**ANNEX 5**

**Resolution MEPC.175(58)**

**Adopted on 10 October 2008**

# INFORMATION REPORTING ON TYPE APPROVED BALLAST WATER MANAGEMENT SYSTEMS

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by the international conventions for the prevention and control of marine pollution,

RECALLING ALSO that the International Conference on Ballast Water Management for Ships held in February 2004 adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Ballast Water Management Convention) together with four Conference resolutions,

RECALLING FURTHER that, on entry into force, the Ballast Water Management Convention will require ships to install ballast water management systems, which meet the D-2 standard stipulated therein,

RECOGNIZING that the collection and dissemination of accurate information on type-approved ballast water management systems (BWMS) will be beneficial for all interested stakeholders,

HAVING CONSIDERED the recommendation made by the Sub-Committee on Bulk Liquids and Gases at its twelfth session,

1. INVITES Member States, when approving a ballast water management system in accordance with the Guidelines for approval of ballast water management systems (G8), to report the following information to the Organization:

.1 approval date;

.2 name of the Administration;

.3 name of the BWMS;

.4 a copy of the Type Approval Certificate and any enclosures, including a copy of, or details about access to, the results from land-based and shipboard testing and the procedures used, including ecotoxicological test results from ballast water management systems approved through Guidelines (G8);

.5 a description of the Active Substance(s), if employed; and

.6 identification of the specific MEPC report and paragraph number granting Final Approval 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).

2. INSTRUCTS the Secretariat to make such information available by an appropriate means.

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evaluated effluent limits using a BPT and a BAT standard, but since conventional pollutants will also be adequately controlled by these same effluent limits for which EPA applied the BPT and BAT tests, EPA determined that it was not necessary to conduct BCT economic tests.

Ballast Water Treatment is Technologically Available

EPA developed the BPT/BAT numeric discharge limitations for ballast water based on an assessment of the demonstrated performance of current ballast water treatment technologies. Based upon available data, EPA's Science Advisory Board (2011) determined that five ballast water management system types (listed below) have been demonstrated to meet the IMO D-2 discharge standard, when tested under the IMO G8 guidelines for approval of ballast water management systems (MEPC 2008), and will likely meet USCG Phase 1 standards (if tested under EPA's more detailed Environmental Technology Verification (ETV) Protocol).

These five types of ballast water treatment technologies include:

- Deoxygenation + cavitation;
- Filtration + chlorine dioxide;
- Filtration + UV;
- Filtration + UV + $TiO_2$; and
- Filtration + electro-chlorination.

Deoxygenation is a physical-chemical process that kills organisms by creating severe hypoxia (through lowered pressure via venturi or vacuum, or lowered partial pressure via sparging with inert gasses). Cavitation is a physical process that kills organisms by the high pressure, shear forces, and shock waves generated by the collapse of micro-vapor bubbles induced into the ballast water. Filtration accomplishes a variety of physical separation processes, including screening to remove sediment and larger organisms resistant to disinfection, reduction of organic matter to reduce oxidant demand, and reduction of turbidity to increase transmittance of UV radiation (EPA SAB, 2011). Chlorine dioxide and electro-chlorination disinfect ballast water using the chemical disinfectants chlorine dioxide and hypochlorite. In the latter, hypochlorite is generated by electrolytic processes using sea water as the source of ions. UV is a physical-chemical process that disinfects ballast water using photochemical reactions generated by ultraviolet light radiation. In the UV + TiO2 physical-chemical process, UV light also activates the surface of the titanium catalytic semiconductor, disinfecting ballast water using both photochemical and photocatalytic reactions.

In conducting its study, EPA's SAB (2011) used the following criteria to determine that the five ballast water treatment technologies were available and demonstrated to meet the standard in today's permit:

- The technical literature supported the fundamental use of the technology (*e.g.*, is it well documented that using the approach will safely and effectively remove, kill, or inactivate aquatic organisms).

.9 a recommended test and checkout procedure specific to the BWMS. This procedure should specify all the checks to be carried out in a functional test by the installation contractor and should provide guidance for the surveyor when carrying out the on board survey of the BWMS and confirming the installation reflects the manufacturer's specific installation criteria.

## 6 APPROVAL AND CERTIFICATION PROCEDURES

6.1 A BWMS which in every respect fulfils the requirements of these Guidelines may be approved by the Administration for fitting on board ships. The approval should take the form of a Type Approval Certificate of BWMS, specifying the main particulars of the apparatus and any limiting conditions on its usage necessary to ensure its proper performance. Such certificate should be issued in the format shown in appendix 1. A copy of the Type Approval Certificate of BWMS should be carried on board ships fitted with such a system at all times.

6.2 A Type Approval Certificate of BWMS should be issued for the specific application for which the BWMS is approved, e.g., for specific ballast water capacities, flow rates, salinity or temperature regimes, or other limiting conditions or circumstances as appropriate.

6.3 A Type Approval Certificate of BWMS should be issued by the Administration based on satisfactory compliance with all the test requirements described in Parts 2, 3 and 4 of the annex.

6.4 An Administration may issue a Type Approval Certificate of BWMS based on separate testing or on testing already carried out under supervision by another Administration.

6.5 The Type Approval Certificate of BWMS should:

.1 identify the type and model of the BWMS to which it applies and identify equipment assembly drawings, duly dated;

.2 identify pertinent drawings bearing model specification numbers or equivalent identification details;

.3 include a reference to the full performance test protocol on which it is based, and be accompanied by a copy of the original test results; and

.4 identify if it was issued by an Administration based on a Type Approval Certificate previously issued by another Administration. Such a certificate should identify the Administration that conducted the tests on the BWMS and a copy of the original test results should be attached to the Type Approval Certificate of BWMS.

