OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, and

Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area

Meeting of the Joint HELCOM/OSPAR Task Group on Ballast Water Management Convention (BWMC) and Biofouling (TG BALLAST 11-2020)

Online: 26-27 November 2020

Sampling and analysis of treated BW pilot exercise in Algeciras

Presented by Spain

Issue: This document presents the methodology of sampling and analysis of a treated BW pilot exercise to be held in Algeciras (Spain).

Action requested

1. JTG-Ballast is invited to;

    a. Take note of this initiative and reflect on the methodology drafted for the pilot exercise.

Background

2. Ballast Water Management Convention in Article 6 'Scientific and Technical Research and Monitoring' calls Parties to endeavour jointly both research on BWM and monitor the effects of BWM in waters under their jurisdiction. These include evaluation and analysis of the **effectiveness** and adverse impacts of any **technology or methodology** as well as any adverse impacts caused by such organisms and pathogens that have been identified as to have been transferred through ships ballast waters.

Pilot exercise to conduct sampling and analysis of treated ballast waters was organized under the leadership of Spanish representative before the HELCOM/OSPAR TG BALLAST in collaboration with the **Finnish Environment Institute** member of the said group also. The exercise was conceived as a public-private partnership as **Harbour Master** together with **Port Authority** in the Port of Algeciras assumed their own tasks under respective public responsibilities whereas private laboratories **LUMINULTRA** and **B-QUIMICA** accepted to perform preliminary and detailed analysis respectively. In addition, the Finnish Environment Institute was engaged to conduct the taking of samples based on previously experience as noted in the previous HELCOM/OSPAR TG BALLAST 10-2019 held in Tallinn. Finally, specialized international companies on ballast water treatment systems and certification **Alfa Laval Iberia S.A.** and **SGS** respectively were invited to participate without no specific commitments.

The pilot exercise was due to hold in March in the Port of Algeciras for three days including first for internal training and planning, and the following two days to board container ships equipped with ballast water system, take the samples, and do the preliminary and detailed analysis

An explanatory letter was drafted to be sent in advance to container terminal operators to alert ship agents and respective Captains, mainly to get necessary information on sampling BW port characteristic on board and to inform on the aim of the exercise.

Due to COVID19 pandemic, the exercise was postponed twice then suspended until it is given the go-ahead signal 'on spot' when the pandemic opens a window where it can be carried out safely, because participants are ready and all the equipment is available too.

The attached document describes the methodology decided to follow during the exercise, which on request was shared with Greek Maritime Administration for the same purpose. The methodology is considered a draft until the exercise is realized, and conclusion and recommendation incorporate.

Ballast water sampling exercise

Content

Context for the exercise

The context for the exercise is the Resolution MEPC.252(67) adopted on 17 October 2014 Guidelines for port state control under the BWM Convention.[1]

2.2.2 Performance of a ballast water management systems (BWMS) is key to protecting the environment, human health, property, and natural resources of the port State. While this performance may be verified directly by sampling the ship's ballast water (as per article 9.1(c) and Guidelines for ballast water sampling - G2), both the port State and the ship may benefit from a document check to more readily establish the validity of the BWMS during the initial inspection. To this end, the PSCO may ask to check the Type Approval Certificate for the BWMS, to determine whether the BWMS is used in accordance with any limiting conditions on the Type Approval Certificate. While carriage and presentation of the Type Approval Certificate is not mandatory, the PSCO may also consult the BWMP to obtain ship-specific information on the BWMS and its use, and may refer to type-approval information shared with the Organization pursuant to the Information reporting on type approved ballast water management systems (Resolution MEPC.228(65)).

2.4.1 PSCO should carry out an indicative analysis first. However, the time required to conduct the indicative analysis should not unduly delay the operations, movement, or departure of the ship. If the result of indicative analysis for the D-2 standard exceeds the D-2 standard by a threshold specific to the validated indicative analysis method being used as set out in the Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention and Guidelines (G2) (BWM.2/Circ.42)1, a detailed analysis can be carried out.

[1] http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Marine-Environment-Protection-Committee-(MEPC)/Documents/MEPC.252(67).pdf

Detailed description of procedure for the exercise

Aim

Assess coordination between parties involved in PSC action to validate proper functioning of BWS including Captain and crew members, Harbor Master, Port Authority, and labs.

