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Ships and marine technology — Model test method for propeller cavitation noise evaluation in ship design —

Part 2: Noise source localization

Navires et technologie maritime — Méthode d'essai sur modèle pour évaluer le bruit de cavitation des hélices dans la conception des navires —

Partie 2: Localisation de la source de bruits

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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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 8, *Ship design*.

A list of all parts in the ISO 20233 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

Propeller cavitation is the major noise source in commercial ships. The propeller cavitation noise can be assessed by experimental and/or numerical methods in propeller design stage. The numerical methods, such as computational fluid dynamics (CFD) or empirical formulae, might be a good alternative to propeller cavitation noise evaluations. However, the model tests are still used widely for research on propeller cavitation noise.

The objective of the model test is to reduce the propeller noise in ship design by evaluating propeller cavitation noise characteristics at the design phase. Localizing the noise sources in the design stage, as well as predicting its noise levels, might be very helpful. ISO 20233-1 addresses the prediction of propeller noise levels. In order to specify the location of noise source, visual observation of cavitation is the most practical way in view of spatial resolution and efficiency, as the main source of hydrodynamic noise in merchant ship is cavitation. In addition to this observation, noise source localization technique using hydrophone array is under development for verifying the observed noise source location[1]. Thus this document devotes to the source localization method as a new part of a model test method for propeller cavitation noise evaluation in ship design.

The estimation methods of the propeller noise via model tests were widely studied for a long time and can be used in the shipbuilding industry nowadays. However, the noise source localization is easily accomplished by cavitation observation. This document also serves to provide an example of protocols for acoustic localization which is a relatively new research area.

Ships and marine technology — Model test method for propeller cavitation noise evaluation in ship design —

Part 2: Noise source localization

1 Scope

This document specifies a model test method for propeller cavitation noise evaluation in ship design, focusing mainly on the noise source localization.

The procedure comprises the model test set-up, noise measurements, data processing and source localization. The target noise source being propeller cavitation, this document describes the test set-up and conditions to reproduce the cavitation patterns of the ship, which is the same as in ISO 20233-1. The noise measurements are performed using a hydrophone array for the source localizations. Therefore, the instrumentation of the hydrophone array is also addressed, as well as a suitable array signal processing of the measured data. Finally, a method to visualize and to interpret the results is presented.

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 20233-1:2018, *Ships and marine technology — Model test method for propeller cavitation noise evaluation in ship design — Part 1: Source level estimation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
acoustic centre
position where all the noise sources are co-located as a single point source

Note 1 to entry: The acoustic centre is the centre of the expected cavitation extent.

3.2
background noise
noise from all sources other than the source under test