PERFORMANCE OF DOUBLE ACTING TANKER DURING ASTERN IN ICE CONDITION

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A project report submitted in partial fulfilment of the requirement for the award of the degree of Master of Science (Ship and Offshore Engineering)

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JUNE 2016
Dedicated to...

My beloved mother Zabidah binti Zainudin,
My beloved father Arifin bin Yatim,
My beloved wife Miftahul Jannah binti Mohamad,
My beloved son Muhamad Ar Rayyan bin Muhamad Ridzuan,

Universiti Teknologi Mara,

Marine Technology Center.
ACKNOWLEDGEMENT

In preparing this thesis, I was in contact with many peoples, academicians, and practitioners. They have contributed towards my understanding and thoughts. In particular, I wish to express my sincere appreciation to my supervisor, Dr. Eng. Jaswar Koto, for encouragement, guidance, critics and friendship. Without his continued support and interest, this thesis would not have been the same as presented here.

I am also indebted to Universiti Teknologi Mara (UiTM) for funding my master study. And also thanks to librarians at Universiti Teknologi Malaysia (UTM) for their assistance in supplying the relevant literatures.

My fellow postgraduate students should also be recognised for their support. My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space. I am grateful to all my family members.
ABSTRAK

The purpose of this study is to investigate the performance of double acting tanker (DAT) during astern in ice condition. The design of ship is based on the existing design known as Ship-A which is the tanker that already used in the market. The performance of ship has been evaluated for moving astern in different ice level condition. The design of ship is designed using SolidWorks and Maxsurf. The design from SolidWorks format is used in CFD simulations by ANSYS to evaluate the performance of ship. New ship design known as Ship-B has been developed based on design on Ship-A with certain modification at stern hull. The effect of ship geometry was studied and resistance of ship were highlighted. Results were compared between data of Ship-A and Ship-B come out with discussion about the relationship of stern hull geometry with resistance of ship.
# Table of Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION</td>
<td>ii</td>
<td></td>
</tr>
<tr>
<td>DEDICATION</td>
<td>iii</td>
<td></td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>iv</td>
<td></td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>v</td>
<td></td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>vi</td>
<td></td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vii</td>
<td></td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xi</td>
<td></td>
</tr>
<tr>
<td>LIST OF SYMBOLS</td>
<td>xiv</td>
<td></td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>xv</td>
<td></td>
</tr>
</tbody>
</table>

1 INTRODUCTION  1

1.1 Background of study  1
1.2 Problem Statement  2
1.3 Objective  2
1.4 Scopes of Study  3

2 LITERATURE REVIEW  4

2.1 Introduction  4
2.2 Past researcher  4

3 METHODOLOGY  10

3.1 Introduction  10
7.4 Boundary conditions 53
7.5 Solution 53

8 RESULTS AND DISCUSSION 55
8.1 Introduction 55
8.2 Ship Design using SolidWorks 55
8.3 Ship Design using Maxsurf 57
8.4 Mesh sequences 60
8.5 Fluid flow through hull surface 61
8.6 Wave pattern 64
8.7 Ship resistance 67
8.8 Stern hull modification 69

