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Joint Group of Experts on the  
Scientific Aspects of Marine  
Environmental Protection

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Agenda item 4

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**PLANNING OF GESAMP ACTIVITIES:  
REVIEW OF APPLICATIONS FOR 'ACTIVE SUBSTANCES' TO BE USED IN BALLAST  
WATER MANAGEMENT SYSTEMS**

**Report of the GESAMP Ballast Water Working Group (Working Group 34)**

**Background and introduction**

1 The International Convention for the Control and Management of Ships' Ballast Water and Sediments, (hereafter referred to as the BWM Convention) was adopted at IMO on 13 February 2004, in response to the increasing concern of the international community with regard to the transfer of invasive species in ships' ballast water. On 8 September 2017, the Ballast Water Management Convention will enter into force. Currently, the ratification status is that the combined tonnage of contracting States to the treaty to 68.47% with 62 contracting Parties.

2 Within this framework, an approval procedure has been set up for those ballast water management systems that make use of an Active Substance or Preparation to comply with the Convention. The procedure consists of a two-step approach for granting Basic Approval and Final Approval. The approval is granted by the Marine Environment Protection Committee (MEPC) based on the advice provided by the Ballast Water Working Group of the GESAMP (WG 34). There is a third step, the type approval, but that is outside the remit of WG 34.

3 The more general outline, scope and aim of the BWM Convention have been addressed in the report to the GESAMP 35 (see document GESAMP 35/5/1) and will only be referred to here. The Terms of Reference of WG 34 have been added as annex 1 to this report. As the terms of reference of WG 34 have not changed, several parts of this report have been kept unchanged. As for the readability of the report these sections are kept in the report with apologies for the experienced reader.

4 This report focuses on the main activities of WG 34, which consist of the evaluation of several ballast water management systems (hereafter BWMS) and the further development of the Methodology of the Group, which has been accepted as a 'living' document. This means that the Methodology will be a discussion item at (almost) each meeting of the Group and changes and improvements are made, as appropriate (see further below).

**'Active Substances'**

5 'Active Substances' are defined by the Convention as "substances or organisms, including a virus or a fungus that have a general or specific action on or against harmful aquatic organisms and pathogens" and the approval of BWMS using such substances is described in resolution MEPC.169(57) adopted in 2008. However, not only 'Active Substances' are evaluated by the WG 34. Also all other substances considered relevant are taken into account in the evaluation report. The Procedure for approval of ballast water management systems that

make use of Active Substances (G9) contained in resolution MEPC.169(57) under the BWM Convention distinguishes also 'Relevant Chemicals' and 'Other Chemicals'.

6 Therefore, WG 34's task is to evaluate the risks for the crew, the ships' safety, the risk for the public at large and the environment of the BWMS. It is furthermore the intention of WG 34 to perform these evaluations in a consequent, consistent and transparent manner, which helps Administrations to prepare a concise dossier, containing all the necessary data. The Methodology, as developed by WG 34 in the course of its work process, serves as guidance in the evaluation.

7 WG 34 convened two times since GESAMP 43 to evaluate proposed BWMS, one time for a regular meeting from 5 to 9 December 2016, where 3 BWMS have been evaluated, and one time for its 8<sup>th</sup> Stock-taking Workshop (STW) from 6 to 10 February 2017. Of these BWMS, two received a recommendation for Basic Approval and one received a recommendation for Final Approval. During its meeting in July 2017, MEPC agreed with the recommendations of WG 34 in all cases and granted the approvals accordingly. An overview of the BWMS evaluated this meeting is presented in annex 2 to this report.

8 WG 34 was able to clear the whole stock of BWMS submitted for evaluation before the meeting of MEPC for which the evaluation was requested. The Group recognized that the number of BWMS presented to the Group have been less than in other reporting periods. It is expected that this has close relation to the ongoing process in IMO to modify Guidelines (G8) for receiving type approval from Administration (see paragraph 10).

#### **Methodology for information gathering and the conduct of work of WG 34**

9 The evaluation Methodology of WG 34 has been determined to be a living document based on increasing experience in the evaluation of BWMS. During eight Stocktaking Workshops WG 34 further developed the Methodology by adding 1) quantitative methods for the evaluation of human risk assessment including exposure assessment for professionals and the general public, 2) quantitative assessment of the environmental effects by using a specific ballast water model, MAMPEC-BW 3.0.1.3 and 3) finalization of the second version of the database for 41 specific chemicals, including AS and neutralizer frequently used in BWMSs and disinfection by-products (DBP) frequently observed, in which the physico-chemical data, the toxicological data and the environmental fate and effect data are included. For these 41 substances the applicants of BWMS do not have to submit the data mentioned anymore to IMO as the Group is of the opinion that all and sufficient, relevant information is already available. All physico-chemical data of 41 chemicals has already been included in the MAMPEC-BW, version 3.0.1.3. The relevant data of these 41 chemicals are now also included in the GISIS database of IMO, where all Administrations and applicants can easily access this data.

10 In 2014, MEPC had started its work to review the Guidelines for approval of ballast water management systems (G8) (resolution MEPC.174(58)), which is used for evaluating biological efficacy and granting type approval by National Administrations. This is the second amendment of Guidelines (G8), which may include the changes of test water conditions (salinity, DOC, POC and TSS), tank holding times (less than 5 days may be accepted) and evaluation of efficacy under extreme conditions. Although, the purpose of the review is to seek more accuracy on the evaluation of biological efficacy in ballast water treated by BWMS, the test water and treated water will be also used for evaluation in accordance with Procedure (G9). During its 71st meeting, MEPC agreed with the revision of Guidelines (G8) and also decided to make Guidelines (G8) mandatory and to transpose it into a Code.

11 Despite the controversy between the new Guidelines (G8) and the Methodology of WG34 on the approach of dangerous gases, the WG34 will continue to use its risk assessment approach and advice MEPC accordingly to its findings on the environmental and human health acceptability of the gases produced during the practical operation of the BWMS.

12 As already stated in paragraph 7, WG 34 held its 8th STW from 6 to 10 February 2017 at IMO Headquarters in London, which was mainly intended to review the proposed changes in Guidelines (G8) and the relation and consequences to the Methodology of WG 34. The report of the workshop has been attached to this report as annex 3.

