Investigation of Structural Response Due to Impact Load on the Small Water Plane Area Twin Hull Autonomous Surface Vehicles

AF Zakki, A Triwiyatno, B Sasmito - 2020 - pdfs.semanticscholar.org

The main objective of the research was to investigate the structural response of The Small Water Plane Area Twin Hull Autonomous Surface Vehicles (SWATH-ASV) due to the impact load. The impact load was defined as the drop phenomena that might be occurred while SWATH-ASV is being carried and transported. The behavior of the absorbed energy in several drop scenarios also was studied. Numerical simulation was performed using nonlinear finite element method to obtain the numerical simulation data. The size of the …

Proceeding of the 6th International Seminar on

OCEAN AND COASTAL ENGINEERING, ENVIROMENTAL AND NATURAL DISASTER MANAGEMENT

ISOCEEN 2018

Surabaya, Indonesia 7-8 November 2018

Editor

Suntoyo, Silvianita, and Agro Wisudawan

Department of Ocean Engineering
Faculty of Marine Technology
Institut Teknologi Sepuluh Nopember

Proceedings

Proceedings of the 6th International Seminar on Ocean and Coastal Engineering, Environmental and Natural Disaster Management

November 4-5, 2018, in Surabaya, Indonesia

Editors: Suntoyo and Silvianita

Affiliation: Department of Ocean Engineering Institut Teknologi Sepuluh Nopember, Indonesia

ISBN: 978-989-758-455-8

Conference Link: http://isoceen.its.ac.id/

Foreword: The 6th International Seminar on Ocean and Coastal Engineering, Environmental and Natural Disaster Management (ISOCEEN) 2018 was held in Surabaya, Indonesia, on 7 - 8 November 2018. The Organizing Committee acknowledged for their dedicated preparation over many years that led to successful seminar with broad participant. A record 102 attendees from 6 countries (Indonesia, Japan, Netherlands, Malaysia, Portugal, Vietnam) gathered at Swiss-Belinn Hotel Manyar Surabaya, Indonesia to discuss research and application in the field of Ocean, Offshore, Coastal engineering, Environmental and Disaster Management. This event is held by cooperation among Institut Teknologi Sepuluh Nopember (ITS) especially Department of Ocean Engineering, Tohoku University, Japan, TU Delft, Netherlands, UNESCO-IHE Delft, Netherlands and HZ University of Applied Sciences, Netherlands. The 39 selected, peer reviewed papers contained in this Proceedings cover the topics including the field of Ocean, Offshore, **(More)**

Volumes:

Vol. 1 - 978-989-758-455-8

Papers Authors

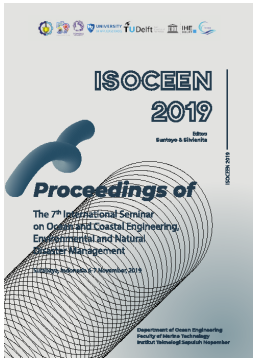
Show All papers

Sarjito Joko Sisworo , Aulia Windyandari and Ahmad Fauzan Zakki

DETAILS OF RELATED PROCEEDINGS

Other proceedings of same conference

Proceedings of the 7th International Seminar on Ocean and Coastal Engineering,



Environmental and Natural

SCITEPRESS - SCIENCE AND TECHNOLOGY PUBLICATIONS, LDA.

RESOURCES

Proceedings

Papers

Authors

Ontology

CONTACTS

Science and Technology Publications, Lda
Avenida de S. Francisco Xavier, Lote 7 Cv. C,
2900-616 Setúbal, Portugal.

Phone: +351 265 520 185 (National fixed network call)
Fax: +351 265 520 186
Email: info@scitepress.org

EXTERNAL LINKS

PRIMORIS

INSTICC

SCITEVENTS

CROSSREF

PROCEEDINGS SUBMITTED FOR INDEXATION BY:

dblp

Ei Compendex

SCOPUS

Semantic Scholar

Google Scholar

Microsoft Academic

Paper

Investigation of Structural Response Due to Impact Load on the Small Water Plane Area Twin Hull Autonomous Surface Vehicles (SWATH-ASV)

In **Proceedings of the 6th International Seminar on Ocean and Coastal Engineering, Environmental and Natural Disaster Management - ISOCEEN,** 144-148, 2018 , Surabaya, Indonesia

Investigation of Structural Response Due to Impact Load on the Small Water Plane Area Twin Hull Autonomous Surface Vehicles (SWATH-ASV)

Ahmad Fauzan Zakki[1], Aris Triwiyatno[2] and Bandi Sasmito[3]

[1]Naval Architecture Department, Engineering Faculty, Diponegoro University, Indonesia
[2]Electrical Engineering Department, Engineering Faculty, Diponegoro University, Indonesia
[3]Geodetical Engineering Department, Engineering Faculty, Diponegoro University, Indonesia

Keywords: Structural Response, Impact Load, SWATH-ASV.

