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Pictorial Standard for Underwater Evaluation of Fouling Degree on Ship Hulls

ABSTRACT

One of the key factors affecting ship performance, particularly fuel consumption and associated GHG (Green House Gas) emissions, is the degree of biofouling on the immersed hull and propeller(s). Rates of biofouling accumulation vary considerably, depending on the suitability, age and physical condition of the coating system(s) applied to the hull, the voyaging, anchoring and lay up patterns of the ship, and the geographical regions where these take place.

Since the rate of biofouling development is often highly variable and difficult to predict, demand for more consistent and reliable descriptions provided by in-water hull inspections has increased. This pictorial-based standard is designed to facilitate more consistent descriptions of the degree of biofouling on a vessel hulls, however it is not meant to define the overall fouling condition of the wetted hull.

KEYWORDS

Marine, Hull, Vessel, Biofouling, Pictorial, Inspection, IMO MEPC, Assessment, Monitor, TG 475

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Foreword

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.

One of the key factors affecting ship performance, particularly fuel consumption and associated GHG (Green House Gas) emissions, is the degree of biofouling on the immersed hull and propeller(s). Rates of biofouling accumulation vary considerably, depending on the suitability, age and physical condition of the coating system(s) applied to the hull, the voyaging, anchoring and lay up patterns of the ship, and the geographical regions where these take place.

Since the rate of biofouling development is often highly variable and difficult to predict, demand for more consistent and reliable descriptions provided by in-water hull inspections has increased.

Apart from the need to measure and manage ship performance by cost-effective methods, demand for obtaining more reproducible and comparable readings of biofouling distribution around a ship's hull has also increased in response to IMO[(1)] guidelines (MECP.207(62)[1] of July 2011) for reducing the spread of harmful marine species via the biofouling vector, and the associated progressive implementation of hull biosecurity assessment and inspection requirements by an increasing number of States and port authorities (2007-ongoing).

This pictorial-based standard is designed to facilitate more consistent descriptions of the degree of biofouling on a vessel hull, however it is not meant to define the overall fouling condition of the wetted hull.

The aim of the proposed standard is to provide a mechanism to help standardize any biofouling descriptions that are based on underwater observations, photographs and other inspection records, so that more comparable and reproducible data and information can be collated for monitoring and assessment purposes, regardless of inspection location or country.

Stakeholders who stand to gain direct benefits from the adoption and widespread use of this standard include ship owners and operators, fleet managers and charterers, and the suppliers of ship performance monitoring packages. Providers of in-water hull inspection and grooming services will also benefit by being able to offer more reliable and consistent survey results.

Ship operators, charterers, Port State authorities and other stakeholders with biosecurity assessment needs will also stand to benefit from the accrual of more reliable and consistent hull inspection records, monitoring data and improved hull management, such as timely application of grooming or other remedial strategies. Widespread use of a standard that improves the quality of biofouling records will enable all stakeholders to work more effectively towards achieving the considerable economic and environmental benefits from improved hull management.

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Section 1: General

1.1 Introduction

1.1.1 This standard provides a pictorial system to help identify and describe the degree of biofouling on a ship, in terms of its gross composition and level of coverage, as viewed, photographed or otherwise recorded underwater.

1.2 Pictorial based degree of biofouling

1.2.1 The standard provides eight sets of pictorial-based expressions of biofouling degree, for assisting the reporting and evaluation needs of in-water inspections that include a biofouling survey. No interpretation or guidance is provided with respect to the potential level of hull resistance or likelihood of invasive species infestation afforded by particular degree(s) of biofouling, and no guidance is offered regarding the particular degree(s) of biofouling that warrant or justify its removal by hull grooming or other remedial treatment.

Section 2: Definitions

Biofouling: The accumulation of aquatic organisms such as micro-organisms, plants, and animals on surfaces and structures immersed in or exposed to the aquatic environment. Biofouling can include microfouling and macrofouling (refer IMO MEPC.207(62))[1]:

Microfouling: Microscopic organisms including bacteria and diatoms and the slimy substances that they produce. Biofouling comprised of only microfouling is commonly referred to as a slime layer.

Macrofouling[(2)]: Large, distinct multicellular organisms that are visible to the human eye, including filamentous algae and fronding seaweeds, hydroids and anemones (types of soft coral), sea mosses (bryozoans), tube worms, barnacles, mussels, oysters, sea squirts and sponges.

Biofouling Survey: Any methodical inspection where the objective is to examine, photograph and/or otherwise document and record the degree of biofouling on a ship's hull, for the purpose of gauging and appraising its gross composition and level of coverage on hull areas or niches of interest.

Hull: The entire shell of the ship that extends from its keel to the main deck, including the bow, stern, flat bottom, vertical sides, counters and skeg(s).

In-Water Inspection: Any survey that is executed by a competent, suitably equipped and qualified diving team, for the purpose of examining and recording the status of a ship's hull and running gear, at a location or time where the option for slipping or dry-docking is unavailable, impractical, unsafe or unaffordable. Various tests, digital pictures and/or video records are usually taken and provided to the ship's operator for in-house use or forwarding to other organization(s).

Marine Surveyor: For a biofouling survey, this term covers any marine surveyor or scientist who has been formally recognized or otherwise accredited by a government agency or respected organization for attending biofouling inspections, so as to provide independent QA/QC guidance, expert knowledge, advice or feedback.

[(2)] N.B. When assessing macrofouling coverage in an image, any green, red or brown algae with filaments or tufts less than 4 mm may be included as microfouling (e.g. in Figure 3 of this standard for 'Heavy Microfouling', the bottom photograph shows emerging algae with green and part-bleached filaments less than 4 mm long, while the top photograph shows well-developed tufts of algae with lengths approaching and exceeding 10 mm). This matches recent New Zealand guidelines for assessing and recording biofouling on vessel hulls (MPI, 2014)[2]. If the zone in question is the vessel's waterline and/or boot-top area, another approach can be to record the amount of filamentous algae coverage separately, instead of part of the micro- or macrofouling (e.g. Davidson et al. 2014)[3].