INTERNATIONAL MARITIME ORGANIZATION

E

MARINE ENVIRONMENT PROTECTION COMMITTEE
71st session
Agenda item 14

MEPC 71/INF.22
28 April 2017
ENGLISH ONLY

WORK PROGRAMME OF THE COMMITTEE AND SUBSIDIARY BODIES

Updated information and analysis based on tests on the effluent of sewage treatment plants

Submitted by the Netherlands

SUMMARY

Executive summary:	This document provides updated information on the malfunctioning of type approved sewage treatment plants installed on board ships, and provides observations on possible causes of malfunctioning
Strategic direction:	7.1
High-level action:	7.1.2
Output:	No related provisions
Action to be taken:	Paragraph 19
Related documents:	MEPC 71/14/2; MEPC 67/8/1; resolutions MEPC.2(VI), MEPC.159(55) and MEPC.227(64)

Introduction

1 This document provides additional information relevant to the consideration by the Committee of the new output proposed by Norway in document MEPC 71/14/2.

2 In document MEPC 71/14/2, Norway proposes a new output on the biennial agenda of the PPR Sub-Committee in order to revise the *Guidelines on implementation of effluent standards and performance tests for sewage treatment plants*.

3 In document MEPC 67/8/1, the Netherlands presented the results of 32 samples that had been taken from the effluent of sewage treatment plants on board ships. It was noted that a vast majority of the sewage treatment plants did not meet the sewage treatment standards as per resolutions MEPC.2(VI) or MEPC.159(55).

4 This document includes the results of more recent samples, which have been taken until January 2017, and discusses the reasons for not meeting the sewage treatment standards, which may be of added value in relation to document MEPC 71/14/2.

The results of the tests on effluent of sewage treatment plants

5 Until January 2017, a total of 127 effluents were investigated by Hatenboer-Water BV and the results were shared with the Netherlands' authorities (see the annex of this document). The average results showed that the majority of the ships are discharging virtually untreated raw sewage from the type approved sewage treatment plants.

6 A total of 4 samples out of 127 samples did meet all the discharge standards; i.e. 97% of the sewage treatment plants did not meet all the discharge standards.

7 For thermotolerant coliforms, the geometric mean of the thermotolerant coliform count of the samples of effluent taken should not exceed 250 thermotolerant coliforms/100 ml according to resolution MEPC.2(VI). According to resolution MEPC.159(55) this ratio is 100/100 ml. Only 17 out of 127 samples comply with the "test" regulations maximum of 250 cfu/100 ml. That means that only 13% of the samples are in compliance with MARPOL Annex IV. The other samples exceed the level of bacteria with high concentrations of thermotolerant coliforms/100 ml and did not come close to the standards. From this it may be concluded that most installations are not meeting the treatment standards.

8 For suspended solids, according to resolution MEPC.2(VI), the geometric mean of the total suspended solids content of the samples of effluent shall not exceed 50 mg/l (in resolution MEPC.159(55) this is 35 mg/l). 17 out of 127 samples show concentrations of suspended solids within the limits of the respective resolution. That means that only 16% of the samples meet the treatment standards.

9 For Biological Oxygen Demand (BOD), according to resolution MEPC.2(VI), the geometric mean of 5-day BOD for the samples of effluent shall not exceed 50 mg/l (in resolution MEPC.159(55) this is 25 mg/l). 34 out of 127 samples show concentrations of BOD below 50 mg/l. That means only 27% meet the treatment standards.

10 For Chemical Oxygen Demand (COD), according to MEPC.2(VI), the geometric mean of Chemical Oxygen Demand of the samples of effluent shall not exceed 125 mg/ltr. 11 out of 111 samples have a COD concentration within the limits. That means that only 10% meet the treatment standards.

11 For pH (acidity), the pH of the samples of effluent shall be in the range of 6 to 8.5. 97 out of 115 meet the standards. That means that 84% of the samples meet the treatment standards.

12 For Chlorine residue, resolution MEPC.227(64) states that the disinfectant residual should be below 0.5 mg/l. 4 out of 92 samples contain free residual chlorine of over 0.5 mg/l. The analysis was carried out in the laboratory and therefore the disinfectant residual will be lower than that measured on-site. There is a lack of clarification within the MEPC resolution regarding the analysis methods for disinfectant residual, and whether free or total residual chlorine should be measured.