Abstract: The main objective of the research was to investigate the structural response of The Small Water Plane Area Twin Hull Autonomous Surface Vehicles (SWATH-ASV) due to the impact load. The impact load was defined as the drop phenomena that might be occurred while SWATH-ASV is being carried and transported. The behavior of the absorbed energy in several drop scenarios also was studied. Numerical simulation was performed using nonlinear finite element method to obtain the numerical simulation data. The size of the damage of the SWATH-ASV was estimated as a design consideration for the structure strength. The external dynamics parameters which include as the contact point location and drop velocity is being considered on the simulation analysis. The internal energy and deformation size which is caused by the drop phenomena will be discussed.

1 INTRODUCTION

Rapid development in the growth of numerical simulation technology, capability of computational speed and relatively large memory capacity makes designers able to create and evaluate of new product designs performance in a virtual world.

Through the finite element method, complex simulations able to provide any valuable information for the design and development of reliable new products like those that have already existed and even better as an improvement on the existing product capabilities. The manufacturer confirmed that this method is very useful, as this method has facilitated them enormously in achieving a better productivity at lower unit costs. This method is also capable for supporting manufacturers to develop engineering components that are easily produced and to create any products that are efficient in terms of material expenditure.

In 2018, an autonomous surface vehicle (ASV) has been developed by Zakki et. al. (2018) which is adopted the Small Water plane Area Twin Hull (SWATH) technology for the hull form. The ASV was developed to support bathymetry survey activities in coastal area. In the development of the SWATH-ASV, the designers attempt to obtain a product that has reliable quality for its hull components. For achieving these quality standards, the SWATH-ASV products must meet the requirements of being able to withstand loads that can result in high stress structures (Ali, et.al, 2011). Therefore this study is focused on the investigation of structural responses that were subjected for impact loading, especially in the drop phenomena. The structure load is the impact load that is occurred when the SWATH-ASV product is dropped from a certain height. Therefore it can be predicted that the developed ASV product has reliable structural integrity when it drops from the certain height during the survey activities.

2 DROP TEST AND FINITE ELEMENT ANALYSIS

2.1 Drop Test

Durability assessment that is important to be conducted for the development of new products is a

144

Authors: Ahmad Fauzan Zakki [1] ; Aris Triwiyatno [2] and Bandi Sasmito [3]

Affiliations: [1] Naval Architecture Department, Engineering Faculty, Diponegoro University, Indonesia ; [2] Electrical Engineering Department, Engineering Faculty, Diponegoro University, Indonesia ; [3] Geodetical Engineering Department, Engineering Faculty, Diponegoro University, Indonesia

Keyword(s): Structural Response, Impact Load, SWATH-ASV.

Abstract: The main objective of the research was to investigate the structural response of The Small Water Plane Area Twin Hull Autonomous Surface Vehicles (SWATH-ASV) due to the impact load. The impact load was defined as the drop phenomena that might be occurred while SWATH-ASV is being carried and transported. The behavior of the absorbed energy in several drop scenarios also was studied. Numerical simulation was performed using nonlinear finite element method to obtain the numerical simulation data. The size of the damage of the SWATH-ASV was estimated as a design consideration for the structure strength. The external dynamics parameters which include as the contact point location and drop velocity is being considered on the simulation analysis. The internal energy and deformation size which is caused by the drop phenomena will be discussed.

Paper

Tidal and Seasonal Variability Circulation Patterns in the Coral Reef System, Berau Continental Shelf, East Kalimantan

In **Proceedings of the 6th International Seminar on Ocean and Coastal Engineering, Environmental and Natural Disaster Management - ISOCEEN,** 9-15, 2018 , Surabaya, Indonesia

Tidal and Seasonal Variability Circulation Patterns in the Coral Reef System, Berau Continental Shelf, East Kalimantan

Ayi Tarya[1], A. J. F. Hoitink[2] and M. van der Vegt[3]

[1]Department of Oceanography, Faculty of Earth Sciences and Technology, Bandung Institute of Technology, Bandung 40132, Indonesia

[2]Hydrology and Quantitative Water Management Group, Wageningen University, Droevendaalsesteeg 3, 6708 PB Wageningen, The Netherlands

[3]Institute for Marine and Atmospheric Research Utrecht/IMAU, Department of Physical Geography, Utrecht University, P.O. Box 80115, 3508 TC Utrecht, The Netherlands

Keywords: Tidal Variability, Seasonal, Coral Reef System, East Kalimantan.

