THE ANNALS OF "DUNAREA DE JOS" UNIVERSITY OF GALATI
FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
2011

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TOWING TANK EXPERIMENTS FOR A SURFACE PIERCING NACA0012 HYDROFOIL

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ABSTRACT

Free-surface flow around a surface piercing NACA0012 hydrofoil is experimentally investigated in the Towing Tank of the Naval Architecture Faculty at "Dunarea de Jos" University of Galati. The test conditions are: Froude numbers: 0.32, 0.40, 0.48, 0.56, and 0.64, corresponding to Reynolds numbers: $2.869x10^5$, $3.587x10^5$, $4.304x10^5$, $5.021x10^5$ and $5.739x10^5$. The measurements includes drag and free surface elevation on hydrofoil surface. Wake and wave formation are filmed and presented. For low Froude numbers a Kelvin pattern with no separation is observed, and for higher values the separation region translates to downstream with spilling and plunging breaking waves.

Keywords: towing tank test, NACA0012, free-surface flow, drag forces, breaking waves

REFERENCES

[1]. **Metcalf, B., et al.,** *"Unsteady free surface wave-induced boundary-layer separation for a surface-piercing NACA 0024 foil: towing tank experiments"*, Journal of Fluids and Structures. 22, 77–98, 2006.

[2]. **Metcalf, B., et al.,** *"Experimental Investigtion of Wave-induced Separation Around a Surface-Piercing NACA0024 Hydrofoil"*, 26th American Towing Tank Conference, Webb Institute, Glen Cove, New York,. 22, 23-24 July, 2001.

[3]. **Longo, J., et al.,** *"Solid/free-surface juncture boundary layer and wake"*, Experiments in Fluids, 25, pp. 283-297, 1998.

[4]. **Jeong, U.C., et al.** *"Numericl Investigation on the Turbulent and Vortical Flows Beneath the Free Surface Around Struts*, Twenty-First Symposium on Naval Hydrodynamics, pp. 794-808, 1997.

[5]. **Pogozelski, E., et al.,** *"The Flow Structure Around a Surface-Piercing Strut"*, Physics of Fluids, vol. 9, no. 5, pp. 1387-1399, 1997.

[6]. **Taneda, S., et al.,** *"The Necklace Vortex of the Ship"*, bulletin of Research Institute for Applied Mechanics, Kyushu Univ., no. 31, pp. 17-28, 1969.

[7]. **Chow, S.K.,** *"Free-surface Effects on Boundary Layer Separation on Vertical Struts"*, PhD Thesis, The University of Iowa, 1967.

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TOWING TANK TESTS FOR THE DTMB 5415 COMBATANT HULL

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ABSTRACT

Experimental fluid dynamics research at "Dunarea de Jos" University Towing Tank is conducted for understanding the physics of high speed ship and supporting validation of simulations methods. Measurements methodology, procedures and results are presented for most typical towing tank tests using a 3.232 m geosym of naval combatant DTMB model 5415, which is an established ITTC benchmark case. The tests include resistance, sinkage and trim. The facility and measurement systems are briefly described

Keywords: towing test, resistance, model-scale data, geosym, Froude method, ITTC

REFERENCES

[1]. **Pinkster, J.A.** "*Aspects of Model Tests and Computations for Ships and Other Structures in Waves"*, WEMT 98, Rotterdam, 1998.

[2]. **Toda, Y., Stern, F., Longo, J.,** "*Mean-Flow Measurements in the Boundary Layer and Wake and Wave Field of a Series 60 CB = 0.6 Ship Model – Part 1: Froude Numbers 0.16 and 0.316"*, Journal of Ship Research Vol. 36, pp.360-77, 1992.

[3]. **Longo, J.,** "*Yaw Effects on Model-Scale Ship Flow"*, Ph.D. Thesis, Department of Mechanical Engineering, University of Iowa, 1996.

[4]. **Van, S.H. et al**., "*Experimental Investigation on the Flow Characteristics around Practical Hull Forms"*, Proceedings of Osaka Conference, 1998.

[5]. **Van, S.H. et al.,** "*Flow measurement around a model ship with propeller and rudder"*, Experiments in Fluids, pp. 533-545, 2006.

[6]. **Olivieri A. et al.,**" *Towing tank experiments of resistance, sinkage and trim, boundary layer, wake, and free surface flow around a naval combatant INSEAN 2340 model"*, IIHR Tech. rep. no. 421, The University of Iowa, Iowa City, USA, 2001.

[7]. **Stern, F., J. Longo, J.,** "*Uncertainty Assessment for Towing Tank Tests With Example for Surface Combatant DTMB Model 5415"*, Journal of Ship Research, Vol. 49, No. 1, pp. 55–68, 2005.

[8]. **Holtrop, J.,** "*Extrapolation of Propulsion Tests for Ships with Appendages and Complex Propulsors"*, Marine Technology, Vol. 38, No. 3, pp. 145-157, 2001.

[9]. **Bertram, V.,** "*Practical Ship Hydrodynamics"*, Butterworth-Heinemann, 2000.

[10]. **Lin, A.C.,** "*Bare Hull Effective Power Predictions and Bilge Keel Orientation for DDG51 Hull Represented by Model 5415"*, Tech. rep. DTNSRDC/SPD-0200-03, 1982.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 17-22, 2011

MODEL TESTS ON THE KRISO HULL FOR THE POWERING PERFORMANCE ASSESSMENT

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ABSTRACT

The paper presents the experimental results of the propulsion model tests, done on the KRISO Container Ship (KCS hereafter), at the towing tank of the Faculty of Naval Architecture from the "Dunarea de Jos" University of Galati. All measured physical quantities are depicted in order to provide informations about the propulsive performances developed by a modern commercial ship with low block coefficient.

