Global TestNet Member‘s Methodology Comparison Charts: Biofouling Assessment
June 2025

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3. Abbreviations

AFS: AntiFouling System
IAS: Invasive Aquatic Species
IMO: International Maritime Organization
IWCS: In Water Cleaning Systems
MGPS: Marine Growth Prevention System

4. Background

4.1. Introduction

Effective biofouling management is increasingly recognized as a critical measure for both environmental protection and optimizing operational performance. When properly implemented, it contributes to marine biosecurity by limiting the spread of Invasive Aquatic Species (IAS) and enhances hydrodynamic efficiency, thereby improving fuel consumption and reducing greenhouse gas (GHG) emissions. Conversely, insufficient biofouling control results in increased hull resistance, higher fuel consumption, greater GHG output, and elevated operating costs. These adverse effects place growing economic burdens on shipowners and operators, particularly in light of increasingly stringent environmental regulations and efficiency standards.

In recognition of the multifaceted importance of biofouling control, the International Maritime Organization (IMO) has initiated the development of a legally binding international instrument on biofouling control, which has been included in its future work programme.

To support the effective implementation of future requirements, Global TestNet members have actively collaborated by sharing testing methodologies and evaluation practices. This joint effort aims to ensure consistency and comparability in the assessment of technologies addressing the risks posed by invasive and harmful aquatic organisms transported via ships' hulls and niche areas.

This document has been compiled based on data collected since the 2024 GloFouling Partnerships Meeting and will continue to be updated through subsequent technical meetings and internal surveys coordinated by Global TestNet. These efforts seek to establish harmonized evaluation protocols across testing facilities, enhance the transparency and reliability of results, and support evidence-based policy development and sustainable marine environmental governance.

4.2. Documentation regulating testing of biofouling

Testing carried out by member facilities is done according to the following documentation:

- IMO Guidelines for the Control and Management of Ship’s Biofouling to Minimize the Transfer of Invasive Aquatic Species (Res. MEPC.378(80))
- MEPC.1/Circ.792: Guidance for Minimizing the Transfer of Invasive Aquatic Species as Biofouling (Hull Fouling) for Recreational Craft.
- MEPC.1/Circ.918: Guidance on In-Water Cleaning of Ships’ Biofouling
- PPR 11/5/2: Procedure for Testing and Certification of In-Water Cleaning Companies (ICS and BIMCO)
- PPR 10/5: Proposed guidelines for Testing Ship Biofouling In-Water Cleaning Systems (ICES)
- ISO 20679 (2024): Ships and Marine technology – Marine Environment Protection – Testing of Ship Biofouling In-Water Cleaning Systems
- NACE SP21421 (2017): Pictorial Standard for Underwater Evaluation of Ship Hulls.
- Guidance Document on Aqueous-Phase Aquatic Toxicity Testing of Difficult Test Chemicals (2019)
- Biofouling Management Guidance for Recreational Craft (2025)
- MEPC 83/INF.3: Proposed guidelines for the evaluation of efficacy of Marine Growth

4.3. Test Organisations

Test facilities active in the Global TestNet have evolved and changed overtime and for this reason only the information from active facilities is included here (e.g. NIOZ & GCDC integrated into Control Union, closing of DHI Singapore). Active testing organizations are listed on Global TestNet website. Organization may be active worldwide but only reference to the country of their headquarter in noted (AU=Australia, CN=China, DE=Germany, DK=Denmark, JP=Japan; NL=The Netherlands, NO=Norway, RoK=Republic of Korea, CH = Switzerland, TUR=Türkiye, USA=United States of Americas, UK=United Kingdom)

5. Inspection

5.1. Biofouling Inspection Methodologies

This section presents a comparative overview of biofouling inspection methodologies employed across different testing facilities. It outlines the inspection approaches, the extent of hull surface coverage inspected, techniques used to identify IAS, and the regulatory or technical guidelines referenced during the inspection process.

Table 1: Biofouling inspection methods and reference guidelines.

Test Facility	Inspection approach	Proportion/part of hull inspected	Identification of invasives	Guidelines used for inspections
Biofouling Solutions (AU)	Dry inspections (vessel maintenance facilities and on heavy-lift vessels), Wet inspections using divers and ROVs.	Dry inspections (>90%), Wet inspections (70-80%)	Confident with taxonomic identifications of most of IAS. Have access to eDNA labs.	Resolution MEPC.378(80)[1], DAFF, BNZ, CSLC, All States/Territories of Australia, Brazil, Woodside, Chevron.
Endures (NL)	Dry dock/ In water divers (not regularly)	Part	Confident with taxonomic identifications of most of IAS. Have access to eDNA labs.	Resolution MEPC.378(80), PPR 11/5/2[2] (currently checking more)
KIOST (RoK)	Dry inspections (vessel maintenance facilities and on heavy-lift vessels), Wet inspections using ROVs.	Part	Traditional taxonomy / eDNA	Resolution MEPC.378(80)
PML Applications (UK)	Dry dock inspections and wet inspections (divers & ROV) for biosecurity and coating performance	Dry inspections (~90%), Wet inspections (70-80%) depending on grating status	Very confident on western european fouling organisms. Capability with major watch list species depending on region. In-house eDNA capability.	Resolution MEPC.378(80), UK MoD specific methods, and bespoke methods as required.
SHOU (CN)	Dry dock / In water divers	Part	Traditional taxonomy / eDNA	Resolution MEPC.378(80)

[1] 2023 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (IMO)
[2] Procedure for testing and certification of in-water cleaning companies (submitted by ISC and BIMCO)

6. Evaluation of In-Water Cleaning System (IWCS)

6.1. Testing Organisation Capabilities

This section provides a comparative overview of the technical readiness and testing scope of each facility for evaluating in-water cleaning systems. Facilities are categorized by their capabilities for land-based and in-situ testing, with details on their capacity to conduct key evaluation items.

