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SEWAGE SYSTEM MAINTENCE AND OPERATION

1. PREAMBLE

This chapter is to be read in conjunction with the chapter 6.2 Control of Operational Discharges of Waste provided in HSE Procedures Manual.

The Chief Engineer is over all in charge of the sewage system and treatment plant. The responsibility for the operation and maintenance of the system and plant is delegated to the 4th Engineer. Only the company prescribed Bio Range of chemicals may be used on the vessel with respect to the toilets, showers and scuppers that are part of the sewerage system, as they are designed to promote break down of effluent naturally. It is the 4th Engineer/Duty Engineers responsibility to make sure that the plant is operating correctly in accordance with Manufacturers prescribed guidelines. Effluent should not exceed 250 faecal coliforms per 100ml MPN and geometric total solids of 50mg/litre. When chlorine is used as a disinfectant, there is no upper limit but the residual chlorine level should be maintained between 4ppm and 6 ppm. In waters not covered by the regulation the chlorine tablets are not necessary.

The Sewage Plant mode of operation should be recorded **in Form 3.2.7i - Sewage Management Record Book**. Entries are to be made for any stoppages of the plant, when changing the mode from Automatic mode to Manual mode and also when reinstating the plant in Automatic mode. If the plant is stopped within the 12Nm datum, the raw sewage should be diverted to the Sewage Holding Tank.

For plants approved by the administration, when the vessel is in port it is important to ensure that the residual chlorine level is maintained between 4-6 ppm. Both the residual chlorine level and sediment level should be logged.

Any operational discharges of sewage retained in the retention/holding tank must be done in accordance with MARPOL Annex IV, Chapter 3, Regulation 11. These discharges must be recorded in detail in **Form 3.2.7j - Sewage Holding Tank Discharge Log Sheet**. Company policy is that any waste water stored within the Sewage Holding Tanks shall be discharged beyond the furthest recommended guideline even if the plant on board is approved by the administration.

All Sewage system valves need to be identified and recorded on the Form 3.2.7h. The valves as listed below in the section **Monitoring of Fixtures and Fittings** connected to the Sewage Systems need to be sealed and tagged with a company security seal and these valves need to be recorded on **Form 3.2.7a – Details of Seals on lines, valves and manholes.**

As with the procedure for valves while operating the OWS, when the valve for the sewage transfer pump is open in order to discharge water from the retention tank, the reason for breaking the valve seal and opening it along with the fitting of the new seal after the operation needs to be recoded on **Form 3.2.7a – Details of Seals on lines, valves and manholes**.

2. SEWAGE AMD GREY WATER HOLDING TANK

Processed black water from a Sewerage plant (Approved by the Administration to meet the operational requirements referred to in regulation 9.1.1 of Annex IV) can either be directed to the holding tank or directly over board depending on operational area. Grey water and galley water can either be directed to the sewage retention tank or directly overboard. Any discharge overboard must be in compliance of MARPOL regulations and local requirements.

It should be noted that certain States may completely prohibit the discharge of any sewage (e.g. Black Sea), whether treated or not, into some or all of its waters, in sensitive areas or habitats of aquatic organisms, birds, and other animals. Ship staff should therefore confirm with the Navigation officer as to the location of the vessel and local legislation to be prior to any discharge.

Ship staff shall ensure that the sewage piping has:

a. not been altered from ships original drawings or as per Class Approved drawings that have been modified

b. not physically by-passed

c. not fitted with any connections to by-pass the unit

Discharge of sewage from the holding tank shall not to be done without prior permission of Chief Engineer taking the vessel position and speed into account.

3. WASTE DESCRIPTION

3.1. Sewage (Black Water)

a. Drainage and other waste from all toilets and urinals.

b. Drainage from medical premises such as dispensary, hospital emanating from wash basins bath tubs scuppers etc.

c. Drainage from any space containing animals.

d. Any other waste water that may be mixed with the above due to piping design.

3.2. Grey Water

a. Drainage from dishwasher, galley, shower, laundry, bath, wash basin drains and WC scuppers.

3.3. Bilge Water

NB: Bilge water is not part of the approved waste that is allowed to be accumulated in the sewage retention tank. Pumping of water from the bilge well or bilge holding tank is prohibited.