### **Planning ahead**

14 The deadline for the submission of proposals for approval of BWMS to MEPC 72 is on 22 September 2017, which is relatively far in the future and therefore no applications were received to date. WG 34 scheduled two meetings to accommodate potential applications: BWWG 35 from 6 to 10 November 2017 and BWWG 36 from 11 to 15 December 2017, if needed. Of course, the number of meetings depends on the number of submissions. Both meetings are foreseen to be held at IMO Headquarters in London.

### **Acknowledgement**

15 WG 34 is very thankful to all the members of GESAMP that took the time to critically review the work of WG 34. The quality of the work has been improved as a result from this peer review process and the comments made were brought to the attention of the consultant involved in the drafting of the reports.

### **Action requested of GESAMP**

16 GESAMP is invited to review this document and comment, as it deems appropriate.

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## ANNEX 1

### TERMS OF REFERENCE FOR THE TECHNICAL GROUP (GESAMP-BWWG/ WG 34)

1 Consideration of development of necessary methodologies and information requirements in accordance with the "Procedure for approval of ballast water management systems that make use of Active Substances (G9)" (adopted by resolution MEPC 169(57)) for consideration by MEPC 65.

2 For Basic Approval, the Group should review the comprehensive proposal submitted by the Member of the Organization along with any additional data submitted as well as other relevant information available to the Group and report to the Organization.

In particular, the Group should undertake:

- .1 scientific evaluation of the data set in the proposal for approval (see paragraphs 4.2, 6.1, 8.1.2.3, 8.1.2.4 of Procedure (G9));
- .2 scientific evaluation of the assessment report contained in the proposal for approval (see paragraph 4.3.1 of Procedure (G9));
- .3 scientific evaluation of the risks to the ship and personnel to include consideration of the storage, handling and application of the Active Substance (see paragraph 6.3 of Procedure (G9));
- .4 scientific evaluation of any further information submitted (see paragraph 8.1.2.6 of Procedure (G9));
- .5 scientific review of the risk characterization and analysis contained in the proposal for approval (see paragraph 5.3 of Procedure (G9));
- .6 scientific recommendations on whether the proposal has demonstrated a potential for unreasonable risk to the environment, human health, property or resources (see paragraph 8.1.2.8 of Procedure (G9)); and
- .7 preparation of a report addressing the above-mentioned aspects for consideration by MEPC (see paragraph 8.1.2.10 of Procedure (G9)).

3 For Final Approval, the Group should review the discharge testing (field) data and confirm that the residual toxicity of the discharge conforms to the evaluation undertaken for Basic Approval and that the previous evaluation of the risks to the ship and personnel including consideration of the storage, handling and application of the Active Substance remains valid. The evaluation will be reported to the MEPC (see paragraph 8.2 of Procedure (G9)).

4 The Group should keep confidential all data, the disclosure of which would undermine protection of the commercial interests of the applicant, including intellectual property.

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ANNEX 2

**LIST OF BALLAST WATER MANAGEMENT SYSTEMS THAT MAKE USE OF ACTIVE SUBSTANCES IN ACCORDANCE WITH PROCEDURE (G9) SINCE GESAMP 43**

Name of the System/Manufacturer	Brief description of the System	Date of Approval	Specifications
<p>1. MicroFade II Ballast Water Management System</p> <p>Kashiwa Co., Ltd. and Kuraray Co., Ltd Japan, but submitted by the Netherlands</p>	<p>Combination of filtration followed by treatment with the Active Substance sodium dichloroisocyanurate dihydrate (NaDCC) and neutralization of the remaining Active Substance with sodium sulfite during discharge. This system requires the storage of chemicals on-board.</p>	<p>Basic Approval, Granted, July 2017</p>	<p>The Flag State Administration was invited to ensure that the recommendations presented in annex 4 of the report of the GESAMP-BWWG 34 were fully addressed during the further development of the ballast water management systems. The recommendations mainly focus on the storage and handling of the Active substance and the neutralizer.</p>
<p>2. ECS-HYBRID Ballast Water Management System</p> <p>NK Company Ltd, Republic of Korea</p>	<p>Treatment with filtration and disinfection with UV-radiation and photocatalytic oxidation using OH-radicals followed by disinfection with hypochlorite through in-situ electrolysis. Finally, the Active Substance is neutralized by sodium thiosulfate.</p>	<p>Final Approval, Granted, July 2017</p>	<p>The Flag State Administration was invited to ensure that the recommendations presented in annex 5 of the report of the GESAMP-BWWG 34 were fully addressed during the further development of the ballast water management systems. The recommendations mainly focus on the minimum required salinity of 8 PSU and the sufficient quality of the corrosion test.</p>
<p>3. Envirocleanse in Tank BWTS</p> <p>Envirocleanse, LLC United States but submitted by Norway</p>	<p>Disinfection with Active Substance hypochlorite ion formed by in situ electrolysis, and doses ballast water after uptake based on a concentration-time (CT) treatment approach. This system requires the storage of the neutralizer on board.</p>	<p>Basic Approval, Granted, July 2017</p>	<p>The Flag State Administration was invited to ensure that the recommendations provided in annex 6 of the report of the GESAMP-BWWG 34 meeting were fully addressed during the further development of the ballast water management systems. The recommendations mainly relate to the</p>

<b>Name of the System/Manufacturer</b>	<b>Brief description of the System</b>	<b>Date of Approval</b>	<b>Specifications</b>
			safe handling and storage of the neutralizer and be made automatic at FA. Finally, it was recommended to define a minimum neutralization time using the circulation loop at FA and propose an appropriate corrosion measurement.

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ANNEX 3



**E**

MARINE ENVIRONMENT PROTECTION  
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MEPC 71/4/7  
27 March 2017  
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**HARMFUL AQUATIC ORGANISMS IN BALLAST WATER**

**Eighth Stocktaking Workshop on the activity of  
the GESAMP-Ballast Water Working Group**

**Note by the Secretariat**

**SUMMARY**

*Executive summary:* This document provides a summary of the outcome of the Eighth Stocktaking Workshop on the activity of the GESAMP-Ballast Water Working Group<sup>1</sup>

*Strategic direction:* 7.1

*High-level action:* 7.1.2

*Output:* 7.1.2.4

*Action to be taken:* Paragraph 59

*Related documents:* MEPC 71/4/7/Add.1; MEPC 62/24 and BWM.2/Circ.13/Rev.3

Introduction

1 Regulation D-3.2 of the Ballast Water Management Convention (BWM Convention) provides that ballast water management systems (BWMS) which make use of Active Substances to comply with the Convention shall be approved by IMO in accordance with the *Procedure for approval of ballast water management systems that make use of Active Substances* (G9) (resolution MEPC.169(57)). Since 2006, this task of approval has been performed by the Marine Environment Protection Committee based on the independent advice provided by the GESAMP-Ballast Water Working Group (GESAMP BWWG).

