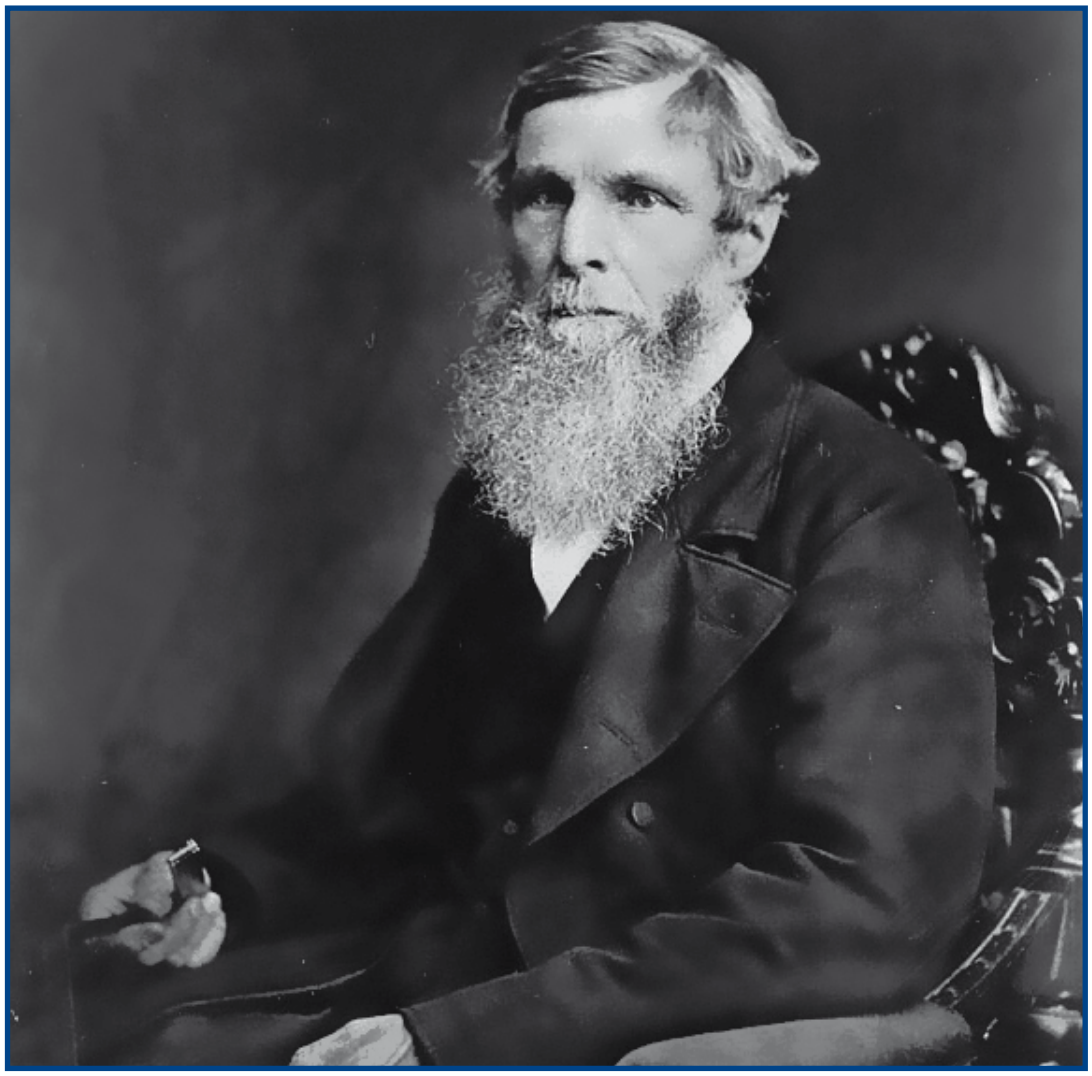
RINA

The Royal Institution of Naval Architects

ITTC International Towing Tank Conference



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QinetiQ

International Conference

THE WILLIAM FROUDE CONFERENCE: ADVANCES IN THEORETICAL AND APPLIED HYDRODYNAMICS - PAST AND FUTURE

24 - 25 NOVEMBER 2010
PORTSMOUTH, UK

The William Froude Confere
and Applied Hydrodyna
24 - 25 Nov

2010 will mark the 200th anniversary of the birth of William Froude, and the 150th anniversary of the founding of the Royal Institution of Naval Architects, both of whom have made a significant contribution to advancing the understanding of hydrodynamics during their time. The William Froude international conference will provide an appropriate opportunity for those who are involved in the research, development and application of hydrodrodynamics to meet and discuss current and future advances in theoretical and applied hydrodynamics. The two-day conference will present 20 papers, with a session devoted to the work being undertaken by universities involved with the Lloyd's Register strategic hydrodynamic research programme. Selected papers from this conference will also be presented in a special issue of the International Journal of Maritime Engineering. The conference will include a visit to the QinetiQ towing tank and exhibition at Haslar.

day 1

08.30 - 09.00 **Coffee and Registration.**

09.00 - 09.30 **Non-linear analysis of ship motions and loads in large waves**
G. Mortola, A. Incecik and O. Turan, University of Strathclyde, UK
Spyros Hirdaris, Strategic Research Group, Lloyds Register, UK

The paper will describe the methodology and the associated formulations, and the results of comparisons obtained from the 2-D frequency and time domain methods as well as from the 2-D and 3-D methods in the frequency domain.

09.30 - 10.00 **A cross-spectral method for combining hydrodynamic wave loads**
Emmanuel A. M., H.S. Chan, J. Downes, Newcastle University, UK
Spyros Hirdaris , Strategic Research Group, Lloyds Register, UK

In this paper, a cross-spectral method for combining different global wave loads will be developed in conjunction with long-term analysis procedures which will be applied to predict their long-term design values and correlations. This method will account for the phase relationships between the load processes which are assumed to be narrow-banded.

10.00 - 10.30 **The influence of forward speed and nonlinearities on the dynamic behaviour of a container ship in regular waves**
T.M. Ahmed, A. Chapchap, D.A. Hudson, P. Temarel, University of Southampton, UK