Keywords: Kriso Container Ship, model tests, propulsion

REFERENCES

[1]. **ITTC – Recommended Procedures and Guidelines 7.5 – 01.01.01,** *"Ship models"*, 26th ITTC 2011.
[2]. **ITTC – Recommended Procedures and Guidelines 7.5 – 02.03.01.1,** *"Testing and Extrapolation Methods. Propulsion, Performance Propulsion Test"*, 23rd ITTC 2002.
[3]. **ITTC – Recommended Procedures and Guidelines 7.5 – 02.03.01.4,** *"Performance, Propulsion 1978 ITTC Performance Prediction Method"*, 22nd ITTC 1999.
[4]. **Van, S. H., Kim, W. J., Yim, G. T., Kim, D. H., Lee, C. J.,** "*Experimental Investigation of the Flow Characteristics Around Practical Hull Forms"*, Proceedings 3rd Osaka Colloquium on Advanced CFD Applications to Ship Flow and Hull Form Design, Osaka, Japan, 1998b.
[5]. **Kim, W. J., Van, D. H., Kim, D. H.,** "*Measurements of Flows around Modern Commercial Ship Model"*, Experiments in Fluids, Vol. 31, pp. 567-578, 2001.
[6]. **Hino, T.,** "*Proceedings of CFD Workshop Tokyo 2005"*, NMRI report, 2005.
[7]. **Simonsen, C., Otzen, J., Stern, F.,** "*EFD and CFD for KCS heaving and pitching in regular head waves"*, Proceedings of the 27th Symposium on Naval Hydrodynamics, Seul, Korea, 2008.

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NUMERICAL STUDY OF A FLOW CONTROL DEVICE MOUNTED ON THE FORE HULL

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ABSTRACT

The present study is aimed at reducing the resistance of a ship by decreasing its viscous component. By combining the natural flow components at the fore end with the hull shape, complex turbulent formations may appear. Using a device mounted on the hull the author aims to inhibit such a vortex formed at the bulb-hull junction. A global viscous approach is used to study the device. Several parameters were selected to describe the appendage and are used to determine the best configuration.

Keywords: flow control, numerical simulation, RANSE, viscous resistance

REFERENCES

[1]. **Regnström, B., Broberg, L., Larsson, L.,** "*Overlapping Composite Grids for Ship Stern Flow Calculations*", MARNET-CFD First Workshop, Barcelona, 1999.

[2]. ******* "*SHIPFLOW Users Manual*", Flowtech, Sweden

[3]. **Patel, V.C., Landweber, L., Tang, C.J.** "*Free Surface Boundary Layerand the Origin of Bow Vortices* ", Iowa Institute of Hydraulic Research, 1984.

[4]. **Pacuraru, F., Lungu, A.,** "*Numerical Flow Simulation around an Appended Ship Hull*", The Annals of "Dunarea de Jos" Univerity of Galati, Fascicle XI, Shipbuilding, pp. 29-34, 2009.

[5]. **Raheja, L.,** "*On submerged StagnationPoints and Bow Vortices Generation*", 23rd Symposium on Naval Hydrodynamics, 2001.

[6]. **Ungureanu C., Lungu, A.,** "*Numerical Simulation of the Turbulent Flow around a Strut Mounted on a Plate*", Numerical Analysis and Applied Mathematics, AIP Proceedings, Melville New York, Vol. 1168, pp. 689-692, 2009.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 29-36, 2011

TOTAL DRAG FORCE STATISTICAL PREDICTION OF AN UNDERWATER ROV-UMBILICAL CABLE SYSTEM

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ABSTRACT

This paper is focused on the preliminary evaluation of the total drag force and the necessary power for a submerged ellipsoidal shape vehicle together with the connections umbilical cable. The prediction of the drag forces is carried on with hydrodynamic statistical relations from specialized references. The analysed ellipsoidal body is an underwater remote operated vehicle ROV, with de maximum speed of 3 knots and operation depth 30 m, developed as design concept in the frame of the national project TOYROV. The umbilical cable is considered with variable length, according the operational depth, having a circular transversal section. The results of this study make possible to select preliminary the ROV-cable system necessary propulsion characteristics, in order to ensure the longitudinal and vertical operational motions.

Keywords: underwater ROV vehicle, umbilical cable, drag force, statistical hydrodynamic relations

REFERENCES

[1]. **Anton, V., Popoviciu, M., Fitero I.**, *"Hydraulics and Hydraulic Machines"*, Didactic and Pedagogic Publishing House, Bucharest, 1978.

[2]. **Blevins, R.D.**, *"Applied Fluid Dynamics Handbook"*, Krieger Publishing Co., 2003.

[3]. **Domnisoru, L., Dragomir, D., Mocanu, C.I., Domnisoru, D.**,*"Preliminary structural design of an underwater vehicle made of composite materials"*, Galati University Press, 2010.

[4]. **Frieze, P.A., Shenoi, R.A.** (editors), *Proceeding of the 16th international ship and offshore structures congress (ISSC)"*, (2 Volumes), University of Southampton, 2006.

[5]. **Ionescu, D.Gh, Matei, P., Ancusa, V., Todicescu, A., Buculei, M.**, *"Fluid Mechanics and Hydraulic Machines"*, Didactic and Pedagogic Publishing House, Bucharest, 1983.

[6]. **Minson, B.R., Young, D.F., Okushi, T.H.**, *"Fundamentals of Fluid Mechanics"*, Fifth Edition, John Wiley & Sons Inc., 2006.