Legal basis

BWMC art 9.1(c) reads,

> (…) a sampling of the ship's Ballast Water carried out in accordance with the guidelines to be developed by the Organization. However, the time required to analyze the samples shall not be used as a basis for unduly delaying the operation, movement, or departure of the ship.

Duration

Duration of the exercise is set for three consecutive days.

Exercise was first planned for 23-25 March and postponed to 23-25 September and to 23-25 November, in 2020. Ministry of Transport limited on-board inspections on 19 March due to outbreak of COVID-19 according to specific regulation.[2]

Main parameters of exercise

1. Exercise will follow EMSA protocol[3] and IMO Guidelines[4]; EPA manual will be taken into consideration also
2. Three container vessels are targeted for sampling, preferably from two different container terminals
3. Samples will be taken from the discharge line and based on an 'open loop' approach.
4. Two random in sequence samples will be taken from each ship ballast discharge

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2 Orden TMA/258/2020, de 19 de marzo, por la que se dictan disposiciones respecto de los títulos administrativos y las actividades inspectoras de la administración marítima, al amparo del Real Decreto 463/2020, de 14 de marzo, por el que se declara el estado de alarma para la gestión de la situación de crisis sanitaria ocasionada por el COVID-19. BOE 19/03/2020

3 EMSA - BWM - Guidance for best practices on sampling

4 IMO Guidance on ballast water sampling and analysis for trial use in accordance with the BWM Convention (G2) (BWM.2/Circ.42) https://www.mardep.gov.hk/en/msnote/pdf/msin1538anx1.pdf ; and Guidance for the commissioning testing of ballast water management systems – BWM 2/Circ 70 – 1 Nov 2018

5. Each sample will be analyzed both indicatively and in detail

6. Indicative and detailed analyses will cover both >10 & 50 um and < 50 um formed colonies, and coli's, enterococci and vibrio cholera bacteria

Main responsibilities of participants

Port Authority

Port Authority will,

- one week prior to date of holding the exercise, address both terminal operators to inform time of ship boarding by the team (see draft letter attached) and ship agent to inform of exercise aim,

- bring either 5 water containers of 80 liters or 1 container of 360 liters type X with two wheels

- dump the sampled water into the port water body near the berth where ship is moored

- make a person available to take photos/videos as requested by participants

- provide the team with a first aid kit

- make a vehicle available to facilitate transportation of the team all together

Port State Control Office with the technical assistance of Finnish Environment Institute

PSC Harbor Master and Inspector will,

- carry out an initial inspection as recommended by IMO[5]

- lead the boarding of ships by the team, introduce team to respective ships captains and brief on exercise to involved crew members (see attachment list of items to cover in the briefing)

- Finnish Environment Institute -Okko OUTINEN- with the assistance of PSC Inspector will

1) receive recipients from Lab for indicative analysis and jars and bottle from Lab for detailed analysis

5 Inspector to inform Captain that based on IMO recommendations "it is committed to refrain from taking further action like stopping of fining the vessel within this [trial period] exercise".

2) connect on board sampling point at isokinetic sampling conduit with sampling pipe/hose with calibrated flow meter (Gardena Water Smart type or similar) and actually do the sampling of ballast water by -basically- doing the following,

3) ask Inspector to request crew members to open valve

4) secure all ballast water flow is collected in the containers

5) ask Inspector to request crew members to adjust valve so that flow velocity not exceeds 50 liters/min at any time during the sampling

6) filter ballast water flow with the cod-end plankton net sized < 50 μm and use the concentrate to fill the Lab I recipients for the bigger organism standard

7) take 5 liters drum from Lab D for the smaller organism standard analysis, and proceed filling it by a "continuous drip" (i.e., collecting approximately 0,5 liters of sampled water every minute during the entire sampling time duration)[6]; the resulting 5 liters of sample water should be mixed

8) extract a sub-sampled to create two sets of samples of 100 ml, one alive and another preserved; hand 100 cc jars over Lab D

9) (at the end of the filtering process) rinse down the net with the filtered water to the cod-end at the bottom end of the plankton net, which should be unscrewed from the net and covered with a lid and stored in the 10 liters bucket filled with -at least- 5 liters of water

10) for the bacterial standard: a sample of approximately 1 liter should be taken as a sub-sample from the 5 liter "continuous drip" collected in the drum after it has been mixed; hand 1liter bottle over Lab D

11) ask Inspector to request crew members to close valve when a minimum of 300 liters were collected in the 360 liters container (approximative duration 10 minutes)

- repeat last four operations to collect a second sample[7]

6 Or collecting about 0.5 liters of sample water every 30 to 45 liters sampled (depending on the flow rate)

7 It is not recommended to take a sample at the very beginning (i.e., the first 5 min) or at the very end of the discharge (i.e., the last 5 min), as an underestimation as well as an overestimation of organism concentrations may be expected.