Causes of malfunctioning

13 The lack of on-board testing of sewage treatment plants could be a first cause of malfunctioning. Existing sewage treatment plants should comply with the relevant IMO

standards as per resolutions MEPC.159(55) and MEPC.227(64). Paragraph 3 of resolution MEPC.227(64) states:

> "It is acknowledged that the performance of sewage treatment plants may vary considerably when the system is tested ashore under simulated shipboard conditions or onboard a ship under actual operating conditions. Where testing ashore demonstrates that a system complies with the standards, but subsequent onboard testing does not meet the standards, the Administration should determine the reason and take it into account when deciding whether to type approve the plant."

Unfortunately, it is not required to have a sampling point and equipment testing on-board and there is no on-board verification of the dilution compensation factor. Therefore, Administrations have no information on on-board compliance of the sewage treatment plant. As the quality of the effluent is not monitored, this will not inform the ship crew on the proper functioning of the sewage treatment plant.

14 Furthermore, as set out by Norway in document MEPC 71/14/2, concerns were also raised regarding a lack of level playing field in absence of performance verifications under MARPOL Annex IV. This is a concern since there are no restrictions on the discharges from approved sewage treatment plants. This could have an impact on the environmental objectives of MARPOL Annex IV, and leads to a situation of an unleveled playing field among the manufacturers of sewage treatment plants.

15 The human factor could be a further cause of malfunctioning. Sewage treatment plants require manual operations every two or three days, like back flushing of the sludge. Also once a year the systems need to be cleaned internally which in general is not a nice job to do. These regular manual services are not always performed and as a result the system does not working properly. At the end of the biological sewage treatment process, chlorine has to be added in order to kill the bacteria. This is also a manual process and not always performed. Moreover, chlorine has a restricted storage life and the crew is not always aware of the limited durability. Furthermore, toilets onboard are often cleaned using chlorine. However, chlorine kills the bacteria in the sewage treatment system and as a result the system does not work properly.

16 The sewage treatment plant is often equipped with aeration systems. But sometimes the system is not in operation and/or dirty. Without a proper working aeration system the sewage treatment plant does not functioning well. After start-up it may take 10 days before the bacteria grows are sufficient for proper working. Yet, the system is often switched on just before entering the 12 miles zone.

17 Recertification by class societies, without any effluent tests, could be a further cause of malfunctioning. Sewage treatment plants are approved according to the IMO resolutions. The approval is monitored by the notified bodies like for example classification societies. According to MARPOL Annex IV and contrary to other MARPOL certificates, annual inspections are not required. For sewage treatment plants, only once in five years a survey will be carried out by the class society. And even then, no effluent tests are requested in order to check proper functioning.

18 A last cause of malfunctioning could be that enforcement is limited in practice. Enforcement is performed by flag States and port States. Flag States in general have their duties delegated to class societies. As mentioned before, only once in five years they renew the MARPOL Annex IV certificate without taking samples of the systems effluent. The port State control officer is entitled to check if there is a valid certificate on board and if the crew is familiar with the procedures. However, as there is no monitoring on the sewage treatment plants, the port State control officer is not required to check the good functioning of the equipment. Samples of the effluent are not taken by the officer as there is no guideline to do so. In contrary to other MARPOL Annexes there are no guidelines for port State control under

MARPOL Annex IV. In short, there is no adequate enforcement on proper working and maintenance of the sewage treatment plants.

Action requested of the Committee

19 The Committee is invited to note the information in this document in its consideration of the proposal of Norway in document MEPC 71/14/2 for a new output to revise the *Guidelines on implementation of effluent standards and performance tests for sewage treatment plants*.