6.6 An approved BWMS may be Type Approved by other Administrations for use on their vessels. Should a system approved by one country fail Type Approval in another country, then the two countries concerned should consult one another with a view to reaching a mutually acceptable agreement.

**List of Active Substance BWTS using oxidizing technologies** 9/23/11

| Company Name | Product Name | Type of Treatment | TRO | Method of TRO/TRC Measurement | Filter | Limiting Conditions | Corrosion Testing/Result |
|---|---|---|---|---|---|---|---|
| Kuraray Co., Ltd. | Kuraray/Microfade | Calcium Hypochlorite Injection | 2 mg/l as active chlorine | DPD (FRO + CRO = TRO) | Yes, unknown mesh size | | |
| MetaFil AS | OceanSaver | Cavitation, supersaturation, disinfection | 2.5 mg/l | DPD | Yes, unknown mesh size | | no description, reported as no corrosion affect |
| Degusa GmbH | SEDNA (using Peraclean Ocean) | Chemical Oxidation with acetic acid, peracetic acid, hydrogen peroxide | 150 mg/l | titration/MS | 50 µm | | |
| Mitsui Engineering | Special Pipe Hybrid PeraClean | Chemical Oxidation with acetic acid, peracetic acid, hydrogen peroxide | 80 mg/l total dose | metering pump | Yes, unknown mesh size | | 150 mg/l "severe" corrosion, 80 mg/l "allowable" |
| Ecochlor Inc. | Ecochlor | Chlorine Dioxide Injection | 5 mg/l Clo2, 19 mg/l sulfuric acid | Palintest ChlorDiox-Duo | 40 µm | | 28/32 days bare steel, seawater, reduced corrosion rate vs control, land based slight increase |
| AQUA Engineering C. | AquaStar | Electrochlorination | 10 mg/l TRO as Cl2 | DPD (FRO + CRO = TRO) | 30-50 µm | brackish and seawater test | seawater only, continuous immersion, no corrosion or coating degradation vs control |
| Greenship | Sedinox | Electrochlorination | 1 ppm (free active chlorine) | unknown | hydrocyclone | | none observed during Type Approval testing |
| Hyundai Heavy Industries | HiBallast | Electrochlorination | 10ppm | DPD | 50 µm | Applicable Range of Salinity: >15PSU, Applicable Range of Water Temp: 13-30 °C | no details in description, reported as no corrosion affect |
| Qingdao Sunrui | BalClor | Electrochlorination | 7.5 mg/l to 9.5 mg/l | elec current and salinity | 50 µm | | Reported to be MEPC 59/2/16, no change to corrosion, coating better than control, "immersed for 6 months" (docs confidential) |
| RWO | CleanBallast | Electrochlorination | 2 mg/l | DPD | 50 µm | | seawater only, no corrosion or coating degradation vs control |
| Samsung Heavy Industries | Purimar (NeoPurimar) | Electrochlorination | 10 mg/l (formerly 3 mg/l) | CLX, ORP meters | 50 µm | water w > 10 psu (or brine) | data confidential, 4 month cycling test control vs treated w 3 mg/l TRO, reported no corrosion or coating affect |
| Severn Trent De Nora | BalPure | Electrochlorination | 20 mg/l | DPD | 40 µm | 14 g/l chloride in water | literature references only for 5 mg/l Cl2 (reported testing to be conducted) |
| Siemens | SiCURE | Electrochlorination | 6 mg/l | ORP | 40 µm | | 40% increased corrosion of steel, high corrosion of stainless steel, continuous immersion only |
| Techross | Electro-Clean | Electrochlorination | 10 mg/l | DPD | none | | observation of test facility, corrosion reported to be reduced (because treatment eliminates MIC) |
| Qingdao Headway Technology | OceanGuard | Electrochlorination (w ultrasonic) | 2.0 mg/l | DPD | 50 µm | | Reported to be MEPC 59/2/16, no corrosion affect |
| ERMA FIRST ESK, SPA | ERMA FIRST | Electro-Chlorination | 10 mg/L (around 5 mg/l measured as TRO) | Hach Lang photometer | 20 µm hydrocyclone | > 6 PSU | not finished as of Final Approval Ap |
| RBT/Wilhelmsen | Unitor BWTS | Ozone and Electrochlorination | 1 mg/l | unknown | 40 µm | | not reported |
| Mitsui Engineering | Special Pipe Hybrid Ozone | Ozone Injection | 4 mg/l ozone | KI method | screen pre-filter type | fresh water not applicable | 97 days continuous immersion after single treatment, seawater only, no corrosion or coating degradation vs control |
| NK Company | NK-O3 BlueBallast | Ozone Injection | 7.5 mg/l TRO, 2.5 mg/l ozone | HACH CL17 (TRO), WEDECO HC500 (O3) | none | | G8, seawater only, none observed, some tests reduced vs control |
| JFE Engineering | JFE Ballast Ace | Sodium Hypochlorite Injection | 20 mg/l total dose, 10 mg/l | DPD | 50 µm | | |
| DESMI Ocean Guard AS | DESMI Ocean Guard | UV Ozone (ballasting and de-ballasting) | 0.4 mg/l total ozone dose | calculated from ozone generator | 40 µm | | confidential |