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Ships and marine technology — Marine environment protection: performance testing of oil skimmers

Part 2: Light and medium viscosity oil

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 2, *Marine environment protection*.

This second edition cancels and replaces the first edition (ISO 21072-2:2009), of which it constitutes a minor revision.

The main changes compared to the previous edition are as follows:

- due to the withdrawal of ISO 21072-1, the focus of this second edition of ISO 21072-2 is to address testing oil skimmers in both low and medium viscosities of oil, in lieu of the procedures provided in the original ISO 21072-1 and ISO 21072-2, which addressed testing in moving and static water conditions, respectively. This brings ISO 21072-2 in line with the remaining ISO 21072-3, dealing with high viscosity oil.

A list of all parts in the ISO 21072 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 21072 standardizes the performance testing of oil skimmers used in marine pollution control.

Some oil skimmers have previously been performance tested under non-standard conditions and procedures, with declared performance parameters being of limited value to the end user, especially under field conditions.

ISO 21072 provides methods for carrying out and recording results of full-scale tests for a skimmer under a variety of test conditions, where there is limited or no access to specialist test facilities.

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Ships and marine technology — Marine environment protection: performance testing of oil skimmers —

Part 2: Light and medium viscosity oil

1 Scope

This document specifies a methodology for establishing quantitative performance data for oil skimmers for recovery of oil with light and medium viscosity (up to 50 000 cP), so the end user can objectively judge, compare, and evaluate the design and performance of different skimmers. The methodology applies to testing in a basin and requires control of oil properties and oil slick characteristics.

The method is applicable to all types of skimmers provided that the equipment dimensions are within the physical limitations of the test basin. The test procedure provides the full-scale test results for the unit tested, under controlled conditions, and for one or more classes of oil. Attention is drawn to the care required when applying the test results to predict skimmer performance under field conditions.

For dedicated/in-built systems, the test procedures outlined in this document can only be used for the skimming device as such, not for the entire skimming system.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16165, *Ships and marine technology — Marine environment protection — Vocabulary relating to oil spill response*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16165 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

data collection period

period of time within the *steady-state period* (3.9) when recovered fluid is collected for establishing performance data

3.2

debris

solid or semi-solid substance that could interfere with the operation of a spill control system

3.3
emulsification factor

EF
amount of water emulsified into the oil as a result of skimming/pumping processes, not including water originally in the test fluid

Note 1 to entry: It is expressed as a decimal fraction between 0 and 1.

3.4
fluid recovery rate

FRR
total volume of fluid recovered per time

Note 1 to entry: It is expressed in cubic metres per hour.

3.5
recovery efficiency

RE
ratio of test fluid (oil or emulsion) recovered per unit time

Note 1 to entry: It is expressed as a percentage.

3.6
oil recovery rate

ORR
volume of test fluid (oil or emulsion) recovered per unit time

Note 1 to entry: It is expressed in cubic metres per hour.

3.7
oily phase

oil that is water-free or incorporates emulsified or encapsulated water that does not readily separate out

3.8
oil skimmer

skimmer
mechanical device used to remove oil from the water surface

3.9
steady-state period

period of time during which the test conditions and operating parameters are constant or within acceptable variability ranges

4 Test facility requirements

This document is applicable to any test arrangement that allows for the control and monitoring of the test conditions.

The test facility shall be designed and equipped to control the following parameters.

- **Oil properties.** The facility shall be able to maintain the oil properties for the duration of the test. Oil analytical equipment shall be available for measuring oil properties (see 9.2).
- **Air and water temperature.** Testing may be carried out at any water temperature, provided that requirements with respect to oil properties are met. The test temperature shall always be well above the pour point of the oil, unless the purpose is to assess the collection of non-flowing/semi-solid oil. The facility shall be able to maintain the water temperature in the test basin at a selected test temperature with a maximum variation of ± 2 °C.
- **Oil slick thickness.** The test facility shall incorporate means of measuring oil slick thickness before and after the test, with a proven accuracy of ± 2 %.

- **Measuring tanks.** In order to provide for sufficient replicates during the test process, the test facility shall incorporate a sufficient number of calibrated tanks to accurately measure FRR, ORR, and water uptake. The tank volumes shall correspond to the expected recovery rate of the unit to be tested, so as to provide data collection periods of sufficient duration and with sufficient measuring accuracy (see [10.1](#)).

5 Clearance requirements

Throughout testing, there shall be sufficient clearance between the skimmer and the tank walls and any containment device, so as not to restrict oil flow to the skimmer or otherwise impede normal operation of the unit.

Since the necessary clearance varies with oil viscosity and unit recovery rate, adequate oil in-flow to the skimmer shall be demonstrated in each specific case, through oil flow observations or slick thickness measurements. Ensure that the clearance between the tank wall and outer limit of the skimmer is at no point less than 50 % of the greatest width (diameter or equivalent dimension) of the skimmer under test.

In considering the depth of the water on which the oil layer is floating, the skimmer or its oil/water interface shall at all times be able to free-float on the water. The clearance between the unit and the tank floor shall be sufficient to not interfere with normal operations of the skimmer.

6 Test parameters

6.1 General

Testing shall establish quantitative performance data for the unit as a function of the following parameters:

- test oil properties;
- oil slick thickness;
- skimmer operating parameters;
- debris interference.

6.2 Test oil properties

Perform testing with oils meeting the specifications shown in [Table 1](#).

To minimize problems associated with flow characteristics of the test oils, carry out testing at water temperatures at least 3 °C above the pour point of the test oil.

Measure oil and emulsion viscosity at two of the three shear rates: 1 s⁻¹, 10 s⁻¹, or 100 s⁻¹. The third shear rate may be determined by interpolation or extrapolation.

In this document, oil is characterized as non-emulsified (fresh) even if it contains up to 20 % volume fraction of water. Such oil may be used for testing as a "water-free" oil provided that the viscosity is within the ranges specified in [Table 1](#).

All oils and emulsions may be reused provided that the properties of the test fluids remain within the ranges defined in [Table 1](#).