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Standard Test Method

Test to Determine the Potential Corrosion Effects of Ballast Water Treatment Systems on Ballast Tanks

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Foreword

Ballast water is carried by ships to control trim, draft, stability, or excessive stresses on the ship structure. Ballast water is typically carried in dedicated ballast water tanks located around cargo tanks/holds, in forepeak and aft peak tanks located near the bow and the stern of the ship. Because ballast water is taken on board from the surrounding port or coastal waters, it can contain a diverse assembly of marine life. When released into a new port, organisms in the ballast water can sometimes establish non-native populations, altering the local biosystem, becoming "biological invasions." Some biological invasions, commonly known as invasive aquatic species (IAS), have been determined to have a significant adverse impact to many of the world's coastal regions.

The majority of the current administration type-approved ballast water treatment technologies developed to satisfy Regulation D-2 of the International Convention for the Control and Management of Ship's Ballast Water and Sediments (MEPC 59/2/16)[1] make use of active substances. These substances may, depending on the substance, concentration, and exposure duration, have an adverse effect on the ballast tank coatings, ballast piping system, and/or anodes within the tank.

Within the Ballast Water Management Convention (yet to enter into force), which will become mandatory when 35 IMO[(1)] member states (the state under whose laws a ship is registered or licensed) representing 35% of the world's total ship gross tonnage ratify the Convention, regulations mandate the installation and use of ballast water treatment systems (BWTS) to remove alien organisms from the ballast water. While the Convention does not specifically state that these BWTS should not affect the corrosion resistance of the applied ballast tank coatings, ballast piping system, or anodes in the tanks, ship owners, builders, and insurers have expressed the need for such confirmation. Currently there is no independent information or test method to prove that there is no detrimental effect on the coating and other materials used within the ballast tank. The purpose of this standard is to provide such a test method.

The coatings applied today within ballast tanks are required to conform to the IMO Resolution MSC.215(82), "Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in All Types of Ships and Double-Side Skin Spaces of Bulk Carriers" (PSPC/WBT/BWT).[2] However, the Ballast Water Management Convention when ratified is also expected to require ballast water management systems in ships coated before the point in time when Resolution MSC.215(82) becomes mandatory under the IMO regulations.

This standard is intended for use by shipbuilding companies, shipping companies, ship personnel, coating companies, cathodic protection (CP) service providers, and ballast water treatment (BWT) suppliers to help prevent corrosion in ballast water tanks.

This standard has been prepared by NACE Task Group (TG) 452, "Testing of Coating Suitability, Anode Consumption, and Corrosion Evaluation with Use of BWT Systems," which is administered by Specific Technology Group (STG) 44, "Marine Corrosion: Ships and Structures," and sponsored by STG 03, "Coatings and Linings, Protective: Immersion and Buried Service," and STG 05, "Cathodic/Anodic Protection." It is issued by NACE under the auspices of STG 44.

In NACE standards, the terms *shall, must, should*, and *may* are used in accordance with the definitions of these terms in the *NACE Publications Style Manual.* The terms *shall* and *must* are used to state a requirement, and are considered mandatory. The term *should* is used to state something good and is recommended, but is not considered mandatory. The term *may* is used to state something considered optional.

(1) International Maritime Organization (IMO), 4 Albert Embankment, London SE1 7SR, United Kingdom.

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Section 1: General

1.1 This standard test method is designed to test the effect of long-term exposure of treated water on an approved coating system and other materials such as ballast piping and anodes located within a ballast tank.

1.2 The standard is based on the existing PSPC/WBT and ISO(2) 2812-2,[3] modified to incorporate the effects of BWTS.

1.3 All of the results for the coatings tested with this standard are specific to that coating system or generic type; a positive result does not indicate that a BWTS is appropriate for all coating types.

1.4 A number of parameters within the IMO PSPC/WBT that require further clarification and reduction in tolerances have been taken into account in this standard.

1.5 For uncoated materials, this standard is based on ASTM(3) G31,[4] ASTM B117,[5] and UN-MTC(4) C.1—Part III, Section 37.[6]

Section 2: Treated Ballast Water

2.1 Current testing in accordance with the PSPC/WBT uses seawater as the test medium. However, a large number of ports in the world have fresh water, for example:

- Hamburg, Germany
- Antwerp, Belgium
- Mississippi River, U.S.A.
- Shanghai, China
- All other Yangtze River ports (24 deep water ports), China
- Shenzhen, China
- Philadelphia, Pennsylvania, U.S.A.
- Baltic Sea

The chemical reactions of the BWTS can work differently in seawater than in fresh water. Based on the premise that untreated fresh water is more aggressive to coatings by producing osmotic blistering, whereas untreated seawater is most aggressive with respect to corrosion, to maintain consistency with the PSPC/WBT, this standard requires the use of seawater as a minimum.

Testing in fresh water should also be used as an alternative for BWT systems in which the active components are known to have an extended life when compared to seawater—ozone systems, for example.

2.2 The seawater used to perform the tests that provided the basis for developing this standard is artificial, with no organic matter or species. Artificial seawater equivalent to, or the seawater in, ASTM D1141[7] may be used.

This substitute ocean water may be used for laboratory testing when a reproducible solution simulating seawater is required, such as tests for oil contamination, detergency evaluation, and corrosion testing.

Note: The lack of organic matter, suspended matter, and marine life in this solution does not permit unqualified acceptance of test results as representing performance in actual ocean water. When corrosion is involved, the results obtained from laboratory tests may not approximate those secured under natural testing conditions that differ greatly from those in the laboratory, and especially when effects of velocity, salt atmospheres, or organic constituents are involved. In addition, the rapid depletion of reacting elements present in low concentrations suggests caution in direct application of results.

For fresh water ASTM D1193[8] Type IV should be used.

(2) International Organization for Standardization (ISO), 1 ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland.
(3) ASTM International (ASTM), 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959, U.S.A.
(4) United Nations, 760 United Nations Plaza, New York City 10017, U.S.A.