Spyros Hirdaris (Strategic Research Group, Lloyds Register, UK)

The aim of this paper is to compare the heave and pitch motions for the S175 containership obtained from frequency domain linear and time domain partly nonlinear potential flow analyses. The frequency domain methods comprise the pulsating and the translating-pulsating Green's function methods, with the relevant source distribution over the mean wetted surface of the hull.

10.30 - 11.00 **Coffee**

11.00 - 11.30 **Development of a CIP based numerical method for prediction of nonlinear wave loads on real ships**
Changhong Hu, Makoto Sueyoshi, Ryuji Miyake, RIAM, Kyushu University, Fukuoka, Japan
Tingyao Zhu, Nippon Kaiji Kyokai, ClassNK, Chiba, Japan

This paper presents a collaborative research between RIAM, Kyushu University and ClassNK, on development of the CIP (Constrained Interpolation Profile) based method for prediction of nonlinear wave loads on real ships in large waves.

11:30 - 12:00 **An approach for implementing viscous roll damping to a barge shaped vessel in irregular seas in frequency domain**
M. Hajiarab, Lloyd's Register, UK
M. Downie, Newcastle University, UK
M. Graham, Imperial College, UK

In the present work the approach developed by Hajiarab et al. is used to generate a database of equivalent roll RAOs associated with wave spectra representative of irregular seastates. Then a practical approach is proposed to use the equivalent roll RAO data base in a hydrodynamic analysis of the vessel motion response.

12:00 - 12:30 **On the prediction of added resistance of ships in waves**
A. Papanikolaou, Ship Design Laboratory, NTUA, Greece

In this paper, both far and near field method approaches to the added resistance problem are presented, in relation to alternative seakeeping potential theories in the time and frequency domain; implemented approaches are validated on the basis of systematic case studies for a variety of hull forms and important conclusions regarding the efficiency of the investigated methods are drawn.

12:30 - 13:30 **Lunch**

13.30 - 14.00 **Prediction of added resistance in irregular waves by using a time-domain approach**
Kyong-Hwan Kim and Yonghwan Kim, Seoul National University, South Korea

In this study, primary interest and observation focus on the prediction of added resistance in random seas. Since added resistance is the second-order, i.e. nonlinear, quantity, the prediction of this value in irregular waves is not straight forward. We can apply the concept of quadratic transfer function, but there are still concerns or problems such as sensitivity to the number of bichromatic waves in irregular seas.