***

ANNEX

RESULTS OF INDIVIDUAL SAMPLES

2012

	Number of crew / passengers	Fresh Water/ seawater	Chemical / biological	Type plant	design capacity m3/day	type of desinfection	production date	free chlorine mg/l	pH	suspended Solids mg/l	Biological Oxygen Demand mg/l O2	Chemical Oxygen Demand mg/l O2	thermotolerant bacteria / ml	nitrite mg/l NO2
Offshore support Vessels														
1	40	fresh	biological	EVAC STP 40C 1122	400	chlorine	2009	< 0,03	7,17	1100	< 3	925	900.000	
2	24	fresh	biological	JETS vacuum AS 30 MB-D	13,9	chlorine	2009	0,1	8,08	190	170	675	77.000	
3	13	fresh	biological	Biocompact KSA-S-15 +30 MB-D	3,75	chlorine	2007	< 0,05	8,63	940	2800	4970	90	
4	48	fresh	biological	hamsworthy ST3A super trident	4,66	chlorine	2001	< 0,05	8,31	180	580	610	10	
5						chlorine		0,3	7,19	210	4	860	300	< 0,01
General Cargo vessels														
6								< 0,05	7,73	52	230	430	44	
7	25	fresh	biological	Aquamar MSP 25				<0,05	6,52	240	470	515	3.300	
8	23	fresh	biological	Hamworthy ST2A super trident	3,12	chlorine		< 0,05	7,12	110	390	860	34.000	
9	13	fresh	biological	Triton format GmbH	1,26	chlorine	2004	< 0,05	8,95	440	920	1290	31.000.000	
10	16	fresh	Chemical	Format chemie / mstd1	10,5	chlorine		< 0,05	7,49	240	260	725	24.000.000	
11	11	both	biological	KP ocean clean 15	2,77	chlorine / C granulat	2004	< 0,05	8,86	100	280	515	231.000.000	0,049
12	25	fresh	biological	SBT 25	1,5	chlorine	2006	0,08	7,74	110	89	315	250.000	1.581
Tankers														
13	25	fresh	biological	BIO ECO 450 DOS 985 LI	x	x	1994	< 0,05	7,92	43	270	535	5.600	
14	27	fresh	biological	Facet iberica RF750M	3	chlorine	1996	< 0,05	5,12	100	400	460	680.000	
15	22	fresh	biological	ISS-25 /IL seung Co, ltd	1,5	chlorine	2007	0,09	8,63	75	640	215	585.000	
16	30	fresh	biological	Facet iberica RF750M	2/hr	chlorine	1995	< 0,05	7,32	300	950	1.000	3.950.000	
17	31	fresh	biological	hamworthy ST3A super trident	4,66	gamazyne DPC, guardex advantage tablets		< 0,05	8,8	130	140	295	7.880.000	< 0,01
18	25	sea	MBR	wcmbr membrane sewage	30 persons	ozone	2010	< 0,05	7,32	44	16	127	270.000	466
19	23	sea	biological	biomaster DV2-SKA-20	3,7	chlorine	2004	x	8,52	< 2	1.800	3.350	32.900.000	0,09
20	19	fresh	biological	hamsworthy ST3A Super trident	9,22	chlorine	1989	< 0,05	7,09	110	400	495	143.000.000	< 0,01
21	24	fresh	biological	SBT 25	1,5	chlorine	2003	0,06	8,59	160	200	1.990	600.000	< 0,01
22	14	fresh	biological	MSD-11/20 CSTM-VAC	4	chlorine	2006	< 0,05	8,28	1.800	260	590	30.000	0,016
Ferries														
23	36	fresh	Biological	DVZ SKA 30 Biomaster	5,5	chlorine	23-3-2009	< 0,05	6,62	220	600	415	6.900.000	
24	90/1200	fresh	biological	evac / msp VIII	2 x 105	chlorine	2008	< 0,05	7,06	310	470	700	100.000	
Container vessels														
25	14	fresh	biological	KSA-S15	3,75	UV & chlorine	2005	0,06	8	370	160	510	279	
26	25	fresh	biologcal	Hamworthy ST4A super trident	6	chlorine		< 0,05	7,47	1.200	420	650	71.000.000	
27								0,08	8,26	150	76	360	9.900	
28	11	fresh	biological	RWO wwt type 3	4,63	chlorine	2006	< 0,05	7,1	2.200	560	3.060	96.000	
29	23	fresh	biological	taiko kikai submerged bio filter treatment	4/uur	chlorine		< 0,05	7,14	13	16	75	5.000	
30	23	fresh	biological	Evac 40C	4,38	chlorine	2007	0,06	7,39	73	50	210	970.000	< 0,01
31	28	fresh	biological	SBT-40	2,4	chlorine tablets	2008	< 0,05	7,59	44	18	140	3.300	77
32	14	fresh	biological	Hamworthy ST2A Supertrident	3,12	chlorine	2009	0,06	6,86	74	150	385	14.000.000	0,01