Lab Indicative Analysis

Lab in charge of the indicative analysis will do the following,

- receive the sampling recipients from Okko and proceed doing the preliminary analysis either on the sampling room on board or at the quay side close to the team vehicle
- measure de cATP following precise protocol (see attachment)
- make calculations, communicate and explain results

Lab Detailed Analysis

Laboratory in charge of the detailed analysis will do the following,

- provide buckets, jars and sterile bottles (containing thiosulfate to neutralize chlorine) and keep proper labels
- receive the concentrate 10 liters buckets, 4 jars and 1 bottle, and write identification of sampling in the labels and transport to lab
- do the fluorescein diacetate (FDA) staining or epifluorescent microscopy method for counting colonies
- do the culture and identification of bacteria following ISO norms
- report back on results

Spanish National Ports Agency - OPPE

- planning and brief participants prior to action

- fill in checking list (see attachment)

- reporting actual exercise

- disseminate results/conclusions and suggest further actions as to improve coordination while taking samples and analysis to eventually confirm proper BWS functioning

Tools/equipment

Vehicle/van (num of seats and characteristics to be defined)

Containers to collect sieved water, either 5 containers of 80 l or two wheeled container (amarillos, grises de tapa naranja y grises de tapa marrón)[8] with characteristics similar to 360 l: 1.110 cm height, 660 width and 875 cm depth, and 21 kg weight.

Drum 5 liters capacity (only one as it is re-usable for both samples and each ship sampled)

Piping to direct water from the sampling point to the plankton net or sieve, fitted with couplings and Garden flow meter and tap

Plankton net 50-micron or sieve with a cod end to concentrate the sample (with replacement material of identical mesh size)

Funnel to ease filling of sample container

Bucket 10 liters capacity: 6 units (2 samples per ship)

Jars of 100 ml for smaller organisms: 24 jars (2 x 2 x 2 x 3 ships =24 jars)

Bottles 1 liter sterilized for microbial analysis with tape to seal the sample bottle lid to the bottle and labels: 6 bottles

Preliminary analysis kit with recipients and filters

All necessary forms including sample data reporting/chain of custody forms

First aid kit

Form to provide evidence of custody chain

Thiosulfate for preserving samples

8 https://www.madrid.es/portales/munimadrid/es/Inicio/El-Ayuntamiento/San-Blas-Canillejas/Listado-de-Tipos/Contenedores-y-cubos-Dimensiones?vgnextfmt=default&vgnextoid=7aa1b3dac3c8b010VgnVCM1000000b205a0aRCRD&vgnextchannel=04745e933ecd9010VgnVCM100000d90ca8c0RCRD

Survey on sampling port configuration of ship

Port: Algeciras

Dates: 23rd – 25th September 2020

To whom it may concern,

At Port and dates indicated above, Spanish Port State Control is conducting a pilot exercise to improve coordination of public bodies involved in BWM Convention.

The exercise will be performed based on legal basis of BWMC art 9.1(c).

In principle two random in sequence samples will be taken from ship ballast discharge.

The ship (with BWMS) should have a sampling port for collection of samples to assess compliance with the D-2 standard in the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004; therefore, the aim of this survey is to **check sampling port configuration**, which is currently variable across ships.

Please complete the following survey in order to plan what equipment will be needed to collect the samples on your ship.

We kindly remind you that by no circumstance this exercise will result in neither any assessment in relation to proper functioning of the ballast water system installed by owner, certified by class society and being operated by crew members, nor any fine will be imposed or notification to third parties be addressed to anybody.

The correspondent report including description of sampling and analysis protocol and concluding exercise coordination conclusion will keep ship identification anonymous.