Abstract: The present study examines tidal and seasonal circulation dynamics in the coral reefs, Berau Continental Shelf, East Kalimantan which exist multiple reef passages by using analysis field data and a three-dimensional hydrodynamic model. The predicted M2 tidal currents, velocities, salinity profiles and sea surface elevation show a good agreement with observed. The model results demonstrate the reef-scale circulation patterns on tidal to monsoonal variation. On the seasonal timescale, the circulation patterns strongly reflect the Monsoon seasonality. The coral reefs exposed by river plume when southwesterly wind prevailed. In this period, the vertical structure of salinity displays a thin stratified water column. The velocity profiles exhibit a classical estuarine circulation with outflow at the top layer and inflow at the bottom layer. For the tidal periods, the tidal currents present complex structures at the reef passages and exhibit the tidal eddies generated by irregularities reef gaps. The flow in the centre of the reef passage is often opposed to the flow near the reef boundaries. A mixed vertically water column occurs during spring tide. During neap tide, the water column structures form a thin stratified on top layer and a classical estuarine circulation for velocity profiles. At the cross-section of reef passages, the lateral velocities develop the two-cell circulation with upward flow at reef shores and an axial convergence (downward flow) at mid-reef passage during flood and reverse pattern during ebb. At the reef slope of continental shelf edge, the model results suggest an upward flow that generated by a Bernoulli effect during flood tide, which may be lifting the nutrient-rich water to the reef passage.

1 INTRODUCTION

Circulation dynamics in coral reef systems can be driven by a number of forcing functions such as waves, tides, wind and density gradients (Andrews and Pickard, 1990; Kraines, 1998; Wolanski, et.al, 1988; Wolanski and Thomson, 1984; Hoitink, 2004; Monismith, et.al, 2006). The associated length scales are ranging from an individual coral colony to the reef, island, and basin scale (Monismith, 2007). In coral reef systems, the hydrodynamics play a crucial role in ecological and biogeochemical processes including dispersal of larval fish and corals (Black, 1993), supply of nutrients to reef organisms (Falter, et.al, 2004), renewal of oxygen (Nakamori, et.al, 1992), delivery of phytoplankton (Yahel, et.al, 1998), the dynamics of zooplankton (Yahel, et.al, 2005), transport of terrigenous sediments (Storlazzi, 2004; Haitink and Hoekstra, 2003), and the distribution of mobile reef fishes (Clarke, et.al, 2005). Therefore, to understand biological and ecological patterns and function in coral reef systems, it is critical to identify the circulation and transport processes.

The importance of wind and waves on circulation patterns in coral reef environments has been investigated extensively (e.g. Wolanski and Thomson, 1984; Hoitink and Hoekstra, 2003; Wolanski and Pickard, 1985; Yamano, et.al, 1998; Presto, et.al, 2006; Kench, et.al, 2009). Wolanski and Thomson (1984), Wolanski and Pickard (1985)) reported that the subtidal sea level dynamics and currents are found to be highly coherent with the local wind variability in the Great Barrier Reef. Trade wind-driven processes are found to be the dominant

9

Authors: Ayi Tarya [1] ; A. J. F. Hoitink [2] and M. van der Vegt [3]

Affiliations: [1] Department of Oceanography, Faculty of Earth Sciences and Technology, Bandung Institute of Technology, Bandung 40132, Indonesia ; [2] Hydrology and Quantitative Water Management Group, Wageningen University, Droevendaalsesteeg 3, 6708 PB Wageningen, The Netherlands ; [3] Institute for Marine and Atmospheric Research Utrecht/IMAU, Department of Physical Geography, Utrecht University, P.O. Box 80115, 3508 TC Utrecht, The Netherlands

Keyword(s): Tidal Variability, Seasonal, Coral Reef System, East Kalimantan.

Abstract: The present study examines tidal and seasonal circulation dynamics in the coral reefs, Berau Continental Shelf, East Kalimantan which exist multiple reef passages by using analysis field data and a three-dimensional hydrodynamic model. The predicted M2 tidal currents, velocities, salinity profiles and sea surface elevation show a good agreement with observed. The model results demonstrate the reef-scale circulation patterns on tidal to monsoonal variation. On the seasonal timescale, the circulation patterns strongly reflect the Monsoon seasonality. The coral reefs exposed by river plume when southwesterly wind prevailed. In this period, the vertical structure of salinity displays a thin stratified water column. The velocity profiles

Paper

MSI Analysis of a Roro Ferry Design

In **Proceedings of the 6th International Seminar on Ocean and Coastal Engineering, Environmental and Natural Disaster Management - ISOCEEN,** 71-76, 2018 , Surabaya, Indonesia

MSI Analysis of a Roro Ferry Design

Ketut Suastika[1], Heri Setyawan[1], Dedi B. Purwanto[1] and Xuefeng Zhang[2]

[1]Department of Naval Architecture, Faculty of Marine Technology, Institut Teknologi Sepuluh Nopember (ITS), Surabaya, Indonesia

[2]School of Marine Science and Technology, Tianjin University, China

Keywords: Comfort Level, MSI Analysis, Relative Motion Spectrum, Roro Ferry, Vertical Acceleration.