4. MONITORING OF FIXTURES AND FITTINGS CONNECTED TO THE SEWAGE SYSTEMS

The company has a Zero tolerance for non-compliance with MARPOL by all personnel. To prevent unwanted scrutiny during inspections all vessels are to implement the following:

All Systems listed below to be secured against tampering

a. All sewage overboard valve flanges to have one drilled bolt and sealed with a numbered company security seal (on the ship side flange). This includes the shore connections on the main deck.

b. The sewage discharge/transfer pump suction and discharge valve flanges to have one bolt drilled and sealed with a numbered company security seal.

c. The sewage pump discharge valve wheel to be secured with a security seal. Security seal to be secured in such a way as to prevent valve wheel from being removed.

d. Manholes on the sewage retention tank to be two bolts drilled and sealed with a numbered company security seal.

e. There will be no cross over connections to other engine room systems (like ballast systems interconnected to the bilge system).

f. Refer to the **SMS Technical Procedures Manual Chapter 21 Guidance for Oil Water Separator** Monitoring of fixtures and fittings Section 2 & 3 for guidance in securing the valves and manholes.

5. PLANT FAILURE

If the plant fails, there is a chance of raw sewage overflowing and ending up in the Bilge Holding Tank; this will affect the operation of the Oily Water Separator.

Raw sewage which is not comminuted or disinfected may not be discharged overboard unless the vessel is proceeding en-route at not less than 4 knots at a distance of more than 12 nautical miles from the nearest land (refer MARPOL, Annex IV, Reg. 1.5 for nearest land off north-eastern coast of Australia) and must adhere to the rules for maximum discharge rate of untreated sewage whilst at sea. This refers to the average rate calculated over any period. It may not be exceeded by more than 20% when measured on an hourly basis. The pump discharge rate of sewage retained in the retention tank is dependent on the vessels speed and draft.

Plant failure must be reported to the vessels Manager if it cannot be repaired within a 24-hour period.

6. MAXIMUM DISCARGE RATE OF UNTREATED SEWAGE IN ACCORDANCE WITH RESOLUTION MEPC.157(55)

A ship specific table should be generated and sent to Class for approval for and on behalf of the Administration. The permissible rate of discharge is reduced at draft and/or speed.
The approval procedure is as follows:

Prepare the discharge rate table in accordance with MEPC.157(55)

Calculate the maximum permissible discharge rate using the following formula:

a. DRmax = 0.00926VDB

   where:
   DRmax is maximum permissible discharge rate(m3/h)
   V is ship's average speed (knots) over the period
   D is Draft (m) up to and including the summer draft
   B is Breadth (m)

b. Make a table using the results of the calculations:

   - Average speed is to be recorded in 2 knot increments from 4 knots up to the maximum service speed.
   - Draft is to be recorded in 1m increments from the minimum operating draft up to the maximum summer draft.
   - The calculated discharge rate refers to the average rate as calculated over any 24hour period, or the period of discharge whichever is lower, and is not to be exceeded by more than 20% when measured on an hourly basis.

c. Two sample discharge rate tables are attached herewith
   See the table below as an example:

   SHIP NAME: XXXXXXXXXXXX
   IMO No. XXXXXXX
   Breadth: 25.00 m
   Min. draft: 5.00 m
   Max. Summer draft: 9.00 m
   Max. Service speed: 12.0 kts
   Theoretical max. rate: 25.00 m3/h

DISCHARGE RATE (m^3/h)					
V (kt) / D(m)	**4**	**6**	**8**	**10**	**12**
5	4.63	6.95	9.26	11.58	13.89
6	5.56	8.33	11.1	13.89	16.67
7	6.48	9.72	12.96	16.21	19.45
8	7.41	11.11	14.82	18.52	22.22
9	8.33	12.50	16.67	20.84	25.00

Where a ship is to discharge sewage from a holding tank using a pump calibrated at a fixed rate, the pump can either be:

- calibrated at the rate permitted at 4 knots; or
- calibrated for a specific minimum ship's speed in excess of 4 knots.