Definitions:

Sample port: The flanged opening for inserting a sample probe into the ballast discharge pipe; this is ship-installed equipment and should be covered by a closed valve (i.e. full port ball valve or gate valve) or blind flange when not in use

Sample probe: The tube inserted into the ballast pipe through the sample port that provides the ability to connect to external tubing/hose for collection and processing of a ballast water sample

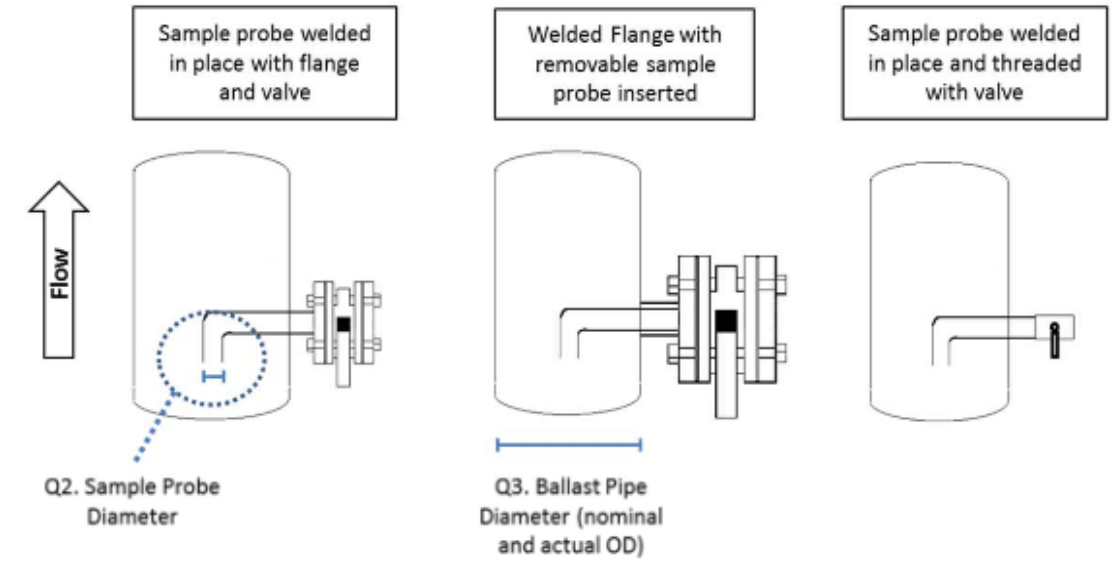
Ship Name:	**IMO number:**		
BWMS Manufacturer and Model:			
Describe the location of the Sample Port nearest to the overboard discharge: (e.g. Downstream of BWMS, high side of ballast pump, close to overboard discharge) *If available, attach ballast system diagram identifying sample port locations*			
1. Describe the Sample Port Configuration:			
Valve installed:	☐ YES	☐ NO	
Valve DN:	☐ MM	☐ INCHES	
Type of Valve:	☐ Ball	☐Butterfly	☐ Gate
	☐ Other (Specify:)		
Valve connection type:	☐ flanged	☐ threaded	
Blind flange installed:	☐ YES	☐ NO	
If flanged, provide description: e.g. JIS 10K50A (PCD 120mm)			
If threaded connection type available:	☐ male	☐ female	
Valve connection nominal size:	☐ MM	☐ INCHES	
Valve connection pipe OD (actual):	☐ MM	☐ INCHES	
Valve connection standard:	☐ NPT	☐ BSP	☐ Other (Specify:)
If other connection type, please describe: e.g. Nakijima 50A			
If available, attach photos of the sample port (close-up) and general location			

2. Describe the Sample Probe Configuration:			
Sample probe installed:	☐ YES	☐ NO	☐ UNKNOWN
If yes, sample probe diameter:		☐ MM	☐ INCHES
If available, attach dimensioned drawing of the flange and valve set up			
3. Describe the Ship's Main Ballast Line Configuration at the sample port:			
Ballast pipe nominal diameter:		☐ MM	☐ INCHES
Ballast pipe OD (actual):		☐ MM	☐ INCHES
Number of Ballast Pumps:			
Ballast Pump capacity (single pump):		☐ m^3/hr	☐ GPM
4. Can ship engineers provide a 25mm (1-inch) hose barb fitting at the sample port for us to connect to?		☐ YES	☐ NO
If no, what fittings are required?			
5. Can the ship accept at least 1 m^3 of water into the bilge?		☐ YES	☐ NO
If no, can an alternative be provided, such as a non-oily/ non-greasy submersible pump of 1/3 to ½ HP; Connections and hose to connect to a water return port or drain downstream of the planned sample port; and power and ability to easily start and stop the pump without leaving the immediate area of the sample port.		☐ YES	☐ NO
6. Describe sample port accessibility (check box below):			
☐ **Ideal**	Easy to access with clear area at least 1 x 1 x 2.5 m (W x L x H)		
☐ **Challenging**:	☐ Below Deck Plating ☐ Accessible only by ladder ☐ Minimal Clearance		
Thank you for completing this survey. *Forward survey, diagrams and photos to* *[Insert Contact Info for Project Leader Here]*			