14:00 - 14:30 **Evaluating the self propulsion of a container ship in a realistic sea state using CFD**
S.R.Turnock, A.B.Phillips, J.Banks, L.Steenson, D.A.Hudson, A.F. Molland University of Southampton, UK

Recent advances in computational power have placed within the reach of the Naval Architect the opportunity to evaluate directly the self-propulsion of a ship. This will allow hull form optimisation to consider both seakeeping response and powering for expected service conditions. This paper will report on the development of a computationally efficient approach to such calculations using a coupled blade element momentum and Reynolds averaged Navier Stokes simulation.

14:30 - 15:00 **Predictions of ship wakes using CFD**
P W Bull, QinetiQ, UK

This paper outlines some of the experiences gained at QinetiQ Haslar on the application of advanced CFD techniques to the prediction of ship wakes gathered over a number of years. Particular attention to the advanced turbulence models and near wall numerical models are shown to be required. Recent methods for the verification and validation techniques which are required to provide trust and confidence in the results obtained from the CFD methods are also described.

15.00 - 15.30 **Coffee**

15:30 - 16:00 **Froude's Law of Similitude - Contemporary and Future Seakeeping Testing**
R.P.Dallinga, MARIN, The Netherlands
R.H.M.Huijsmans, TU Delft, The Netherlands

Our contribution to the conference is a visionary review of contemporary and future problems in applying Froude's Law of Similitude in modern seakeeping tests. In this context we will discuss the merits of the latest developments in the area, including the development of a new Two-Phase Laboratory facilitating seakeeping and sloshing tests at reduced air pressure.

16:00 - 16:30 **CFD modelling of planing hulls with partially ventilated bottom**
S. Brizzolara, Alessandro Federici and Marco Ferrando, University of Genova, Italy

The focus of the paper will then concentrate on the investigations in the specific capabilities of modern RANSE solvers in simulating the complex hydrodynamics phenomena related to stepped hulls with partially ventilated bottom.

16:30 - 17:00 **CFD methodology for evaluation of hydrodynamic coefficients of an underwater vehicle**
D. Deepak, A. Benjamin, V Seshadri and S N Singh, Indian Institute of Technology, Delhi, India

The paper discusses the optimum mesh characteristics for the computationally inexpensive approach. The approach provides a flexible and inexpensive alternative to costly and hardware-intensive real time unsteady flow CFD simulations. The reasonable accuracy obtained using the approach is demonstrated by comparing with experimental results.

17:00 - 20.00 **After the end of the conference Qinetiq will be hosting an evening drinks reception at their facilities in Haslar, including a short presentation on the life, work and legacy of William Froude and a tour of their hydrodynamic facilities. Transport to and from Haslar will be provided.**

This represents a preliminary progra

nce: Advances in Theoretical amics - Past and Future

ember 2010

day 2

08.30 - 09.00 **Coffee and Registration.**

09.00 - 09.30 **Coupling between flexible ship and liquid sloshing using potential flow analysis and their effect on wave induced loads**
Y. Lee, M. Tan, P. Temarel and S. Miao, University of Southampton, UK

The purpose of this study is to investigate the influence of hull flexibility on the hydrodynamic forces and moments associated with liquid sloshing, as well as the dynamic characteristics (e.g. resonance frequencies) of the whole system. For this purpose, symmetric and antisymmetric structural responses such as bending moments and torsional moment, etc. for an idealized LNG carrier in head, beam and quartering regular waves are studied with and without coupling effect from liquid sloshing.

09.30 - 10.00 **Modelling fluid-structure impact with the coupled FE-SPH approach**
J.C. Campbell, R. Vignjevic and M.H. Patel, Cranfield University

This paper will discuss the coupled FE/SPH approach for modelling the response structures to impact with water such as extreme wave loading. Previous work at Cranfield has demonstrated the FE-SPH approach for impact of aircraft structures on water. This work has extended this to wave loading of floating structures, which requires significantly more complex initial conditions for the water component.