Where the intended actual discharge rate exceeds that permissible at 4 knots, the actual discharge rate may need to be reduced or the speed increased. The rate and speed is to be detailed in the approval issued by the Administration. For instance, if the pump is rated at 8m3/hr the below table may be generated for submittal to Class.

DISCHARGE RATE (m^3/h)					
V (kt) / D(m)	**4**	**6**	**8**	**10**	**12**
5	4.63	6.95	9.26	11.58	13.89
6	5.56	8.33	11.11	13.89	16.67
7	6.48	9.72	12.96	16.21	19.45
8	7.41	11.11	14.82	18.52	22.22
9	8.33	12.50	16.67	20.84	25.00

Discharge Not Permitted

6.1. Regulation 3 – Exceptions

MARPOL Annex IV "Regulation 11 this annex and section 4.2 of chapter 4 of part II-A of the Polar Code of shall not apply to:

a. the discharge of sewage from a ship necessary for the purpose of securing the safety of a ship and those on board or saving life at sea; or

b. the discharge of sewage resulting from damage to a ship or its equipment if all reasonable precautions have been taken before and after the occurrence of the damage, for the purpose of preventing or minimizing the discharge

7. MAINTENANCE OF SEWAGE SYSTEM

The Onboard sewage treatment plant principle operation relies on an aerobic process using bacteria which requires oxygen to break down the waste. Air from a compressor is circulated into the wastewater where the aerobic bacteria feed on waste in the water and reproduce. In order to reproduce, the bacteria requires sufficient biomass to regenerate and the solid wastes that the bacteria cannot process settle out as sludge. In order to remove the sludge, the plant requires maintenance. At 6 Monthly intervals the plant needs to be emptied flushed and cleaned as specified in Mespas[1].

When planning the cleaning of the plant, it is important that the vessel is on a long voyage, not less than 2 weeks, in open sea and more than 12 NM from the coast. It should not be done in port or anchorage.[2]

After cleaning and maintenance, sufficient time has to be allowed for the bacteria regeneration and for the treatment plant to be back up to design capacity. A minimum of 2 weeks is required for the Biomass(waste) to build up and the aerobic bacteria to regenerate. The aerobic bacteria reduce the waste which is made up of Carbon, Oxygen, Hydrogen Nitrogen and Sulphur into Carbon Dioxide, water and new bacteria cells. Chemical Dosing (Bioguard/Biopowder) is only recommended when the plant is at normal operational capacity not during the first two weeks after cleaning[3]. Always check the makers manual for further guidance on the subject.

Until the bacteria in the plant has regenerated (2-week interval), the sewage shall be considered as untreated sewage and shall not be transferred to any tank which is designated to store the treated sewage. The untreated sewage shall be discharged overboard when the vessel is proceeding en-route at not less than 4 knots and is more than 12 nautical miles from the nearest land and the discharge rate is moderate and consistent with the recommended discharge rate as contained in resolution MEPC.157(55). Refer to section 6 for the maximum discharge rate of untreated sewage.[4]

Form 3.2.7 j Sewage Holding Tank Discharge Log Sheet shall be completed and filed in Sharepoint[5].

One of the key factors that affect the efficient operations of the sewage plant is the use of non approved chemicals in the lavatories that makes it's way to the sewage treatment plant. These

[1] W 03 / 2024
[2] W 37 / 2020
[3] W 37 / 2020
[4] W 37 / 2020
[5] W 37 / 2020

household detergents and chemicals destroy the bacteria that is present in the 2nd stage of the treatment plant, the section that has the microbio life form that breaks down the raw sewage.[6]

IMO has approved a few detergents that are bio degradable and user friendly in the plant. We have opted to use the 2 following detergents.[7]

- Gamazyme BTC from WSS
- Bioactive Toilet Cleaner from Marichem
- Gamazyne 700 FN to be in stock, for dosing the sewage plant whenever the plant is shut down, emptied for cleaning. Use all chemicals as per instruction

Vessel should not use Toilet Duck, or Bleach products. If in doubt, check with the Ship Manager[8] for further advise. Masters and Chief Officer are to monitor the cleaning of toilets and explain to crew the importance of using the correct products.[9]

[6] W 52 / 2021
[7] W 52 / 2021
[8] W 09 / 2024
[9] W 52 / 2021