2 MEPC 58 agreed that additional time should be allocated to the GESAMP-BWWG to take stock of the experience achieved and to discuss the lessons learned and the general aspects related to the evaluation process, without the pressure of having to review specific submissions. In considering the report of the Third Stocktaking Workshop, MEPC 62 noted the outcome of the

1 Following a decision of MEPC 58, only the main body of the GESAMP-BWWG report is translated in all three working languages with the annexes being submitted in English only.

Workshop contained in document MEPC 62/2/14 (Secretariat) and endorsed the proposal of the GESAMP-BWWG to conduct the stocktaking meetings on a yearly basis.

### **Eighth Stocktaking Workshop on the activity of the GESAMP-Ballast Water Working Group**

3 The Eighth Stocktaking Workshop (STW) on the activity of the GESAMP-BWWG (hereafter the Group) was held at IMO Headquarters in London from 6 to 10 February 2017, chaired by Mr. Jan Linders. GESAMP was represented by its Chair, Dr. Peter Kershaw, who made a presentation providing background information on the purpose, structure and current work of GESAMP, demonstrating the context in which the Group carries out its work. The agenda, as adopted by the Workshop, is set out in annex 1. A summary report of the Workshop is provided below.

### **Introduction to the revised Guidelines for approval of ballast water management systems (G8)**

4 The Chair updated the Workshop briefly on the revision of Guidelines (G8), as finalized at MEPC 70. This helped to provide the context for the Workshop's consideration of some of its main agenda items that were affected by this revision, including those that had been referred to the Group by the Committee. The Workshop noted the information provided, including the adoption of the revised Guidelines (G8) by resolution MEPC.279(70) and the agreement that the revised Guidelines (G8) should be made mandatory and renamed as "Code for approval of ballast water management systems".

### **Submission of new data on fresh water testing of BWMS with Final Approval**

5 The Workshop recalled that MEPC 70 had requested the Group to consider the issue of submission of new data on fresh water testing of BWMS that have already received Final Approval but had not been tested for fresh water as part of that approval and, if necessary, develop a procedure for submission of new data on fresh water testing of such BWMS, which would be included in the next revision of the *Methodology for information gathering and conduct of work of the GESAMP-BWWG* (BWM.2/Circ.13, as may be further revised, hereafter the Methodology).

6 The Workshop further recalled that the Methodology states clearly that all three salinity regions are to be tested to demonstrate that the BWMS has no unacceptable effects on the environment, human health or ship safety. The Workshop noted, however, that some BWMS, which make use of an electrolysis system for which a threshold salinity is required to produce an Active Substance, were not tested in freshwater conditions.

7 The Workshop also recalled that, although the salinity of the water to be tested is not mentioned in Procedure (G9), the requirements of test data for all three salinity ranges had been included in the Methodology in view of the potential formation of disinfection by-products (DBPs), the varying toxicities determined during the laboratory ecotoxicity tests (LET) and the whole effluent toxicity (WET) tests.

8 Following discussion, the Workshop agreed that the development of a procedure for the evaluation of additional fresh water testing of BWMS with Final Approval was necessary, as the Group is not able to evaluate fresh water data by extrapolating from the already available data on other salinities. The Group is of the opinion that the significant differences in the results obtained from the available data do not allow a scientifically justified conclusion. The main considerations for the development of such a procedure are outlined in the ensuing paragraphs 9 to 15.

9 The following information would need to be submitted to the MEPC for BWMS with Final Approval that had not been tested for fresh water as part of that approval:

- .1 WET tests for organisms at three trophic levels, e.g. a micro-alga, a crustacean and a fish; and



- .2 identification of the Relevant Chemicals with the same test water at 1, 2 and 5 days after treatment (which should be understood to include potential neutralization). For the evaluation of risks to human health, information on the Relevant Chemical concentrations before neutralization is also required.

10 The tests should be carried out with the appropriate QA/QC and with full analysis of the quality criteria as required for the test protocols.

11 It is assumed that there is no significant modification of the BWMS from the previous Final Approval at the submission of an application for fresh water data evaluation, while it is recognized that some minor modification of the BWMS may be needed to generate the fresh water data required. When receiving an application for submission to the MEPC, the Administration should determine whether a significant modification has taken place, in which case a new application for Basic Approval of the BWMS should be submitted, in accordance with paragraph 8.4.2 of Procedure (G9), instead of an application for evaluation of the new fresh water data only.

12 The Group would evaluate the submitted data on fresh water using the latest version of the Methodology, regardless of the version that had been used for the Basic and Final Approval of the BWMS.

13 The Group would evaluate whether the WET test results show no unacceptable effects or may show effects that will disappear after the application of a dilution factor of maximum five (5). For the assessment of risks to human health and the environment from Relevant Chemicals a separate calculation should be carried out with the maximum concentration found in treated (and neutralized) ballast water to determine the maximum concentration in ballast water that would be discharged to the receiving waters. If the Group concludes that the discharges from the BWMS following its operation with fresh water would show unacceptable effects to the environment, then the Group would recommend additional system limitations from the viewpoint of environmental acceptability.

14 The evaluation by the Group would take about four hours of work during its meeting, excluding the preparation time of the consultant, which is assumed to be two days.

15 Priority should always be given to new BWMS. In this way a level playing field would be ensured for all applicants. Remaining time during the Group's meetings can be devoted to the evaluation of fresh water data. It is therefore likely that at its meetings the Group may be able to evaluate both new BWMS and new data on fresh water testing of BWMS with Final Approval. In such cases the Group would produce one report for the meeting, covering both categories of evaluations.

16 Based on the considerations outlined above, the Workshop developed the draft procedure for the submission of new data on fresh water testing of BWMS with Final Approval, as set out in annex 2. The Workshop also incorporated this procedure in the draft revised Methodology, as set out in document MEPC 71/4/7/Add.1, as a new chapter 11.

17 Taking into account the delay until the revised Methodology becomes effective, the Workshop agreed that the Group would immediately start applying the above proposed procedure and be ready for submissions of new data on fresh water testing of BWMS with Final Approval once the procedure is approved by the Committee.