2013-2014

Date	Type vessel	Coliform 44 CFU/100 ml	Suspended solids mg/l	Biochemical oxygen demand mg/l	Chemical oxygen demand mg/l	pH value	Free chlorine mg/l
2-11-2014	suction dredger	32.000.000	670	470	1950	9,52	< 0,10
4-7-2014	Yacht	10	15	< 3	6	7,28	< 0,05
15-4-2014	Yacht	14000	22	230	915	5,33	< 0,05
22-7-2014	Tanker	9200	770	570	2020	7,53	< 0,05
20-8-2014	pipe laying vessel	2.500.000	160	520	1480	8,97	*
		170000	120	390	1210	9,10	*
26-8-2014	bulk carrier	390000	910	250	715	7,43	0,27
15-8-2014	crane vessel	< 1	< 2	< 3	115	7,12	< 0,05
22-10-2014	Diving support	5100000	760	420	1050	7,30	< 0,05
13-10-2014	trenching support vessel	18.000.000	210	620	1030	8,71	< 0,05
15-11-2014	oil tanker	13.000.000	720	810	1760	8,57	*
11-5-2014	General cargo	4500	200	160	525	8,41	< 0,05
29-1-2013	General cargo	1.900.000	210	420	1260	7,66	0,08
30-1-2013	Crane vessel	60.000.000	220	420	775	6,85	0,25
30-1-2013	deepwater construction vessel	27.000.000	350	380	1040	8,6	0,07
		7.700.000.000	240	1300	1300	5,55	0,64
		< 1	68	340	175	8,10	< 0,05
		30.000.000	72	*	215	7,38	< 0,05
13-3-2013	jack-up barge	1.600.000.000	160	480	755	6,69	< 0,05
27-4-2013	general cargo	2.200.000.000	120	410	730	7,18	< 0,05
26-4-2013	jack-up barge	130.000.000	100	220	435	6,24	0,88
5-8-2013	trenching support vessel	4.700.000	66	650	1340	7,54	< 0,05
14-6-2013	jack-up barge	1.500.000	120	64	290	7,27	< 0,05
25-7-2013	pipe laying vessel	1	2	3	38	7,27	< 0,05
31-7-2013	General cargo	66.000.000	120	620	740	6,79	0,08
16-9-2013	Diving support	8.300.000	78	510	1480	7,54	0,06
17-9-2013	pipe laying vessel	8.800.000	75	150	415	7,99	< 0,05

2015

Date	Type vessel	Coliform 44 CFU/100 ml	Suspended solids mg/l	Biochemical oxygen demand mg/l	Chemical oxygen demand mg/l	pH value	Free chlorine mg/l
15-1-2015	hopper dredger	2.600.000	460	130	760	8,19	0,91
13-2-2015	Suction dredger	1.500.000.000	320	460	1040	7,62	< 0,05
19-3-2015	bulk carrier	1.000.000	300	750	755	6,99	0,32
29-3-2015	LPG tanker	1.600.000	48	96	570	9,55	0,08
15-5-2015	Survey vessel	2.400.000	120	290	565	7,18	< 0,05
3-6-2015	Suction dredger	96.000	250	120	385		0,08
14-6-2015	Ocean drilling research vessel	200	139,5			6,7	0,08
15-6-2015	dredger	19.000.000	100	180	430	6,39	0,09
15-6-2015	supply vessel	1.200.000	600	630	1850	7,18	0,23
22-6-2015	suction dredger	34.000.000	420	660	1510	6,63	0,07
4-7-2015	LPG tanker	130.000	360	140	620	8,51	0,32
21-7-2015	LPG tanker	2.400	70	87	285	7,93	0,09
3-8-2015	trenching support vessel	2.600.000	180	960	1730	8,14	
15-8-2015	general cargo	1.200.000	790	300	1.700	8,69	
23-8-2015	container	4.400.000	900	140	485	8,35	
3-9-2015	Hopper barge	6.200	310	650	1450	7,64	0,16
5-10-2015	chemical tanker	< 1,3	12	17			
8-10-2015	crane ship	< 10	110	46			
22-10-2015	Cargo	200.000	73	67	65	8,04	< 0,10
26-10-2015	Suction dredger	780.000	130	280	330	7,75	< 0,05
4-11-2015	Pipe layer	60.000	3000	3000	9110	7,38	< 0,05
9-11-2015	suction dredger	740.000	41	24			
12-11-2015	Cargo	500	4200	1300	4690		
16-11-2015	container	26.000	270	230	177	7,08	< 0,10
18-11-2015	trenching support vessel	8.400.000	400	490	1990	7,5	< 0,05
26-11-2015	LPG tanker	10.000	66	180	355	7,51	< 0,05
9-12-2015	Hopper barge	4.100.000	420	740	2010	7,17	0.42
9-12-2015	hopper barge	< 1000	170	29	745	4,31	0,06
10-12-2015	chemical tanker	170.000	83	42			
15-12-2015	hopper barge	820.000	230	920	940	7,58	0,26
15-12-2015	hopper barge	1.900	240	170	665	9,58	< 0,05