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THE NUMERICAL ANALYSIS OF STEADY STATE AND TRANSITORY DYNAMIC RESPONSE, FOR A FULL SCALE LIQUEFIED NATURAL GAS CARRIER

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ABSTRACT

In this paper is presented the study of the steady state and transitory hydroelastic dynamic response, of a full scale large liquefied natural gas carrier ship (LNG), induced by irregular head waves, model Longuet-Higgins. The LNG has a double hull structure. Full cargo and ballast loading cases are considered. The numerical analyses are carried on with the eigen program codes package DYN, based on the hydroelasticity theory. The DYN programs package are previously validated, based on two experimental models at ship towing tanks. The numerical model includes linear-modal frequency domain procedures and also non-linear time domain implicit integration procedures for the motion equations solution. The numerical hydroelastic wave induced dynamic response includes: the linear and non-linear oscillations (low frequency response 0.1Hz), taking into account the bottom and side slamming phenomena, and the vibrations on the first and higher natural modes (high frequency response 1Hz), taking into account the springing and whipping phenomena. For the numerical analysis is used the LNG model provided by the ICEPRONAV Galati, in the frame of a common project. The numerical results are pointing out the hull structure wave induced extreme loads.

Keywords: ships hydroelasticity, linear and non-linear numerical analysis, wave induced dynamic response

REFERENCES

[1]. **Bertram, V.,** "*Practical Ship Hydrodynamics*", Butterworth Heinemann, Oxford, 2000.
[2]. **Bishop, R.E.D., Price, W.G.,** "*Hydroelasticity of Ships*", University Press, Cambridge, 1979.
[3]. **Domnisoru, L., Domnisoru, D.,** The Unified Analysis of Springing and Whipping Phenomena, Transactions of the Royal Institution of Naval Architects London 140(A), pp. 19-36, 1998.
[4]. **Domnisoru, L., Domnisoru, D.,** Experimental Analysis of Springing and Whipping Phenomena, International Shipbuilding Progress Delft 47(450), pp. 129-140, 2000.
[5]. **Domnisoru, L.,** *"Ship Dynamics. Oscillations and Vibrations"*, Technical Publishing House, Bucharest, 2001.
[6]. **Domnisoru, L., Stoicescu, L., Domnisoru, D.,** The Linear Numerical Analysis of Displacement Response Amplitude Operator, Based on the Hydroelasticity Theory, for a Barge Test Ship, Romanian Journal of Physics 53(1-2), pp. 121-128, 2008.
[7]. **Domnisoru, L., Domnisoru, D.,** The Numerical Analysis of Transitory Dynamic response, based on the Non-linear Hydroelasticity Theory, for a Barge Test Ship, Romanian Journal of Physics 53(1-2), pp. 129-136, 2008.
[8]. **Fonseca, N., Guedes Soares, C.,** Comparison between Experimental and Numerical Results of the Non-linear Vertical Ship Motions and Loads on a Containership in Regular Waves, International Shipbuilding Progress Delft 52(1), pp.57-89, 2005.
[9]. **GL,** "*Hull Structures Rules*", Germanischer Lloyd's, Hamburg, 2011.
[10]. **Guedes Soares, C.,** Special Issue on Loads on Marine Structures, Marine Structures 12(3), pp. 129-209, 1999.
[11]. **Hirdaris, S.E., Price, W.G., Temarel, P.**, Two and Three-Dimensional Hydroelastic Modelling of a Bulk Carrier in Regular Waves, Marine Structures 16, pp. 627-658, 2003.
[12]. **Hirdaris, S.E., Chunhua, G.,** *Review and introduction to hydroelasticity of ships*, Report No.8, Lloyd's Register, London, 2005.
[13]. **Ozsoysal, R.,** A Review of Recent Ship Vibration Papers, The Shock and Vibration Digest 5(36), pp. 207-214, 2004.
[14]. **Park, J.H., Temarel, P.,** The Influence of Nonlinearities on Wave-induced Motions and Loads Predicted by Two-dimensional Hydroelasticity Analysis, PRADS-American Bureau of Shipping Houston 1, pp. 27-34, 2007.
[15]. **J.V. Perunovic, J.V., Jensen, J.J.,** Non-linear Springing Excitation due to a Bi-directional Wave Field, Marine Structures 18, pp. 332-358, 2005.

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PAGES 45-50, 2011

SEAKEEPING NUMERICAL ANALYSIS IN IRREGULAR OBLIQUE WAVES FOR A SIMPLIFIED SHIP MODEL

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ABSTRACT

This paper is focused on the seakeeping analysis of a simplified mono-hull ship model, with 80m length. The study includes the linear seakeeping analysis, coupled heave and pitch motions, uncoupled roll motion, in irregular oblique waves, heading angle $0 \div 360$ deg., with ITTC wave power density spectrum. Based on short term prediction statistical values and specific limits of seakeeping criteria, are obtained the dynamic response statistical polar diagrams, on each motion degree and cumulative, pointing out the influence of the ship speed and heading angle for seakeeping assessment. The numerical seakeeping analyses are carried on with own DYN_OSC program code, in the frame of PhD POSDRU research activities.

Keywords: numerical analysis, ship dynamics, seakeeping, irregular oblique waves

REFERENCES

[1]. **Bertram,V.,** "*Practical Ship Hydrodynamics*", Butterworth Heinemann, Oxford, 2000.
[2]. **Bhattacharyya, R.,** "*Dynamics of marine vehicles*". John Wiley & Sons Publication, New York, 1978.
[3]. **Domnisoru,L.,**"*Ship Dynamics. Oscillations and Vibrations*", Technical Publishing House, Bucharest, 2001.
[4]. **Faltinsen, O.M.**, "*Sea loads on ships and offshore structures*", Cambridge University Press, 1993.
[5]. **Price, W.G.& Bishop, R.E.D.,** "*Probabilistic theory of ship dynamics*", Chapman and Hall, London, 1974.
[6]. **Söding, H.,** "*Bewegungen und Belastungen der Schiffe im Seegang*", Institut für Schiffbau der Universität Hamburg, 1982.

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PAGES 51-56, 2011

BALAST AND STABILITY COMPUTING OF AN UNDERWATER ROV VEHICLE

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ABSTRACT

This study is focused on the analysis of the stability conditions of a mini ROV submerged vehicle. The paper presents two mini ROV models whose ballast placement and mass are calculated so that to ensure the buoyancy and stability conditions. The both ROV models have the designed depth 30 m. The mathematical method used in computing the ballast conditions is a restricted extreme method and the software support is given mainly by the MS-EXCEL program.