Examples of samples ports showing information required for survey

Note: there are likely to be multiple sample ports located on the BWMS intake, on the ballast discharge line(s), and at any additional locations necessary to ascertain the proper functioning of the BWMS. It will typically be desirable to use the sample port located nearest to the overboard discharge. Please refer to attached figure of sample ports and correspondent definitions at the end of this form before completing of this this survey.

Common Sample Port Configurations:



Q1. Common Connection Types:

Flange:
(e.g.)
- JIS 10K50A (PCD 120mm)
- DIN 2527 PN50 (PCD 110mm)

Flange with thread pipe:
(e.g.)
- 25mm BSP (M)
- also describe flange

Fire or other quick connection:
(e.g.)
- Nakajima 50A
- also describe thread/flange if present

Threaded pipe:
(e.g.)
- 25mm BSP (F)

Example of BW sampling point/port on board

Source: Harbor Master Port of Algeciras

Bibliography

The development of a full standard methodology for testing ballast water discharges for gross non-compliance of the IMO's Ballast Water Management Convention (EMSA/NEG/12/2012) S.M. Bierman, P. de Vries and N.H.B.M. Kaag Report number C124/12.

Annex: Clarification note on regulation

El 13/10/19 entró en vigor por RESOLUCIÓN MEPC.300 (72) el "CÓDIGO PARA LA APROBACIÓN DE LOS SISTEMAS DE GESTIÓN DE AGUA DE LASTRE" (BWMS CODE), con el objetivo principal de introducir nuevas especificaciones técnicas para la aprobación de sistemas de gestión de agua de lastre en cumplimiento de la regla D2 del Convenio de Aguas de Lastre.

Este nuevo código derogará la resolución MEPC.279(70): "2016 Guidelines for approval of ballast water management systems (G8)". En cualquier caso, los sistemas ya aprobados en base a esta resolución se presumen que cumplen con este nuevo Código.

Nota: los sistemas de gestión de agua de lastre certificados en base a la resolución MEPC.174(58), resolución que fue sustituida por la MEPC. 279(70), no más tarde del 28/10/2018 pueden ser instalados en los buques hasta 28/10/2020.

Annex: Estimation of organism concentration (≥ 50 µm) based on raw counting data

In the report by Gollasch and David (2010) only raised concentrations (c_{raised}) are presented. These raised concentrations in fact represent estimates, $\hat{\mu}$, of the (unobserved true) concentration μ of numbers of living organisms in the total ballast water discharge, based on an observed count in a sample of the discharge.

These raised concentrations are calculated from the raw counts as follows:

$$c_{raised}\left[\frac{\text{number of organisms}}{m^3}\right] = c_{raw}[\text{number of organisms}] \times R[m^{-3}], \qquad \textbf{Eqn. 1}$$

Where, for organisms ≥50 µm, $R[m^{-3}] = \frac{V_{conc}[cm^3]\times 1000[dm^3/m^3]}{V_{subsamp}[cm^3]\times V_{sample}[dm^3]}$,

which is the inverse of the volume of discharge which the subsample represents. We will refer to R as the raising factor.

For organisms ≥10 and <50 µm, $R[cm^{-3}] = \frac{1}{V_{subsamp}[cm^3]}$.

For example, suppose a raw count (c_{raw}) of 90 living organisms ≥50 µm was observed in a subsample of 6 cm^3 ($V_{subsamp}$), which originated from a sample volume of 500 dm^3 (V_{samp}), and then concentrated to a volume of 100 cm^3 (V_{conc}). Then, the raising factor is

$$R = \frac{100\times 1000}{6\times 500} = \frac{100}{3},$$

and the raised concentration (c_{raised}) is calculated as:

$$\hat{\mu} = c_{raised} = 90 \times \frac{100}{3} = 3000 \ \text{ organisms}/m^3$$

The reliability of estimates, expected of true concentrations $\hat{\mu}$ relies on the actual sampling volumes and counts which were made. This information has been retrieved in e-mail conversations with the authors of the Gollasch and David (2010) report, and the data has been included in appendix A of this report.