2016

Date	Type vessel	Coliform 44 CFU/100 ml	Suspended solids mg/l	Biochemical oxygen demand mg/l	Chemical oxygen demand mg/l	pH value	Free chlorine mg/l	disolved oxygen
23-1-2016	LPG tanker	< 1	42	110	390	7,71	0,24	
8-2-2016	Container	6.500	170	130	315	7,63	0,05	
10-2-2016	chemical tanker	5.500.000	99	440	440	9,46	< 0.05	
10-2-2016	LPG tanker	2.100.000	120	160	490	8,25	*	
15-3-2016	Pipe laye	280.000	360	87	320	6,29	0,33	
15-3-2016	pipelaye	8	260	73	198	5,94	0,12	
15-3-2016	Pipe laye	1.100	79	51	220	7,86	0,09	
25-3-2016	Crane vessel	< 1	< 2	< 3	63	5,18	< 0.05	
10-4-2016	Chemical tanker	2.300.000	160	170	520	8,14	< 0.05	
5-4-2016	Research vessel	39.000	160	37	1320	7,43	< 0.05	
4-5-2016	Pipe laye	200	2,2	< 3	35	5,35	< 0.05	
2-6-2016	chemical tanker	8.500.000	140	140	410	7,01	< 0.05	
15-7-2016	hopper barge	3.300.000	330	770	1.700	8,14	0,09	
8-7-2016	Pilot ship	2.100.000	3.800	1.400	6.100			
28-7-2016	Pilot ship	80.000	410	260	1.200			
26-7-2016	Pilot ship	8.000.000	150	300	630			
1-9-2016	pipelaye	160.000	310	150	710		0,24	
1-9-2016	pipelaye	140.000	410	500	750		0,34	
29-7-2016	hopper barge	10.000.000	350	710	1.400	7,66	0,06	
13-9-2016	general cargo	1.400.000	180	28	1.900	7,68	0,15	
27-9-2016	pipelaye	6.400	5,3	< 3	54	7,41	0	
6-10-2016	Research vessel	> 1,600	68	205			0,08	
19-10-2016	deepwater construction	25.000	120	20		6,54		3,9
19-10-2016	deepwater construction	34.000	82	9,2		6,64		3,2
19-10-2016	deepwater construction	28.000	98	23		6,81		2,3
19-10-2016	deepwater construction	3.400	63	18		6,96		< 0.5
19-10-2016	deepwater construction	56.000	160	25		7,58		< 0.5
26-10-2016	LPG tanker	75.000	47	5,2	89	8,16	0,03	
15-11-2016	Bulk carrier	< 1	96	< 3	280	7,79	5,2	
22-11-2016	Research vessel	< 1	4,9	330	360	7,52	0,02	
24-11-2016	deepwater construction	4.200	180	32		6,87		4,1
24-11-2016	deepwater construction	16.000	390	46		6,48		3,9
24-11-2016	deepwater construction	14.000	180	36		6,19		5,6
24-11-2016	deepwater construction	290.000	150	31		7,45		4
24-11-2016	deepwater construction	32.000	270	36		5,95		5,8
6-12-2016	Crane vessel	< 1	< 2	< 3	24	6,95	0,03	
13-12-2016	general cargo	7.300	22	< 3	5,2	7,97		