Table 2: IWC test organisation capabilites: Land-based and *in-situ* testing

Test facility	Land-based testing			In situ testing	Proportion / Part of hull inspected	Reference
	Test setup	Cleaning / grooming / Efficacy/ Impacts on AFS	Capture efficacy	Cleaning/ grooming/ Efficacy/ Impacts on AFS		
Biofouling Solutions (AU)	YES	YES	YES	YES	Depends on experimental design and testing requirements	PPR 11/5/2
DHI (DK)	YES	YES	YES	YES	At least 10%	PPR 10/5[3], PPR 11/5/2 , Own methods
Endures (NL)	YES	YES		YES	LB : Full area / In situ: depends on experimental design	Resolution MEPC.378(80), PPR 11/5/2
KIOST (RoK)	YES	YES / Under development but not included in the impact on AFS	YES/Under development	Yes/under development but not included in the impact on AFS.	Flat hull	MPEC.1/Circ.918[4], Own methods
KOMERI (RoK)	YES	N/A	YES	YES		PPR 10/5, PPR 11/5/2, Own methods
NIVA (NO)	YES	YES / Under development	YES/Under development	Under development	LB: flat hull. In situ: not specified yet.	PPR 10/5, Own methods
PML Applications (UK)	YES	YES	YES	YES	Variable	PPR 11/5/2, Own method, UK MoD
SGS (CH)	NO			YES	Only inspecting discharges in the environment	MPEC.1/Circ.918, PPR 11/5/2, AMMP-NACE

[3] Proposed guidelines for Testing Ship Biofouling In-Water Cleaning Systems (ICES)
[4] Guidance on In-Water Cleaning of Ships' Biofouling

6.2. Evaluation Approaches

This section provides an overview of practices employed by test facilities for identifying invasive aquatic species and assessing effluent toxicity.

Table 3: Taxonomic evaluations and toxicity testing

Test facility	Identification of Invasives / Taxonomy	Eflfluent toxicity (Parameters tracked)
Biofouling Solutions (AU)	Traditional taxonomy/ eDNA	No
DHI (DK)	Detailed analysis	WET tests on multiple trophic levels / Variety of physicochemical parameters
Endures (NL)	Detailed analysis/ eDNA if requested	N/A
KIOST (RoK)	Detailed analysis/ eDNA	WET tests on multiple trophic levels / Microplastics and chemical analyses
KOMERI (RoK)	Detailed analysis	WET tests on multiple trophic levels
NIVA (NO)	Under development: ATP measurement of biological activity	Chemical analyses. Microplastics and WET tests on request.
PML Applications (UK)	Yes	Yes
SGS (CH)	Detailed analysis/ eDNA	WET tests on multiple trophic levels / testing on coral possible / Microplastic analysis and unlimited chemical analysis capabilities

7. Comparative Overview of Facility Capabilities for AFS, MGPS, and Ecotoxicity Testing

This section provides a comparative summary of the capabilities of test facilities with regard to three key assessment areas: Antifouling System (AFS) testing**,** Marine Growth Prevention System (MGPS) testing**,** and ecotoxicity testing. It outlines the type of test setups employed, environmental parameters configured, reference guidelines applied, and the availability of ecotoxicity testing at each facility.

Table 4: Summary of test facility capabilities for AFS, MGPS, and ecotoxicity assessments

Test facility	AFS tesitng			MGPS testing		Ecotoxicity testing	
	Test setup (e.g., static exposure / rotating drums)	Environmental parameters monitoring set up (e.g., temperature, replicates)	Guidelines	Test setup	Guidelines	Test Availabitliy	Guidelines
Biofouling Solutions (AU)	YES	YES	NO	NO		NO	NO
DHI (DK)	Static exposure	1-3 depnding on setup		MEPC 83 INF3[5].	MEPC 83 INF3.	YES	ISO, OECD, OSPAR
Endures (NL)	YES	YES	ECHA/ASTM	MEPC 83 INF3.	MEPC 83 INF3.		N/A
KIOST (RoK)					N/A	YES	ISO, OECD
KOMERI (RoK)				Under development	MEPC 83 INF3.		
PML Applications (UK)	YES	YES		YES	MEPC 83 INF3.	YES	Bespoke/Own method
SGS (CH)	Static exposure	Triplicates / tropical waters (Singapore) / high biofouling pressure	ASTM - 3623-78a(2020)	Under development	MEPC 83 INF3.	YES	ISO and OECD + ecotox testing on corals

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