Keywords: ROV submerged vehicle, stability, restricted extreme calculus

REFERENCES

[1]. **Domnisoru, L., Dragomir, D., Mocanu, C.I., Domnisoru, D.**,"*Preliminary structural design of an underwater vehicle made of composite materials"*, Galati University Press, 2010.

[2]. **SWCM.,** "*SolidWorks Cosmos/M FEM Program User Guide"*, Dassault Systems SolidWorks Corporation, 2007.

[3]. **MS.,** "*Multisurf"*, Aerohydro Inc., Southwest Harbor, 2005.

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PAGES 57-66, 2011

ON THE GLOBAL-LOCAL 3D FEM STRENGTH ANALYSIS IN QUASI-STATIC HEAD WAVES, FOR THE STRUCTURE OF A 100000 CBM LIQUEFIED PETROLEUM GAS CARRIER

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ABSTRACT

In this paper is presented the ship hull structure strength analysis, based on numerical 3D/1D FEM full-length models, under equivalent quasi-static head wave loads. The test ship is an LPG 100000 cbm liquefied petroleum gas carrier, length 238.7m, with type B structural independent cargo tanks. The scantlings are according to the Bureau Veritas Rules. As cargo loading cases are considered full and ballast, under sagging and hogging wave conditions. The CAD model is developed by NX Nastran Femap and is transferred as FEM model into SolidWorks Cosmos/M for the numerical strength analyses, based on own program codes and user subroutines. The stress analysis results are pointing out the LPG structure hot spot domains.

Keywords: large liquefied petroleum gas carrier, equivalent quasi-static wave, strength analysis, stress hot spot

REFERENCES

[1] **Bathe, K.J.,** "*Finite Elementen Methoden"*, Springer Verlag, Berlin, 1990.
[2] **BV.**, *"Bureau Veritas Rules"*, Paris, 2006.
[3] **Domnisoru, L.,** "*Structural analysis and hydroelasticity of ships"*, Galati University „Dunarea de Jos" Press, 2006.
[4] **Eyres, D.J.,** *"Ship Construction"*, Butterworth Heinemann, Boston, 2006.
[5] **Femap,** NX Nastran Femap Program, 2008.
[6] **Hughes, O.F.,** "*Ship structural design. A rationally based, computer-aided optimisation approach*", The Society of Naval Architects and Marine Engineering, New Jersey, 1988.
[7] **Lehmann, E., Böckenhauer, M., Fricke, W. & Hansen, H.J.,** "*Structural design aspects of bulk carriers*" Second International Conference on Maritime Technology Szczecin, 1997.
[8] **Mansour, A. & Liu, D,** "*Strength of ships and ocean structures"*,The Society of Naval Architects and Marine Engineers, New Jersey, 2008.
[9] **SWCM,** SolidWorks-Cosmos/M Program, 2008.
[10] **Zienkiewicz, O.C. & Taylor R.L.,** "*The Finite Element Method*", Butterworth Heinemann, Oxford, 2000.

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NUMERICAL STRUCTURAL OPTIMIZATION ANALYSIS FOR A CONTAINER SHIP

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ABSTRACT

This paper is focused on the structural optimization analysis for the amidships cargo hold of a container ship. The numerical analysis is carried on using LBR-5 software, developed by ANAST, University of Liege. The optimization analysis uses as initial structure the scantlings obtained by Poseidon Germanischer Lloyd program. There are considered two optimization cases, first with design variable: plates, frames and stiffeners and the second with: plates and frames. The optimization analyses are carried on for full cargo loading case, in sagging and hogging conditions. The objective function of the optimization is the minimum weight with ultimate strength and global-local strength constraints.

Keywords: container ship structural optimization, minimum weight objective, ultimate strength

REFERENCES

[1]. **Poseidon, "**Poseidon Software User Guide", Germanischer Lloyd Rules, 2011.

[2]. **L.B.R.**, *"LBR-5 Software User Guide"*, ANAST, University of Liege, Faculty of Applied Sciences, 2007.

[3]. **Paik.J.K., Thayamballi.A.K.,** *"Ultimate limit state design of steel-plated structures"*, John Wiley & Sons.

[4]. **Rigo.P.,** *"A module-oriented tool for optimum design of stiffened structures -Part I"*, Marine Structures, Vol.14, Issue 6, pp. 611-629, 2001.

[5]. **Rigo.P., Fleury.C.,** *"Scantling optimization based on convex linearization and a dual approach-Part II"*, Marine Structures, Vol.14, Issue 6, pp. 631-649, 2001.

[6]. **Hughes.O.F.**, *"Ship structural design. A rationally-based, Computer-Aided Optimization Approach"*, The Society of Naval Architects and Marine Engineers, 2000.

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PAGES 73-78, 2011

THE INFLUENCE OF THE PROFILE TYPE ON STRESS VARIATION IN STRATIFIED COMPOSITE MATERIALS

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ABSTRACT

Fibreglass-reinforced polyester (GRP) is the most widely used composite material in the ship building industry, requirings careful study in point of mechanical characteristics. This article presents the collective experience related to the behaviour of GRP loading in different situations. The paper examines three cases of GRP manufacturing: layers with mechanical characteristics for each layer, composite (the material is considered isotropic but with layers and the same mechanical properties for all layers), and isotropic plates.

Keywords: composite materials, stress, FEM

REFERENCES

[1]. **Kesavan., A., Deivasigamani., M., John., S., Herszberg., I.,** "*Damage detection in T-joint composite structures*", Composie Materials, Elsevier, pp. 313–320, 2006.

[2]. **Agarwal., B.D., Broutman., L.J**., "*Analysis and performance of fiber composites"*, New York: Wiley-Interscience; 1990.

[3]. **Sih., G.H., Skudra., A.M.,** "*Failure mechanics of composites*", New York: Elsevier Science; 1985.