9 CONCLUSION AND RECOMMENDATION 71
9.1 Conclusion 71
9.2 Recommendation 72

REFERENCES 73
Appendices A - B 77-78
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE NO.</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Ship parameter of MT Uikku</td>
<td>7</td>
</tr>
<tr>
<td>2.2</td>
<td>Maximum ship speed attainable at full power in astern mode</td>
<td>8</td>
</tr>
<tr>
<td>2.3</td>
<td>Hull resistance augmentation in 18mm level ice in astern mode</td>
<td>8</td>
</tr>
<tr>
<td>2.4</td>
<td>Hull resistance augmentation in 29mm level ice in astern mode</td>
<td>8</td>
</tr>
<tr>
<td>2.5</td>
<td>Average value of the model ice properties</td>
<td>9</td>
</tr>
<tr>
<td>4.1</td>
<td>List of double acting tanker (DAT) power by Azipod</td>
<td>16</td>
</tr>
<tr>
<td>6.1</td>
<td>Fluid properties used in the simulations</td>
<td>54</td>
</tr>
<tr>
<td>6.2</td>
<td>ANSYS Fluent setups for k-ω SST transition model.</td>
<td>54</td>
</tr>
<tr>
<td>8.1</td>
<td>Comparison resistance by meshing type</td>
<td>60</td>
</tr>
<tr>
<td>8.2</td>
<td>Ship resistance in ice level with different speed while moving astern</td>
<td>67</td>
</tr>
<tr>
<td>8.3</td>
<td>Resistance coefficient for different speed in different ice level</td>
<td>68</td>
</tr>
<tr>
<td>8.4</td>
<td>Comparison data for Ship-A and Ship-B</td>
<td>70</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE NO.</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Location of ice actions¹</td>
<td>1</td>
</tr>
<tr>
<td>2.1</td>
<td>MT Uikku in level ice²</td>
<td>5</td>
</tr>
<tr>
<td>2.2</td>
<td>Ice breaking capability of DAT²</td>
<td>5</td>
</tr>
<tr>
<td>2.3</td>
<td>Speed of vessel against ice thickness for MT Mastera³</td>
<td>6</td>
</tr>
<tr>
<td>2.4</td>
<td>Thick ice against speed curve⁷</td>
<td>9</td>
</tr>
<tr>
<td>3.1</td>
<td>Flow chart for thesis methodology</td>
<td>11</td>
</tr>
<tr>
<td>4.1</td>
<td>Bulbous bow for common tanker²</td>
<td>13</td>
</tr>
<tr>
<td>4.2</td>
<td>Ice breaking bow²</td>
<td>14</td>
</tr>
<tr>
<td>4.3</td>
<td>Stern hull design of Vasily Dinkov tanker⁵</td>
<td>14</td>
</tr>
<tr>
<td>4.4</td>
<td>Propeller milling the ice level</td>
<td>15</td>
</tr>
<tr>
<td>4.5</td>
<td>MT Uikku³</td>
<td>17</td>
</tr>
<tr>
<td>4.6</td>
<td>Stern design for model vessel²</td>
<td>18</td>
</tr>
<tr>
<td>4.7</td>
<td>General arrangement of double acting tanker Tempera³</td>
<td>19</td>
</tr>
<tr>
<td>4.8</td>
<td>General Arrangement of MT Vasily Dinkov⁵</td>
<td>19</td>
</tr>
<tr>
<td>4.9</td>
<td>MT Mikhail Ulyanov⁶</td>
<td>20</td>
</tr>
<tr>
<td>4.10</td>
<td>Common design with pod hanger</td>
<td>21</td>
</tr>
<tr>
<td>5.1</td>
<td>Characteristic and properties parts of a hull.</td>
<td>23</td>
</tr>
<tr>
<td>5.2</td>
<td>Hull and ice interaction¹</td>
<td>26</td>
</tr>
</tbody>
</table>
5.3 The h-v curves determined from the full scales tests of four vessels.  
5.4 Kelvin wake pattern behind a moving object.  
5.5 Schematic illustration of a boundary layer at a flat plate.  
5.6 Coordinate system showing the 6 degrees of freedom of a rigid body.  
5.7 Stern part modification  
6.1 Cell centered, a) Vertex centered, b) Control volumes.  
6.2 Geometries of mesh element.  
6.3 Wrong edge association in mesh generation.  
6.4 a) Good quality and b) Poor quality boundary layer meshes.  
6.5 a) Positive and b) Negative Hexahedral cell.  
6.6 a) Gradual and b) Abrupt node distribution.  
6.7 a) Low and b) High aspect ratio hexahedral cells.  
6.8 a) Normal and b) Skewed hexahedral cells.  
6.9 a) Normal positive and b) Deformed by small angles hexahedral cells.  
7.1 Dimensions of computational domain.  
7.2 Mesh application interface.  
7.3 Schematic illustration of the FLUENT mesh structure.  
7.4 Boundaries of the computational domain.  
8.1 Isometric view of Ship-A.  
8.2 Hull top view of Ship-A.  
8.3 Front view of Ship-A.  
8.4 Back view of Ship-A.  
8.5 Size surface for ship design.
8.6 Perspective view of ship. 58
8.7 Profile view of ship. 58
8.8 Plan view of ship. 59
8.9 Body plan view of ship. 59
8.10 Plot of comparison resistance for different mesh. 60
8.11 Contour plot of pressure distribution while moving astern. 61
8.12 Contour plot of pressure distribution at side view. 61
8.13 Velocity vector through the hull surface. 62
8.14 Velocity vector through the hull surface at side view. 62
8.15 Contour plot of pressure distribution at ship speed, Vs = 1.0 m/s. 63
8.16 Contour plot of pressure distribution at ship speed, Vs = 2.0 m/s. 63
8.17 Contour plot of pressure distribution at ship speed, Vs = 3.0 m/s. 64
8.18 Contour plot of pressure distribution at ship speed, Vs = 4.0 m/s. 64
8.19 Contour wave pattern at speed, Vs = 1.0m/s. 65
8.20 Contour wave pattern at speed, Vs = 2.0m/s. 65
8.21 Contour wave pattern at speed, Vs = 3.0m/s. 66
8.22 Contour wave pattern at speed, Vs = 4.0m/s 66
8.23 Plot ship speed against ship resistance. 67
8.24 Plot of resistance coefficient against speed. 69
LIST OF SYMBOLS

