

Prefatory Note

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Special Feature Articles on “Dealing with Risk”

Risk in the Maritime Sector

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In recent years, discussion using risk has come to be widely used in the maritime field. As part of this trend, risk assessment was introduced in the offshore development field from the second half of the 1970s, and HSE activities, *etc.* are now making an important contribution to safety assessments. In the ship field as well, use of FSA, GBS and related approaches is continuing to expand in forums of discussion in the IMO. Therefore, this paper presents the basic concepts of safety and risk which are used in the maritime field, and explains the actual techniques of risk assessment and future expansion of its fields of application.

Necessity of New Framework to Support Social Implementation of Maritime Autonomous Surface Ships

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The social implementation of MASS is becoming a reality, and the time has come to consider a new framework that supports the social implementation of truly new technologies/solutions that transcend conventional frameworks. It is necessary to establish new ways of thinking such as functional safety and systems engineering, for the maritime industry. As one of these methods, this paper proposes the concept of vulnerability.

Fundamentals and Applications for Risk-Based Design *Research Institute, ClassNK*..... 21

This paper introduces the fundamentals of risk-based design for structures, which has attracted attention recently, and its applications to rule development. First, structural reliability theory is explained, after which the characteristics of risk-based design are explained from the perspective of an optimum design problem. Next, the GBS-SLA (Goal Based Standards-Safety Level Approach) Interim Guideline which is a risk-based structural rule development guideline of the IMO, is introduced. Finally, as an example of application of risk-based design, a development method for fatigue strength criteria and its technical issues are described.

Technical Topics

Development of Local Scantling Formulae for Plate Members

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Plate members are basic constituent elements of the ship hull structure, and local strength equations for out-of-plane (lateral) loading are extremely critical. This paper introduces the following content of a study which was conducted to review these equations in order to develop dimensional equations that are backed by theoretical equations and have a clearer correspondence with damage. First, the effect of in-plane stress on the fully-plastic moment and additional lateral loading was formulated as a basis for the dimensional equations, and after comparison with an elasto-plastic FEM analysis based on residual deflection criteria, dimensional equations using 2-point plastic hinge formation criteria were proposed. In addition, the influence of in-plane stress was interpolated between those of a longitudinally framed structure and a transversely framed structure, and a composite influence factor which considers this interpolation in combination with the aspect ratio correction factor was formulated.

World's First Zero Emission Battery-Propelled Tanker and Outlook for the Future

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Reduction of emissions of greenhouse effect gases (GHG) as a measure against global warming is an urgent challenge. One solution for target achievement in ships is battery propulsion systems, which are increasingly used in automobiles. Kawasaki Heavy Industries delivered a large capacity battery propulsion system for coastal ships for the world's first zero emission battery-propelled tanker, the "Asahi," which was ordered by Asahi Tanker Co., Ltd. and completed at the end of March 2022. This paper introduces the background of development, the overview and features of the battery propulsion system, and the outlook for the future.

Introduction to "Guidelines for Additive Manufacturing (3D Printing)"

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In recent years, the development of metallic products using additive manufacturing (AM) technologies, notably 3D printing, has spread rapidly, and in particular, AM technology is used in fields such as automobiles, aerospace, medicine and industrial machinery. Although there are still few examples of manufacturing using this technology in the shipbuilding field, full-scale introduction of AM technology is also expected in the shipbuilding field in the future, since the issues of cost reduction and productivity improvement are also the same in the shipbuilding. Against this backdrop, ClassNK issued guidelines which arrange the requirements for approval of metallic ship products, etc. manufactured using AM technology. This paper introduces the content of the Guidelines.

Estimation and Use of Wave Information for Ship Monitoring

.....*Research Institute, ClassNK*..... 79

Active development of real ship monitoring technologies is underway in the ship propulsion and structure field. Estimation and use of wave information is important in ship monitoring technologies, but use must be based on the respective strengths and limitations of this information. This paper first presents a brief explanation of the observation devices and analysis techniques which have generally been widely adopted and a bird's eye comparison of the features of the main types of wave information, and also discusses the applicability of each type of wave information to ship monitoring.

This article introduces recent topics discussed at the International Maritime Organization (IMO). In this issue, a summary of the decisions taken at the 78th Marine Environment Protection Committee (MEPC 78) and 105th Maritime Safety Committee (MSC 105) is provided.