### **Precursors involved in the process of DBP production and TRO consumption**

18 The 2016 Guidelines (G8) include new provisions for test water augmentation, emphasizing the critical importance of dissolved organic carbon (DOC) and stipulating that "relevant properties of the augmented water (such as the oxidant demand/TRO decay and UV absorption in the range of 200 to 280 nm, the production of disinfection by-products and the

particle size distribution of suspended solids) are equivalent, on a mg/L basis, to that of natural water" (2016 Guidelines (G8), paragraph 2.4.21). Since the same test water that is used for land based testing taking into account Guidelines (G8) is frequently also used for the identification of Relevant Chemicals and toxicity testing under Procedure (G9), MEPC 70 requested the Group to "review what kind of precursors are involved in the process of disinfection by-product (DBP) production and total residual oxidant (TRO) consumption and are considered important during Procedure (G9) assessments, in order to ensure compatibility between Guidelines (G8) and Procedure (G9)" (MEPC 70/18, paragraph 4.19.3).

19 For the discussion of this issue, the following materials were taken into account:

- .1 a literature review of the effect of different organic precursors on DBP formation;
- .2 a presentation of experimental data on TRO consumption collected by DNV GL and delivered to the Workshop by the invited expert Dr. Marte Rusten; and
- .3 a presentation and report of experimental data on TRO consumption and DBP formation collected by the Korea Testing & Research Institute (KTR) and submitted to the Workshop in writing.

20 The Workshop recognized that TRO consumption is primarily of relevance for the performance evaluation according to Guidelines (G8), while DBP formation is of relevance for the toxicity evaluation according to Procedure (G9). While the chemical reactions between TRO and DOC that lead to DBP formation contribute to TRO consumption, the two are not entirely identical since TRO may also be consumed by other processes, such as thermally induced disproportionation, that are not subject to the evaluation by the Group.

21 The Workshop noted that literature studies published in the last 40 years have established a clear relationship between the DBP formation potential of an organic substance and its aromaticity. A suitable measure of aromaticity can be provided by the specific UV absorbance (SUVA) at 254 nm, which has been shown to correlate well with DBP formation both in fresh and marine waters. However, too little data is available with regard to typical SUVA values of natural marine waters to make a quantitative recommendation for appropriate SUVA values of augmented test waters. The Group expects to collect more experience regarding this issue in the future, based on the new provisions for test water augmentation under the 2016 Guidelines (G8).

22 The data sets collected at different test facilities that were presented to the Workshop concern the use of additives such as lignin/lignosulfonate, sodium citrate, glucose, methyl cellulose and others. While there is general agreement that lignin/lignosulfonate increases TRO consumption and can be expected to result in notable DBP formation, the two studies came to contradictory results with regard to other additives, in particular sodium citrate. The Workshop noted these results and concluded that a resolution of the observed discrepancies can only be achieved by further information exchange, test protocol harmonization and possibly the performance of additional studies by the test facilities.

23 Following discussion, the Workshop concluded that:

- .1 there is no need for a further revision of the 2016 Guidelines (G8) at this moment;
- .2 there is no need for a revision of the Procedure (G9) with regard to this matter, but a revision of the Methodology is proposed to establish a cross reference to the 2016 Guidelines (G8) and to highlight the particular importance of the specific UV absorption at 254 nm (see paragraph 3.6.19 of the draft revised Methodology, set out in document MEPC 71/4/7/Add.1);

- .3 although the Group currently does not at the moment have sufficient information to recommend a specific additive for DOC adjustment of test waters, the Workshop recommended that the same type of additive should be used for all testing to be performed with the same BWMS under Procedure (G9), in order to make the test results consistent and comparable; and
- .4 the Group is not in a position to consider the issue of the discrepancy between data sets, which is something that test facilities may wish to consider further.

### **Criteria to determine when BWMS using drinking water should seek approval in accordance with Procedure for approval of ballast water management systems that make use of Active Substances (G9)**

24 The Workshop recalled that the use of drinking water as ballast water, either from a land-based source or produced on board, has been considered previously by both the MEPC and the Group, and that it had been recognized that there are considerable challenges when addressing this issue. The Workshop also recalled that MEPC 69 requested the Group to develop criteria for when BWMS using drinking water should seek approval in accordance with Procedure (G9).

25 The Workshop recognized that, where an additional Active Substance is added to drinking water on board, there are potential concerns to the use of the Active Substance that should be taken into account. Therefore, the Workshop concluded that any use of Active Substance, added on board, in the treatment of drinking water to be used as ballast water should be considered as a system that needs review by the Group.

26 Following discussion, the Workshop concluded that, in all cases where ballast water management involves the addition of an Active Substance to drinking water on board, there should be a submission to the Group for approval under Procedure (G9). This does not exclude the possibility that the Group in such cases may come to the conclusion that a Final Approval submission is not necessary, similarly to the case of the Van Oord BWMS (MEPC 65/2/9, annex 6).

### **Current status of transformation of the Methodology into a GESAMP R&S document**

27 After consulting with the GESAMP Chair, Dr. Peter Kershaw, the Workshop agreed to prepare a GESAMP Reports and Studies series (R&S) publication using information from the draft revised Methodology, pending its approval by MEPC 71. The main focus will be on the evaluation of risks to human health and the environment, therefore drawing primarily from appendices 4 (Human risk assessment of ballast water chemicals) and 5 (MAMPEC-BW information), as well as other relevant parts of the Methodology. This publication aims to reflect the Group's way of working and the expertise gained during approximately ten years of activity, as a result of the scientific evaluation of proposals for approval of BWMS, in terms of environmental and human health risk assessments. The publication will be prepared by the Group with a target of submitting a draft to the 44th meeting of the GESAMP in September 2017.

### **Impact of the revision of Guidelines (G8) on Procedure (G9) and the Methodology**

28 The Workshop recalled the discussions at STW 7 in conjunction with the revision of Guidelines (G8), which at that time was still ongoing. The outcome of deliberations on the remaining points that had not already been discussed are summarized in the ensuing paragraphs 29 to 50 and the draft revised Methodology reflecting consequential amendments, including those originating from other agenda items, is set out in the annex to document MEPC 71/4/7/Add.1. In this connection, the Workshop agreed to request the Committee to advise on the date the revised

Methodology should be applied to allow sufficient time for applicants seeking the Committee's approval for BWMS making use of Active Substances to fully implement the new provisions.