[4]. **Ruzek, R., Lohonka., R., Jironc., J.,** " *Ultrasonic C-scan and shearography NdI techniques of impact defects identification*"., NDT and E International 2005, pp. 1–11, 2005.

[5]. **Mickens, T., Schulz, M., Sundaresan, M., Ghoshal, A,**. "*Structural health monitoring of an aircraft join"*, Mech Syst Signal Proc 2003;17(2), pp. 285–303, 2003.

[6]. **Johnson, T.J., Brown, R.L., Adams, D.E., Schiefer., M.,** "*Distributed structural health monitoring with a smart sensor array*", Mech Syst Sig Proc 2004,18(3), pp. 555–72, 2004.

[7]. **Tocu, F., Mocanu., C. I.,** "*The number of layers influence for composite materials subjected to fatigue at the request of force breaking to axial load"*, Annals of "Dunarea de Jos" University of Galati – Fascicle XI Shipbuilding, ISSN: 1221 - 4620, pp. 191 – 196, 2010.

[8]. **Tocu., F., Mocanu., C.I., "***Experimental Study on the Influence of Cycle Number at Variable Load on the Mechanical Characteristics of GRP"*, Annals of Maritime University of Constanta – Anul XI, Vol. 14, ISSN: 1582-3601, pp. 101 – 104, 2010.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 79-86, 2011

MOTIONS OF THE GLORIA-TYPE JACK-UP DRILL RIG TOWED IN HEAD SEAS

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ABSTRACT

This paper briefly presents the differential equations governing the dynamic behavior of the Gloria-type jack-up drill rig in transit conditions, when towed with constant velocity in head seas. The motion equations have been derived from the hypothesis of the potential flow of the water around the platform. For the estimation of the coefficients of these equations we used the strip theory and a large number of supporting hypotheses. Then the first algorithm for numerical solving of these linear equations is presented, which is used for the response amplitude operator calculations of the surge, heave and pitch motions of the Romanian Gloria-type jack-up drill rig. The presence of the immersed legs and the inclined bow leads to the occurrence of the non-linear terms in the motion equation. In this latter case, the weight of the non-linear terms is important, imposing their consideration and the solving of the motion equations in the time domain. The numerical calculated values in both cases are compared in order to quantify the influence of the non-linearities on the pitching motion.

Keywords: drilling rigs, self-elevating units, offshore drilling platforms

REFERENCES

[1] **Kim C.H.., Chou F.**, *"Motions of Jack-up Drill Rigs in Head Seas"*, I.S.P., Nov. 1993.
[2] **Pitulice D., Stoicescu L.**, *"The Differential Equations of the Motions of Jack-up Drill Rigs in Head Seas"*, The Annals of "Dunarea de Jos" University of Galati, Fascicle XI Shipbuilding, ISSN 1221 – 4620, Galati, 1997.
[3] **Det Norske Veritas**, *"Rules for the design, construction and inspection of offshore structures"*, Norway, 2001.
[4] **Frank W**., "Oscillation of cylinders in or below the free surface of deep fluids", Naval Ship R/D Center, Rpt. No. 2375, 1967.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 87-92, 2011

THE INFLUENCE OF DAMAGE IN SOME ELEMENTS IN THE LEGS' STRUCTURE UPON GENERAL STRESS

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ABSTRACT

Offshore platforms are designed for the drilling and extraction of oil and gas from the bottom of seas and oceans. Most offshore platforms are steel structures, of the jacket with deck type. Under the effect of the environmental factors or by contact with various floating bodies, some elements in the structure of the legs can be damaged. To analyse and predict the stress state of leg elements, the platform model taken into consideration is the Romanian "Gloria" oil rig platform. The platform has four legs linked together through the body platform. Only one leg was taken into consideration in point of the destructive elements caused by the impact with various floating bodies. By means of the finite element method analysis, with the help of SolidWorks – COSMOS/M method, stress and displacement variations due to the destruction of some structure element may be examined.

Keywords: destructive elements, offshore structure, finite element method

REFERENCES

[1]. **Gerwick, B.C.,** "*Construction of Marine and Offshore Structures*", Edited by M.D. Morris, P.E.2000 by CRC Press LLC, 2000.

[2]. **Domnisoru, L**., "*Metoda elementului finit în construcţii navale*", Editura Tehnică, Bucureşti, 2001.

[3]. **Gerwick, B.C**., "*Construction of offshore structures*", John Wiley & Sons, New York 1986.

[4]. **Graff, W.J**., "*Introduction to offshore structures*", Gulf Publishing Company, Houston 1981.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 93-102, 2011

PRELIMINARY DESIGN OF STEEL MONOPILE OFFSHORE WIND STRUCTURES

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ABSTRACT

As conceptual studies are essential for offshore wind deployment, a computerized methodology to check the scantling of monopile steel structures at the preliminary stage of the offshore project has been developed. The objectives of this tool are the verification of the structural integrity of the offshore wind turbine towards resonance phenomena, fatigue damages and structural instabilities such as bucling of shells. The design tool has been applied to the scantling of the support structure of a 5MW wind turbine placed in the environment of the Kriegers Flak location.