Abstract: Crew and passengers' comfort is one of the main objectives in the design of a ferry. A parameter quantifying it is the so-called motion sickness incidence (MSI). In this study, the comfort level of a roro ferry design is assessed for which the vessel's vertical acceleration and the MSI were used as quantitative parameters. The voyage area is the seas around Adaut, Saumlaki and Letwurung in the Eastern part of Indonesia. The response characteristics of the vessel were calculated using a diffraction theory. The vertical acceleration and the MSI were determined from the vessel's relative motion. The predicted vertical acceleration is 1.18 m/s^2 or equal to 0.12 g, where g is the gravitational acceleration. Although the vertical acceleration is 20% below the maximum recommended one of 0.15 g, the discomfort level is, according to ISO 2631-1: 1997, classified as uncomfortable. Furthermore, the predicted MSI is approximately 15%, which is larger than the maximum recommended one of 10%. Further consideration of the design and/or operating location is recommended.

1 INTRODUCTION

Crew and passengers' comfort is one of the main objectives in the design of ferries. A parameter quantifying it is the so-called motion sickness incidence (MSI), which concept was first propsied by O'Hanlon and McCauley (1974) in the early 1970s. A definition of the MSI is as follows: the percentage of passengers who vomit within an exposure time of two hours. Improvement of comfort level and the consequence reduction of MSI have always been considered as the most important factors in the design of passenger ships (Campana et al., 2009; Diez and Peri, 2010).

Piscopo and Scamardella (2015) gives an overview of the historical development of the concept of MSI and the similar concept, called vomiting incidence (VI), developed by Lawther and Griffin (1987). The development started from a consideration of a simple vertical sinusoidal motion (O'Hanlon and McCauley, 1974) to irregular waves making an arbitrary angle to a moving vehicle, including population characteristics (age, gender). It turns out that the vessel's vertical acceleration dominantly determines the motion sickness incidence (O'Hanlon and McCauley, 1974; Lawther and Griffin, 1987; ISO, 1997; Lloyd, 1998; Cepowski, 2012; Piscopo and Scamardella, 2015).

The purpose of this study is to analyse a given ferry design regarding its comfort level by estimating the vessel's vertical acceleration and the value of the MSI, which are then compared with recommended standard values. The analysis results can serve as feedback to further consider the design and/or the operating location of the ferry.

Furthermore, case studies of full-scale design in which detail calculations of vertical acceleration and MSI are discussed, are still lacking. The present results can enrich the literature on MSI.

2 SHIP PARTICULARS AND WAVE DATA

The ship particulars are summarized in Table 1. The lines plan and general arrangement are shown in Figs. 1 and 2, respectively (Safitraa, 2017; Setyawan, 2018).

The intended operating location of the ferry is the seas around Adaut, Saumlaki and Letwurung in the Eastern part of Indonesia (see Figs. 3 and 4). The representative significant wave height is 2.28 m and the average zero up-crossing wave period is 5.95 s

71

Authors: Ketut Suastika [1] ; Heri Setyawan [1] ; Dedi B. Purwanto [1] and Xuefeng Zhang [2]

Affiliations: [1] Department of Naval Architecture, Faculty of Marine Technology, Institut Teknologi Sepuluh Nopember (ITS), Surabaya, Indonesia ; [2] School of Marine Science and Technology, Tianjin University, China

Keyword(s): Comfort Level, MSI Analysis, Relative Motion Spectrum, Roro Ferry, Vertical Acceleration.

Abstract: Crew and passengers' comfort is one of the main objectives in the design of a ferry. A parameter quantifying it is the so-called motion sickness incidence (MSI). In this study, the comfort level of a roro ferry design is assessed for which the vessel's vertical acceleration and the MSI were used as quantitative parameters. The voyage area is the seas around Adaut, Saumlaki and Letwurung in the Eastern part of Indonesia. The response characteristics of the vessel were calculated using a diffraction theory. The vertical acceleration and the MSI were determined from the vessel's relative motion. The predicted vertical acceleration is 1.18 m/s2 or equal to 0.12 g, where g is the gravitational acceleration. Although the vertical acceleration is 20% below the maximum recommended one of 0.15 g, the discomfort level is, according to ISO 2631-1: 1997, classified as uncomfortable. Furthermore, the predicted MSI is approximately 15%, which is larger than the maximum recommended one of 10%. Furt (More)