### ***Procedure (G9) as a mandatory document***

29 The Workshop recalled that MEPC 69 had noted that it would consider any necessary action with regard to the possible need to categorize Procedure (G9) as mandatory, should it decide to make the revised Guidelines (G8) mandatory (MEPC 69/21, paragraph 4.35.6). Following the decision by MEPC 70 to make the 2016 Guidelines (G8) mandatory (MEPC 70/18, paragraph 4.18), the Workshop proposed that Procedure (G9) should also be categorized as mandatory, and invited the Committee to take necessary action.

### ***Need for revision of Procedure (G9)***

30 Having considered the possible need for consequential amendments to Procedure (G9), the Workshop concluded that Procedure (G9) should be revised and invited the Committee to agree with this proposal. The Workshop discussed the sections of Procedure (G9) that would need to be revised, taking into consideration the corresponding sections of the 2016 Guidelines (G8). The Workshop considered it to be premature to propose specific revisions to Procedure (G9) in this report, without a decision on the matter by the Committee. The Workshop, however, invited the Committee to note that, if a review of Procedure (G9) is initiated, the Group would be ready to contribute to such a process.

### ***Holding time of less than five days allowed***

31 The Workshop agreed that the Methodology should include a provision for applicants to prepare additional treated ballast water in a separate tank (5-day storage tank) to be used for testing under Procedure (G9), in conjunction with tests conducted under the 2016 Guidelines (G8).

### ***Two intervals of water temperatures for testing introduced***

32 The Workshop agreed to amend the paragraphs in the Methodology that deal with the recommended temperature ranges to be covered during testing (namely paragraphs 3.5.2.1.5 and 6.3.1.9) to be in accordance with the temperatures being stated in paragraph 2.5.1 of the 2016 Guidelines (G8). Furthermore, the Workshop concluded that for Basic Approval the tests should be carried out in ambient temperature conditions (paragraph 3.2.3.6 of the draft revised Methodology).

### ***Three salinity ranges required for testing***

33 The Workshop prepared draft amendments to the Methodology to take into consideration that three salinity ranges are required for testing in the 2016 Guidelines (G8).

### ***DOC, POC and TSS***

34 The Workshop agreed to amend paragraph 3.6.19 of the Methodology in accordance with paragraph 2.4.21 of the 2016 Guidelines (G8) in conjunction with the selection and validation of the additives used to augment the test waters. The Workshop further agreed to add a provision in the same paragraph of the Methodology for applicants to submit any information on the results of measuring Specific UV Absorbance at 254 nm.

### ***Major components***

35 The Workshop agreed to add a paragraph in chapter 4 of the Methodology (Use of the Active Substance or the Preparation) with regard to the specific timing of the submission of a Basic Approval dossier, stating that the applicant should prepare all the information on the manner of application after receiving the results of the "readiness evaluation" (2016 Guidelines (G8),

annex, part 1, paragraph 1.5) from the relevant Administration (Procedure (G9), paragraph 8.1.2.2).

36 Furthermore, the Workshop agreed that the application dossier should include information on the major components of the proposed BWMS, as identified in paragraph 3.9 of the 2016 Guidelines (G8). In this context, the Group's position is that the neutralization process to ensure the Maximum Allowable Discharge Concentration (MADC) is not such a component, because it does not directly affect the ability of the BWMS to meet the ballast water performance standard described in regulation D 2 of the BWM Convention.

### ***Risks to ship safety***

#### *Increased corrosion*

37 Recalling that MEPC 69 had approved in principle, with a view to incorporation in the next revision of the Methodology, amendments to section 7.1 concerning corrosion testing (MEPC 69/21, paragraph 4.35.7), the Workshop included in the draft revised Methodology the amended relevant paragraphs, based on the report of STW 7 (MEPC 69/4/3, annex 3).

#### *Fire and explosion; storage and handling of substances*

38 Following discussion, the Workshop concluded to add new paragraphs on fire and explosion and storage and handling of substances, in section 7.1 of the Methodology.

#### *Contact with, or inhalation of, process products*

39 Since section 7.1 of the Methodology is related to risks to the safety of a ship and thereby does not address risks to human health, the Workshop decided to delete point 7.1.1.4 (contact with, or inhalation of, process products), noting that risks to human health are described in section 7.2.

#### *Noise generated by a BWMS*

40 The Workshop discussed the potential noise generated by a BWMS in terms of its impact both on seafarers' occupational health and on ship safety.

41 In the case of seafarers' exposure to such noise, the Workshop considered the existing protective legislation measures for seafarers such as the *Code on noise levels on board ships* (resolution MSC.337(91), hereafter the Code) and ILO's *Maritime Labour Convention, 2006*, as amended. Taking such international mandatory instruments into account, the Workshop recognized that noise levels created by a BWMS would be a matter for the Administration or an appropriate authority to consider when the BWMS is installed on board a particular ship.

42 Moreover, the Workshop also recognized that the applicant, i.e. the manufacturer of a BWMS, will not be able to provide appropriate measurement data of ambient noise levels on board a ship fitted with a BWMS, as required under the Code, at the stages of Basic Approval and Final Approval, i.e. before completion of a new ship's construction or installation of a BWMS on board an existing ship.

43 With regard to ship safety, and taking into account the application of the above mentioned protective measures, the Workshop considered it unlikely that noise levels generated by a BWMS on board a ship would have a detrimental effect on the overall safety of the ship.

44 As a result of these deliberations, the Workshop agreed to delete point 7.1.1.5 from the Methodology, as it implied the consideration of noise generated by a BWMS as a potential risk.

#### *Hydrogen gas generation*

45 Further to paragraphs 25 to 27 of the report of STW 7 (MEPC 69/4/3), the Workshop revisited the issues surrounding the production of hydrogen gas (H<sub>2</sub>) from a BWMS employing electrolysis.

46 To further illustrate the matter of H<sub>2</sub> generation a calculation of the theoretical production of H<sub>2</sub> against the water flow rate passing through such a generator is set out in annex 4 to this report. The potential magnitude of the quantity of the H<sub>2</sub> gas produced was subsequently considered by the Workshop.

47 The Workshop concluded that the fate of the produced H<sub>2</sub> gas was worthy of more detailed scrutiny in future applications, although the H<sub>2</sub> concentrations always stayed at least a factor of 2 to 4 below the lower explosion limit (LEL). It was therefore recommended that some form of quantified mass balance at key locations, such as gas venting outlets from gas separators, should be submitted in order to determine that the produced H<sub>2</sub> could be suitably monitored and managed during the operation of the BWMS by using appropriate gas separators with sufficient capacity.