Keywords: monopile, offshore wind structure, preliminary design

REFERENCES

[1]. **Van der Tempel, J.**, *"Design of Support Structures for Offshore Wind Turbines"*, PhD Thesis, Delft University of Technology, 2006.
[2]. **Kühn, M.,** *"Dynamics and Design Optimisation of Offshore Wind Energy Conversion System"*, PhD Thesis, Delft University of Technology, Section Wind Energy, 2001.
[3]. **Germanischer Lloyd**, *"Guidelines for the Certification of Offshore Wind Turbines"*, Germanischer Lloyd WindEnergi, edition 2005.
[4]. **Det Norsk Veritas**, *"Recommended Practice DNV-RP-C202 – Buckling Strength of Shells"*, 2002.
[5]. **Kühn M. et al.,** *"Opti-OWECS Final Report Vol2: Methods Assisting the Design of Offshore Wind Energy Conversion Systems"*, Delft University of Technology, 1998.
[6]. **Bülow L., Jorgensen L., Gravesen H.,** *"Kriegers Flak Offshore Wind Farme - Design basis foundation"*, Vattenfall Vindkraft, 2008.
[7]. **Bülow L., Jorgensen L., Gravesen H.,** *"Kriegers Flak Offshore Wind Farme – Site Assessement"*, Vattenfall Vindkraft, 2009.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 103-108, 2011

EXPERIMENTAL MODEL TESTS ON A NACA 0017 SURFACE-PIERCING HYDROFOIL

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ABSTRACT

This paper focuses on the drag characteristics of a NACA 0017 surface-piercing hydrofoil. The article contains the results of the experimental tests performed in the Towing Tank of the Naval Architecture Faculty in the "Dunarea de Jos" University of Galati, in order to investigate the influence of a plane plate mounted on the immersion part of the surface-piercing hydrofoil on the hydrofoil resistance . Also, the influence of the immersion on the hydrofoil resistance was studied. The results confirmed the negative effect of the plane plate on the NACA 0017 surface-piercing hydrofoil resistance, within the domains of the Froude number, Reynolds number and immersion investigated.

Keywords: NACA surface-piercing hydrofoil, plate plane influence**,** model experimental tests

REFERENCES

[1]. **Molland, A., Turnock, S.**, "*Marine Rudders and Control Surfaces*", Butterworth-Heinemann, Elsevier, 2007.

[2]. **Obreja D., Crudu, L.,** "*Operational Reinforcement of the Towing Tank of Dunarea de Jos University of Galati*", The Annals of "Dunarea de Jos University of Galati", Fascicle XI - Shipbuilding, pp. 157-162, 2009.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 109-116, 2011

THE CARBON DYOXID SHIP SYSTEM EXTINGUISHING FIRE DESIGN WITH PIPE FLOW EXPERT PROGRAM

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ABSTRACT

The design of Extinguishing Fire System with carbon dioxide using the rules of the Ship Society Classification does not always assure the achievement of required parameters. The flow simulation using software Pipe Flow Expert allows execution of corrections for the flow improvement. The paper presents a design application of Carbon Dioxide Extinguishing Fire System fitted on multipurpose vessel.

Keywords: design, pipe, flow, extinguishing fire system, numeric, simulation

REFERENCES

[1]. **Burducea, C., Leca, A.**., *"Pipes and Thermal Network"*, Technical Publishing House, Bucharest, 1974.
[2]. **Collins, M., Cooper, L., Helgason, R., Kennington, J., Leblanc, L.,** *"Solving the Pipe Network Analysis Problem Using Optimization Techniques"*, Management Science , Vol. 24, No.7, pp. 747-760, 1978.
[3]. **Hwang, N., Houghtalen, R.**., *"Fundamentals of Hydraulic Engineering Systems"*, Prentice Hall, Upper Sadde River, New York, 1996.
[4]. **Ioan, A., Radu, M.,** *"The Design of the Ship Pipe Systems based on CAD approach"*, Didactic and Pedagogic Publishing House, Bucharest, 2004.
[5]. **Munson, B.R., Young, D.E., Okiishi, T.H.,** *"Fundamentals of Fluid Mechanics"*, John Wiley and Sons, Inc., NY, 1998.
[6]. **Sabersky, R.H.,** *"Fluid Flow"*, Prentince Hall, New Jersey, 1999.
[7]. **PFE, "**Pipe Flow Expert *User's Guide"*, Applied Flow Technology Inc., 2010.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 117-124, 2011

THE BORE SIZE INFLUENCES ON THE CYLINDER LINERS' VIBRATION IN DIESEL ENGINES

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ABSTRACT

This paper deals with the manner in which the vibrations of cylinder liners in Diesel engines vary with the bore size. Thus, three bore sizes were examined: 102 mm, 108 mm and 114 mm. The structure of the cylinder liner was loaded with normal force acting on the piston, taking into account the inertia forces of the motor mechanism.

Keywords: diesel engine, cylinder liner, normal force, inertia force, acceleration, motor mechanism, vibration

REFERENCES

[1] **Gheorghies, C., Simionov, M.**, *"Study on Tribo-model of the Damage Process in the Diesel Cylinder"*, Tribology in Industry Revue, Belgrad, Iugoslavia, 2000.
[2] **Grünwald, B.**, "*Teoria, calculul si constructia motoarelor pentru autovehicule rutiere*", Editura Didactica si Pedagogica, Bucuresti, 1980.
[3] **Jones, S.**, "*LNG market looks at power alternatives"*, The Motor Ship, May 2002.
[4] **Simionov, M., Gheoghies, C., Crudu, I.**, "*The Evolution of the Superficial Layer Microgeometry in the Vibration Cavitation Case*", 9th Nordic Symposium on Tribology NORDTRIB 2000, VTT SYMPOSIA, Vol. 3, ISSN 0357-9387, ISBN 951-38-5287-4, ISI 000165636200041, Porvoo, Finland, 2000.
[5] **Simionov, M.**, "*Instalatii de propulsie navale"*, Galati University Press, 2000.
[6] **Pimosenko A.P.,** *"Zasita sudovîh dizelei ot kavitationîh rezrusenii"*, "Sudostroenie", Leningrad, 1983.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 125-132, 2011

DINAMIC BEHAVIOR OF THE SUPERCHARGED DIESEL INTERNAL COMBUSTION ENGINES

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ABSTRACT

The paper deals with the differential equation expressing the dynamic behavior of turbocharged internal combustion engines using supercharged with free rotation units. Mathematical model is based on knowledge of the characteristics of subsystems, such as engine itself, turbocharger, exhaust and intake manifold and the injection system to stationary regimes and theirs vicinity. Transfer functions are determinated, functions that are used for achieving and adjusting automatic regulators which controls the operation of the system under consideration.

