engine Log Book.

NOTE: Internal transfer operations are not permitted during any bunker loading or discharging operation. Should any fuel transfer be essential, then the bunkering operation must be suspended for the duration of transfer.

11.2. Bulk Internal Transfers

In order to maximise bunker intakes, it is often necessary to make internal transfers between bunker storage tanks. The quantities transferred will be far greater than the daily transfers and in this respect the Chief Officer must be consulted before the transfers takes place to ensure his stability calculations are still valid.

For Bulk internal transfers in preparation for an up and coming bunkering operation a Bunker Safety Checklist is to be utilized along with a Risk Assessment associated with the planned

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transfer operation prior to commencement. Refer to **Section 6. Bunkering Procedures** as the accepted guidance.

- a. Tank transfer to be discussed in advance with the vessel management to ensure cross departmental planning and also to ensure that other aspects such as list, vessels stress and stability are in order.
- b. Proper bunker transfer plan to be made the quantities and tank details to be calculated.
- c. Sufficient and dedicated personnel to be allotted the work.
- d. Pre transfer meeting to be carried out wherein the actual job details of the operation to be discussed in detail and any doubts clarified.
- e. Testing of overfill alarms and other safety devices to be done prior any Tank Transfer.
- f. During the actual bunker transfer, the bridge to be informed so that watch can be established on deck to ensure that all precautions are taken and that SOPEP equipment is in readiness.

12. DISCHARGE OF WASTE OIL OR SLUDGE


All company safety and environmental protection procedures relating to bunkering operations as an oil transfer procedure shall also apply to the discharging of waste oil or sludge to another vessel or to shore reception facilities.

To assist the process of settling out the contents of oily waste tanks should be heated where such heating equipment is so fitted. Every effort should be made to reduce the water content of waste oil.

In ships where incinerators or dual fuel boilers are fitted, sludge and the oil content of oily waste may be incinerated in accordance with the maker's instructions. Where local contractors are prepared to pay for oily waste products, or removed for free, the opportunity should be taken to dispose of these residues. A signed receipt for waste oil disposal is to be attached to the relevant page in the Oil Record Book and a copy forwarded to the Ship Manager. Bunker checklist form is to be used for this procedure.⁸²

13. LOADING OF LUBE OIL

All company safety and environmental protection procedures relating to bunkering operations as an oil transfer procedure shall also apply to the loading of bulk lube oil.

	<p><i>SAFETY, HEALTH, ENVIRONMENT AND QUALITY MANAGEMENT SYSTEM</i></p> <p>16.6. BUNKER MANAGEMENT AND OPERATIONS</p> <p>FLEET PROCEDURES MANUAL</p>	<p>Sect : 16.6 Page : 46 of 46 Date : 6-Aug-25 Rev : 10.1 Appr : DPA</p>
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14. BUNKER OPERATIONS WATCH-KEEPERS AND TRAINING REQUIREMENTS

Crewmembers designated as watch-keepers for the bunkering operation must not have any other tasks assigned to them. In addition, the duty engineer should not be included in the bunkering team.

The number of personnel assigned to each bunkering operation will depend upon the circumstances of each case and be at the discretion of the Chief Engineer.

The working language on board Company vessels is English, and in cases where proficiency in English is limited on the part of the delivery vessel or terminal, hand signals and / or specific phrases may be agreed upon in order to avoid any confusion.

Bunkers shall be planned to allow for the availability of sufficient rested personnel to carry out the operation safely in terms of hazards to both personnel and the environment.

In cases where several key members of the Bunkering Team are to be relieved at a bunkering port, such relieving must be postponed until after the operation.

If, after consultation and agreement with the Chief Engineer, bunkering cannot be carried out safely then bunkering operations are to be delayed until such time as sufficient resources can be dedicated to the operation. Such circumstances may cause delay to the ship and Ship Manager and the Commercial Operations Manager must be advised immediately.

The Chief Engineer is to train all ship's personnel involved in bunkering, and a record of this training is to be issued and filed.

Date, time and names of attending personnel must be recorded and duly signed by them and the Chief Engineer.

The training on bunkering is to be performed at regular intervals in order to include any new signed on personnel at least 48 hours before bunkering. This 48hour rule may be waived in the case of Returning personnel who have sailed on the ship before. The training must however, be carried out.

The training session is to include the following, as a minimum:

- a. Company's Environmental Policy with specific reference to prevention of pollution.
- b. The ship's bunker tanks, piping, valves and pumps. The bunker piping diagram is also to be consulted.
- c. The specific duties of each person.
- d. An explanation of methods of communication to be used between ship and supplier.