### ***Ensuring MADC at system design limitations***

48 The Workshop agreed that the following general recommendation should be made at Basic Approval for all BWMS with a neutralization process:

"The Group recommended that for the further development of the BWMS the applicant should ensure that the control scheme could maintain the TRO dose and the MADC effectively in the full-scale BWMS at all times and in particular to avoid unacceptable TRO levels at the beginning of discharge and under extreme low temperatures. The Group is of the opinion that, in order to achieve the MADC, an initial overdose against stoichiometric demand is needed, during a limited period of time. Also, an additional overdosing will be needed at extreme low temperatures."

49 The Workshop further agreed to amend paragraph 4.1.2 of the Methodology to make the wording more general with regard to the scope of system design limitations (SDL).

### ***Sampling facility for monitoring Active Substance concentrations at discharge***

50 The Workshop recognized that there is a possibility that the sampling facility may be placed at a different location than that for TRO monitoring, while taking into account the practicability of the situation at hand. However, for the purpose of port State control sampling, the sampling facility may be used for taking the discharged water samples to check whether MADC is maintained. Therefore, the Workshop concluded to insert a new paragraph in the Methodology to highlight this matter (see paragraph 4.1.8 in the draft revised Methodology).

### ***Future work***

51 The Workshop briefly considered items listed under its future work, as summarized in the ensuing paragraphs 52 to 57.

### ***Amendment of human exposure scenarios***

52 The Workshop agreed to amend the Tier 2 scenarios for the general public in appendix 4 (Human risk assessment of ballast water chemicals) of the Methodology, since these amendments had already been discussed and agreed upon in principle during GESAMP-BWWG 34 and the corresponding calculations had been implemented in the GESAMP-BWWG Database of chemicals most commonly associated with treated ballast water. The Workshop also noted that in the Tier 2 scenarios the Predicted Environmental Concentration (PEC) for surroundings from the marine antifoulant model for PEC calculation (MAMPEC) is being used while taking into

consideration that the activities of the general public take place in areas more remote to the actual harbour. Following these conclusions, the Workshop agreed that this item had been finalized and should be deleted from the agenda of future workshops.

***Implementation of the exposure scenario template for assessment of risk mitigation measures***

53 The Workshop agreed to discontinue consideration of this agenda item, as the template for risk mitigation measures was already fully discussed and no revisions were foreseen. Instead, the Workshop concluded that it would be appropriate to start populating the template based on the information submitted as part of future applications, on a case-by-case basis.

***Supplementary tests with ballast water***

54 Due to time constraints, the Workshop did not consider this agenda item and agreed to retain it on the agenda for a future workshop.

***Factors affecting neutralization***

55 The Group discussed this agenda item briefly and agreed to develop a discussion document on the matter with a view to considering it at a future workshop.

***Mutagenicity and reproductive toxicity classification and potential applicability of the dose addition approach for mixtures***

56 Due to time constraints the Workshop did not consider this agenda item and agreed to retain it on the agenda for a future workshop.

***Secondary poisoning in relation to the bioconcentration factor***

57 The Workshop agreed to add a paragraph in the draft revised Methodology for clarification of one of the scenarios for the general public (namely consumption of seafood) with regard to the bioconcentration factor (BCF) (see paragraph 2.2.4.2 in appendix 4 of the draft revised Methodology). The Workshop agreed that the BCF should be applied for all Active Substances and Relevant Chemicals regardless of the value of the octanol-water partition coefficient ( $\log P_{ow}$ ) of each substance, which means that the cut-off value ( $\log P_{ow} < 3$ ) used for the environmental risk assessment is not deemed applicable for the human health situation (Procedure (G9), paragraph 5.1.1.2). Following these conclusions, the Workshop agreed that this item had been finalized and should be deleted from the agenda.

***Future activities***

58 The Workshop recognized that it was premature to make any decision on the timing of the Ninth Stocktaking Workshop (STW 9), pending the Committee's consideration of the proposal to revise Procedure (G9), and, therefore, agreed to consider this in due course, noting that it may also be possible to combine STW 9 with a regular GESAMP BWWG meeting.

***Action requested of the Committee***

59 The Committee is invited to note the outcome of the Eighth Stocktaking Workshop of the GESAMP-BWWG and in particular to:

- .1 agree to the proposed procedure for submission of new data on fresh water testing of BWMS with Final Approval, as set out in annex 2, to be incorporated into the draft revised *Methodology for information gathering and conduct of work of the GESAMP-Ballast Water Working Group*, as set out in document MEPC 71/4/7/Add.1, and note the Group's intention to

immediately start applying the proposed procedure once it is approved by the Committee (paragraphs 16 and 17);

- .2 note the Workshop's conclusion with regard to additives used to achieve requirements for test water challenge conditions, and invite test facilities to consider the matter as appropriate (paragraph 23);
- .3 endorse the Workshop's recommendation with regard to when BWMS using drinking water should seek approval in accordance with Procedure (G9) (paragraph 26);
- .4 approve the draft revised Methodology as set out in document MEPC 71/4/7/Add.1, for dissemination as a BWM circular to supersede the existing BWM.2/Circ.13/Rev.3, and advise from which date on the revised Methodology should be applied (paragraph 28);
- .5 agree that Procedure (G9) should be revised and made mandatory, as a consequence of the revision of Guidelines (G8), and take the necessary action (paragraphs 29 and 30); and
- .6 note the Group's recommendation to request applicants to provide information on measurements of hydrogen gas in relation to the sufficient capacity of gas separation (paragraph 47).