Keywords: supercharged engine, transfer function, dynamic behavior, unsteady working conditions

REFERENCES

[1]. **Burciu, M.,** *"Internal Combustion Piston Engines – Thermodynamic Processes, Turbocharger, Operating Characteristics and Engine Installations"*, Europlus Publishing, Galati, 2006.

[2]. **Burciu, M.,** *"Calculation of the unsteady mechanical and gasothermodynamic processes in the free rotation supercharger units of the supercharged internal combustion engines"*, Bulletin of the Transilvania University of Brasov, vol 2 (51) series I, 2009.

[3]. **Dumitru, Gh.**, **Burciu Burciu, S.,M.**, *"Dynamical Characteristics of Supercharged Internal Combustion Engine Itself"*, The scientific session in University "Dunarea de Jos", Galati, 1992.

[4]. **Dumitru, Gh.**, *"Dynamical Characteristics of Admission Pipe for Internal Combustion Engine"*, The scientific session in University "Dunarea de Jos", Galati, 1993.

[5]. **Dumitru, Gh.**, *"Dynamical Characteristics of Evacuation Pipe for Internal Combustion Engine"*, The scientific session in University "Dunarea de Jos", Galati, 1993.

[6]. **Dumitru Gh., Burciu**, **S.,M.**, *"Dynamical Characteristics of Turbocharger for Internal Combustion Engine"*, The scientific session in University "Dunarea de Jos", Galati, 1994.

[7]. **Dumitru Gh., Burciu, S.,M.**, *"Dynamical Characteristics of Injection System for Internal Combustion Engine"*, The scientific session in University "Dunarea de Jos", Galati, 1995.

[8]. **Burciu M.S**, "Contributions to the study of nonstationary processes in the internal combustion engine overloading turbo-compressors", Thesis Ph.D., University of Galati, Faculty of Mechanical Engineering, Department of Internal Combustion Engines, 2000.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 133-138, 2011

EXTENDING A CAD - CAM INTEGRATE SYSTEM FOR THE ENVIRONMENTAL SHIP DESIGN

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ABSTRACT

The new exigencies included in classification rules of ship design, regarding the "green passport" of the ship are the argument of this paper. We proposed an extending of the CAD-CAM Integrate System already used with other facilities for creating, controlling and manipulating a new ship design environmental data base.

Keywords: CAD-CAM Integrate System, Environmental Ship Design

REFERENCES

[1]. **Aveva Marine**, *"Training Manuals"*, 2008.
[2]. **Inc Icon Group International and The Computers Research Group,** "*Computer-Aided Design (CAD), Manufacturing (CAM) and Engineering (CAE) in Canada*: *A Strategic Entry Report"*, 2005.
[3]. **H.J. Hwang**, *"Mapping 2D ship structure information into 3D ship model using symbols of shipbuilding CAD drawings"*, Ph.D. thesis, Korea Advanced Institute of Science and Technology, Korea, 2003.
[4]. **NAPA OY**, Official homepage of the NAPA Steel system, Available at: www.napa.fi, 2006.
[5]. **O.Y. Cadmatic**, Official homepage of the NUPAS-CADMATIC system, Available online at: www.cadmatic.com, 2006.
[6]. **SENER Engineering Group,** Official homepage of the FORAN system, Available at: www.foransystem.com, 2006.
[7]. **Tribon**, *"Training Manuals"*, 2007.
[8]. **Ullman, D.G., Dietterich, T.G., Stauffer**, **L.A**., *"A Model of the Mechanical Design Process Based on Empirical Data"*, Artificial Intelligence in Engineering Design, Elsevier, Amsterdam, pp. 193-215, 1998.
[9]. **Lloyd's Register**, *"Inventory of Hazardous Materials Onboard"*, Available at: http://www.lr.org/Images/LRGreenPassportv20EXAMPLEforprinting%5B1%5D_tcm155-175161.pdf .
[10]. **AMERICAN BUREAU OF SHIPPING**, *"Green Passport Guide for Class Notation 2011"*.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 139-146, 2011

HYDRODYNAMIC STUDY OF BEARING FORCES FOR A SHIP HULL FITTED WITH WAKE IMPROVEMENT DEVICES

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ABSTRACT

Propeller-induced vibrations problems are mainly generated by the unsteadiness of the flow field behind the ship. The paper presents a hydrodynamic study of propeller-induced shaft forces for a ship hull fitted with wake improvement devices. Bearing forces fluctuations have been computed using an in house code based on quasi-steady approach. Inflow velocity distributions in the propeller plane have been numerically investigated for several flow control devices placed in front of the propeller location. The results have been used as input data for the bearing forces calculations. Influence of various parameters such as the semi-duct's geometry and position has been analysed using practical criteria for predicting acceptable levels of propeller-induced vibrations.