\( d \) - Diameter
\( F \) - Force
\( g \) - Gravity = 9.81 m/s
\( T \) - Thrust
\( R \) - Resistance
\( v \) - Kinematic viscosity
\( \sigma \) - Ice flexural strength
\( h \) - Ice thickness
\( \mu \) - Viscosity
\( A \) - Area
\( \rho \) - Density
\( L \) - Length
\( L_{OA} \) - Length overall
\( L_{PP} \) - Length between perpendicu\( l \)ars
\( L_{WL} \) - Wetted length
\( \Omega \) - Angular velocity
\( P \) - Pressure
\( V \) - Velocity
\( T \) - Draught
\( B \) - Beam
\( D \) - Depth
\( \varepsilon \) - Dissipation
## LIST OF APPENDICES

<table>
<thead>
<tr>
<th>APPENDIX</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Hydrostatics Data at DWL from Maxsurf</td>
<td>77</td>
</tr>
<tr>
<td>B</td>
<td>Curves of Ship Area from Maxsurf</td>
<td>78</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

1.1 Background of study

The increasing of shipping activities through the Northern Sea Route (NSR) and growth of oil and gas activities in Arctic and Sub-Artic regions required suitable design of ice-going ships and planning operations in ice. The characteristic of ice should be noted depends on locations of ice, form of ice level, ice ridges and icebergs. Figure 1.1 shows the typical geographical regions where the ice actions are of current concern.

Figure 1.1: Location of ice actions
Design of ice-going ships requires considering the performance, adequate hull and strength of machinery and good functioning of the ship in ice condition and open water condition. Nowadays, the ice-going ships has been develop that called as Double Acting Tanker (DAT) which is can run astern more efficiency than ahead in ice condition\(^2\).

There is a lot of research finding the optimum design of hull for best performance of double acting tanker in ice condition during astern. In addition, the lacks of research about DAT in ice condition during astern also motivate us to do the case study for performance of DAT. The existing research has been doing the analysis of performance of DAT with different angle of stern design. Hence, to finding better design of stern hull and optimum performance of tanker, this thesis has been doing

1.2 **Problem Statement**

The running in astern mode of DAT in ice condition will give effect to thrust, wake and ice cutting performance. Beside that the design of stern hull will gives impact to the performance of DAT

1.3 **Objective**

The objectives of this research are:

i. To evaluate hull performance of double acting tanker during astern operation.

ii. To analyse the performance of double acting tanker during astern in ice condition using different ice level.
REFERENCES