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## ANNEX 1

### EIGHTH STOCKTAKING WORKSHOP ON THE ACTIVITY OF THE GESAMP-BALLAST WATER WORKING GROUP

6 to 10 February 2017, IMO, London, United Kingdom

#### AGENDA

- 1 Adoption of the agenda
- 2 Introduction and ways of working during the Workshop, housekeeping, timetable and GESAMP presentation
- 3 Introduction to the revised Guidelines for approval of ballast water management systems (G8)
- 4 Submission of new data on fresh water testing of BWMS with Final Approval
- 5 Precursors involved in the process of DBP production and TRO consumption
- 6 Criteria to determine when BWMS using drinking water should seek approval in accordance with the *Procedure for approval of ballast water management systems that make use of Active Substances* (G9)
- 7 Current status of transformation of the Methodology into GESAMP R&S document
- 8 Impact of the revision of Guidelines (G8) on Procedure (G9) and the Methodology
- 9 Future work<sup>2</sup>
  - .1 Amendment of human exposure scenarios – postponed from STW 7
  - .2 Implementation of the exposure scenario template for assessment of risk mitigation measures
  - .3 Supplementary tests with ballast water – postponed from STW 7
  - .4 Factors affecting neutralization – postponed from STW 7
  - .5 Mutagenicity and reproductive toxicity classification and potential applicability of the dose addition approach for mixtures – postponed from STW 7
  - .6 Secondary poisoning in relation to the bioconcentration factor
- 10 Any other business

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<sup>2</sup> **Note:** Tentative agenda item to be considered only time permitting after conclusion of agenda items 3 to 8.

## ANNEX 2

### DRAFT PROCEDURE FOR SUBMISSION OF NEW DATA ON FRESH WATER TESTING OF BALLAST WATER MANAGEMENT SYSTEMS WITH FINAL APPROVAL

The following new chapter is inserted after chapter 10 of the draft revised Methodology as set out in document MEPC 71/4/7/Add.1:

#### "11 PROCEDURE FOR SUBMISSION OF NEW DATA ON FRESH WATER TESTING OF BALLAST WATER MANAGEMENT SYSTEMS WITH FINAL APPROVAL

##### Testing method and criteria for evaluation

11.1 For the evaluation of new data on fresh water testing of BWMS with Final Approval, WET tests with three organisms from three different trophic levels, e.g. a micro-algae, a crustacean and a fish, are required in accordance with section 5.2 of Procedure (G9). The tests should be carried out according to the description in section 6.2.

11.2 In addition, the identification of Relevant Chemicals is required in accordance with section 4.1 of Procedure (G9) and should be carried out according to the description in section 3.2.3.

11.3 The tests mentioned in paragraphs 11.1 and 11.2 should be carried out taking into account all relevant QA/QC, including the evaluation of the quality criteria for each test. If these quality criteria are breached in the study results, the test reports will not be acceptable for the GESAMP-BWWG.

11.4 The GESAMP-BWWG evaluates the fresh water testing separately from the evaluation of new BWMS proposals for Basic and Final Approval, with the understanding that priority is always given to the new BWMS. If four or more new BWMS are submitted, the evaluation of new fresh water data will take place in a separate meeting of the GESAMP BWWG.

##### Submission procedure

11.5 The manufacturer should evaluate the results of fresh water testing in accordance with the criteria specified in paragraphs 11.1 and 11.2.

11.6 Upon completion of the evaluation in paragraph 11.5, the manufacturer should prepare an application for fresh water data evaluation and submit it to the Member of the Organization concerned. An application should only be made when the BWMS has previously received Final Approval. The Administration should be satisfied that there is no modification of the BWMS from the previous Final Approval at the submission of an application for fresh water data evaluation.

11.7 Upon receipt of an application, the concerned Administration should conduct a careful completeness check to ensure that the application satisfies the relevant provisions contained in Procedure (G9), as specified in paragraphs 11.1 and 11.2, and that it is presented in the format recommended in this Methodology. Administrations should check the quality and completeness of any application against the latest version of the Methodology, regardless of the version that had been used for the Basic and Final Approval of the BWMS.

11.8 When the Administration is satisfied with the application received, it should submit a proposal for approval to the Organization in accordance with the procedure in paragraphs 2.3.5 to 2.3.18. For such applications, a non-refundable registration fee should be paid in accordance with paragraph 2.3.7, immediately following receipt of the Letter of Agreement by the Organization."

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## ANNEX 3

### DRAFT CONTENTS OF PROPOSED GESAMP R&S DOCUMENT

Executive summary

Acknowledgements

#### **1 Background to GESAMP WG34 risk assessment approach**

1.1 Ballast water and invasive aquatic species (IAS)

1.2 The Ballast Water Management Convention (BWMC)

1.2.1 Procedure (G9)

1.3 Working Group 34 – GESAMP-BWWG

1.3.1 Terms of reference

#### **2 GESAMP-BWWG risk assessment: a tiered approach**

2.1 Environmental risk assessment

2.1.1 Marine Antifoulant Model for PEC calculation for Ballast Water

2.1.2 PEC/PNEC ratio

- General
- Near ship
- Surroundings

2.2 Human health risk assessment

2.2.1 Human exposure scenarios (HES)

2.2.2 Operations involving the crew and/or port State workers

- Delivery, loading, mixing or adding chemicals to the BWMS
- Ballast water sampling at the sampling facility
- Periodic cleaning of ballast tanks
- Ballast tank inspections
- Normal work on deck unrelated to any of the above

2.2.3 Situations in which the general public might be exposed to treated ballast water containing chemical by-products

- Recreational activities (swimming) in the sea
- Consumption of seafood exposed to treated ballast water

2.3 DNEL/DMEL Derivation

2.4 Risk Characterization Ratio (RCR) calculation

#### **3 Higher Tiers**

3.1 Environment

3.2 Human Health

**4 Future challenges / Recommendation**

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ANNEX 4

CALCULATION OF THE THEORETICAL PRODUCTION OF HYDROGEN GAS AGAINST THE FLOW RATE OF WATER PASSING THROUGH A HYDROGEN GENERATOR