Keywords: propeller induced bearing forces, wake equalizing duct

REFERENCES

[1]. **Sasajima, T.**, *"Usefulness of Quasi-Steady Approach for Estimation of Propeller Bearing Forces"*, Propeller '78 Symposium, Virginia, 1978.
[2]. **Popovici, J.,S., Prever, R., Totoloci, S., Trincas, G.,** *"Unsteady Hydrodynamic Forces: validation among theoretical calculation, experiments and full-scale measurements"*, Tecnica Italiana, No 2, pp 75-91, 1993.
[3]. **Asmussen, I., Menzel, W., Mumm, H.,** *"GL-Technology, Ship Vibrations"*, Germanischer Lloyd Publication, Hamburg, 2001
[4]. **Carlton, J.**,S., *"Marine Propellers and Propulsion"*, Elsevier, 2007
[5]. **Schneekluth, H., Bertram, V.,** *"Ship Design for Efficiency and Economy"*, Butterworth Heinemann, 1998
[6]. **Amoraritei, M.,** *"Complements in the hydrodynamic of ship propeller in unsteady flow*", Galati University Press, 2008
[7]. **Maria, G.,V., Lungu, A.,** *"Numerical simulations of the Wake Field Produced by a High Block Coefficient Ship Hull"*, The Annals of Dunarea de Jos University of Galati, Fascicle XI Shipbuilding, 2010
[8]. **Simion, A., Alexandru, G.,** *"Model tests for Chemical Tanker 37000 tdw"*, Icepronav Ship Hydrodynamics Laboratories Report, 2003
[9]. **Bosoanca, I., Parvulescu, R., Moraru, L., Bosoanca, R.,** *"Contributions to Reducing Vibrations Onboard Ships through Additional Systems"*, The Annals of Dunarea de Jos University of Galati, Fascicle XI Shipbuilding, 2008
[10]. ***American Bureau of Shipbuilding, *"Guidance Notes on Ship Vibrations"*, ABS Publications, 2006
[11]. ***Bureau Veritas, *"Building and Operation of vibration free, propulsion plant and ships"*, BV Publications, 1987
[12]. ***ITTC, 16th ITTC Report of Propeller Committee, 1981

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PAGES 147-154, 2011

CFD STUDY ON THE PROPELLER – HULL – INTERACTION OF STEERABLE THRUSTERS

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ABSTRACT

In order to detect possible benefits through axis tilting for monohull vessels, the present paper reveals a CFD study which focuses on different thruster arrangements for this kind of ship. The CFD software Comet which is based on a finite-volume method is employed for all the simulations which were carried out at full scale, different performance characteristics being found for different nozzle and axis orientations.

Keywords: steerable thrusters, thruster tilting, Reynolds averaged Navier-Stokes, Voith Radial Propelle

REFERENCES

[1]. **Jurgens, D., Palm, M., Amelang, A., Moltrecht, T.,** *"Design of Reliable Steerable Thrusters by Enhanced Numerical Methods and Full Scale Optimization of Thruster – Hull Interaction Using CFD"*, Dynamic Positioning Conference, Houston, 2008

[2]. **Ferziger, J. H., Peric, M.,** *"Computational Methods for Fluid Dynamics"*, 3rd ed., Springer, Berlin, 2003

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PAGES 155-160, 2011

CFD OPTIMIZATION OF VORTEX GENERATORS FORMING THE WAKE FLOW OF LARGE SHIPS

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ABSTRACT

In this study the effectiveness of using the vortex generators for improving the wake flow of large merchant ships is analyzed. Several configurations were proposed and computations were carried out using RANSE flow.Unstructed grids of 2 to 4 million cells were used. Based on some initial results, further modifications were employed in order to improve the effects.

Keywords: wake fraction, vortex generator, resistance

REFERENCES

[1]. **Schmode, D**., *"RANS computations for wake improving vortex generators"*, Proceedings of the 11th Numerical Towing Tank Symposium (NuTTS), Brest, France, 2008.

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FASCICLE XI – SHIPBUILDING. ISSN 1221-4620
PAGES 161-166, 2011

CFD VALIDATION OF DIFFERENT PROPELLER DUCTS ON OPEN WATER CONDITION

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ABSTRACT

This paper summarizes some of the CFD calculations performed as starting point for trawler ducted propeller studies and high-lights the capabilities of CFD as a valuable tool for the prediction of propulsive factors for ducted propellers. The mathematical model employed is Reynolds Averaged Na-vier Stokes based, coupled with wall laws and a two equations turbulence model. A Finite Volume method has been employed for the so-lution of the model. A validation process for ducted propel-lers in open water condition is presented.

Keywords: trawlers, thrust, ducted propellers, Finite Volume method

REFERENCES

[1]. **Carlton, J., "***Marine propellers and Propulsion*", 2nd Edition, Butterworth-Heinemann 2007.

[2]. **Sánchez Caja, A., Pylkkänen, J. V. , Spila, T.P.,** *"Simulation of the incompressible Viscous Flow around Ducted Propellers with Rudders Using a RANSE Solver"*, 27th Symposium on Naval Hydrodynamics Seoul, Korea, 2008.

[3]. **Ferziger, J.H., Peric, M.,** *"Computational Methods for fluid dynamics"*, Springer 2000.

[4]. **Harvald, SV.AA.,** "*Resistance and Propulsion of Ships"*, Krieger Publishing Company, Malabar, Florida, 1991.

[5]. *** *"CFD General Uncertainty Analysis in CFD Verification and Validation Methodology and Procedures"*, ITTC- Recommended Procedures and Guidelines.

[6]. ***, *"User guide STAR-CCM+ (Version 4.0.6)"*.

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PAGES 167-174, 2011

NUMERICAL MODELLING OF CAVITATION AND EROSION ON RUDDER

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ABSTRACT

The main topicof this research represents the developing of a computational method for modeling the cavitation phenomenon and the erosion on the surface of the placed in the ship wake. Two rudder models was considered: one with a conventional form and a twisted form for the other one. The numerical results are compared with the experimentally ones from the cavitation tunnel.

Keywords: rudders, numerical simulation, cavitation

REFERENCES

[1]. **Blazek, J**., *"Computational Fluid Dynamics, Principles and Applications"*, ELSEVIER, 2001
[2]. **Dymarski P**. *"Predictions of the open water propeller cavitation using the SOLAGA solver"*, 9th Numerical Towing Tank Symposium, Hamburg, Germany, 23-25 September, 2007.
[3]. **Ferziger, J.H, Peric, M.**, *"Computational Methods for Fluid Dynamics"*, 2nd ed., Berlin, Springer, 1999.
[4]. **Lecoffre, Y.**, *"Cavitation. Bubble Trackers"*, A.A. Balkema/Rotterdam/Brookfield, 1999.
[5]. **Wilcox, D.C., "***Turbulence Modeling for CFD"***,** DCW Industries 2002.