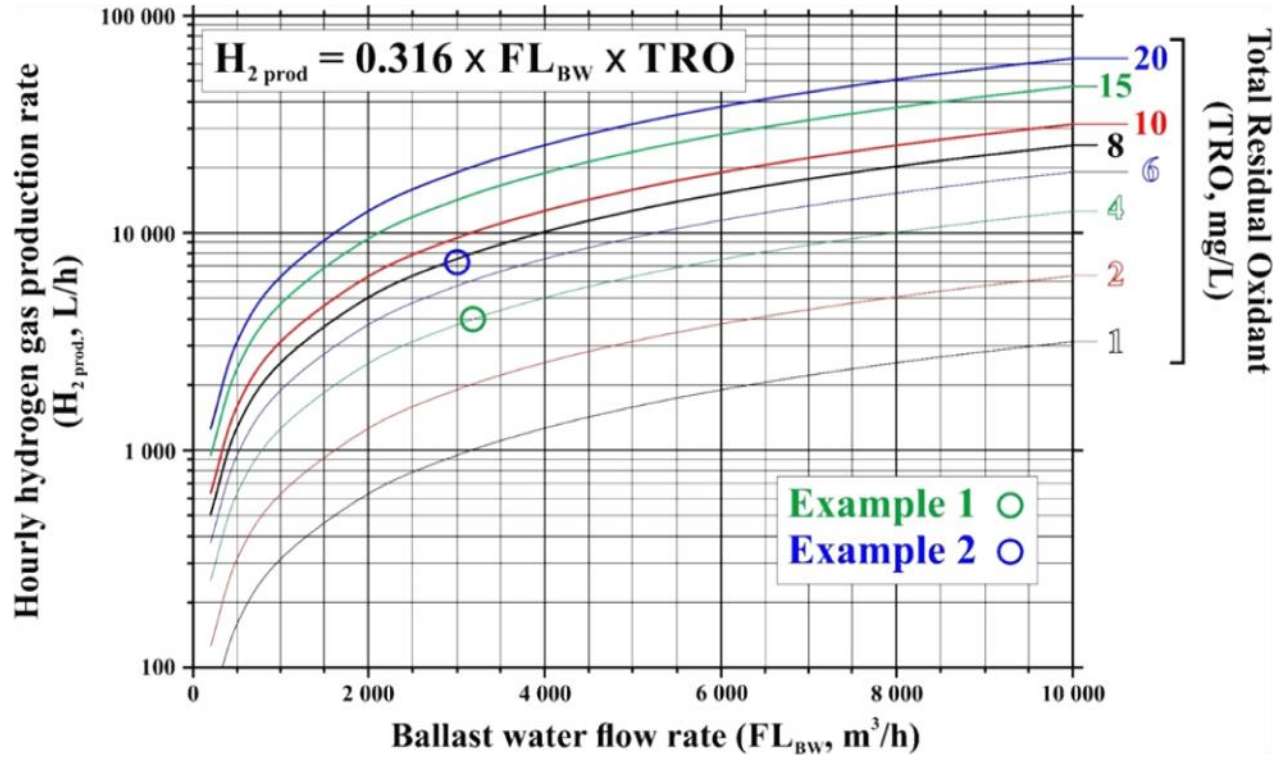


Figure 1: Graph of hydrogen gas production ( $H_2$ , in L/h) by electrochlorination as a function of ballast water flow rate ( $FL_{BW}$ , in  $m^3/h$ ), for total residual oxidant target concentration (TRO) of 1, 2, 4, 6, 8, 10, 15, and 20 mg  $Cl_2/L$ .

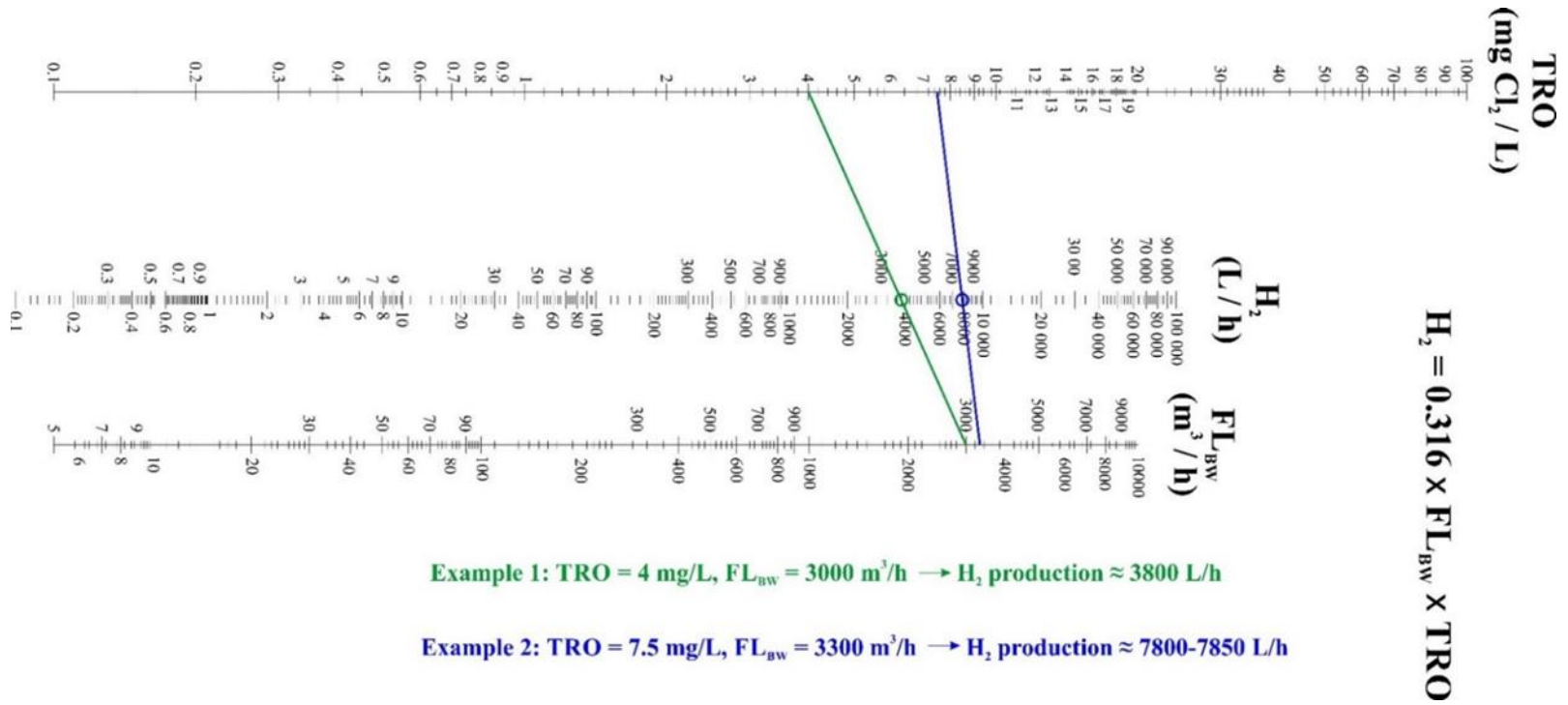


Figure 2: Nomogram for the calculation of hydrogen gas production (H<sub>2</sub>, in L/h) by electrochlorination as a function of total residual oxidant target concentration (TRO, in mg Cl<sub>2</sub>/L) and ballast water flow rate (FL<sub>BW</sub>, in m<sup>3</sup>/h)