10.00 - 10.30 **Computation of slamming forces on 2D and 3D bodies with CIP method**
Q. Yang and Wei Qiu, Memorial University of Newfoundland, Canada

Slamming forces on 2D and 3D bodies have been computed based on a CIP method. The highly nonlinear water entry problem governed by the Navier-Stokes equations was solved by a CIP based finite difference method on a fixed Cartesian grid. In the computation, a compact upwind scheme was employed for the advection calculations and a pressure-based algorithm was applied to treat the multiple phases. The free surface and the body boundaries were captured using density functions. For the pressure calculation, a Poisson-type equation was solved at each time step by the Conjugate Gradient iterative method.

10.30 - 11.00 **Coffee**

11.00 - 11.30 **Study of Froude and Hugh's methods by numerical towing tank**
Q. Gao and D. Vassalos, University of Strathclyde,UK

The resistance of a cargo model is calculated by numerical towing tank. The RANSE multi-phase parallel solver with K-□ SST turbulent model and VOF formulation is applied. Computational results from double model (without free surface) are used to obtain 1+k in Hugh's method and those with free surface are analyzed by both Froude and Hugh's approaches to derive model and full scale correlation.

11:30 - 12:00 **Advances in free-running model technology**
N. Kimber, Senior Scientist, QinetiQ

A research project within the EU Hydro Testing Alliance identified four areas of common interest to experimenters: motion measurement, both onboard and external tracking; control and data logging systems; communication both underwater and through the air/water boundary; and model powering. The state-of-the-art of each of these topics will be reviewed, including examples of recent incorporation into hydrodynamic test facilities.

12:00 - 12:30 **The need for full scale measurements**
T.A. Dinham-Peren, BMT Defence Services Ltd.
I. Dand, BMT ISIS Ltd.

This paper discusses the analysis of in-service ship powering performance data to determine the actual performance of the vessel. Issues to do with the measurement of the performance data and the environmental conditions are discussed and two possible methods for analysis the data are examined; 'data normalisation' and 'data bucketing'.

12:30 - 13:30 **Lunch**

13.30 - 14.00 **Application of RANS to hydrodynamics of bilge keels and baffles**
A.B.G. Querard , KBR, UK
P. Temarel and S.R. Turnock, University of Southampton, UK

This investigation first focuses on modelling the flow around cantilever plates in normal oscillation, providing key guidance for attaining sufficient accuracy for most engineering applications, in terms of turbulence modelling, mesh refinement and time step. The modelling approach is then applied to the hydrodynamics of a ship-like section fitted with vertical bilge keels, rolling at free surface.

14:00 - 14:30 **On the roll damping of an FPSO with riser balcony and bilge keels**
R. van 't Veer, SBM GustoMSC, The Netherlands

The paper will discuss the roll damping of a spread-moored FPSO intended to operate in deepwater Brazil. A specific feature of the hull is the presence of an upper and lower balcony which guide the more than 40 lazy wave risers along portside of the vessel. The roll damping and roll natural period are affected by the lower balcony which is submerged for all loading conditions.

14:30 - 15:00 **Numerical modelling and assessment of the UGEN floating wave energy converter**
N. Fonseca, S. Ribeiro e Silva and J. Pessoa, Technical University of Lisbon, Portugal

The paper presents a linear hydrodynamic model for the UGEN wave energy converter, an analysis of the dynamics of the system and the predicted ability to extract energy from the waves. The UGEN (floating device with a U tank for GENeration of electricity from waves) consists of an asymmetric floater with a large internal U tank filled with water, where the energy is extracted from the relative motion of the water inside the tank.

15.00 - 15.30 **Coffee**

15:30 - 16:00 **Influence of environmental and operational uncertainties on wave bending moments of containerships**
J. Parunov, M. Ćorak, University of Zagreb, Kroatia

The purpose of the paper is to investigate wave loads of containerships on different shipping routes. The motivation is that assumptions built-in the IACS Recommendation No.34 "Standard Wave Data" need revision to account appropriately for speed reduction, course changes and wave energy spreading. The study concentrates on vertical wave bending moments (assuming rigid hull), as the most important wave load component.

16:00 - 16:30 **Using long term wave buoy data for ship operability assessment**
D A Wing and M C Johnson, QinetiQ Ltd. *now at Lloyd's Register'*

Ship operability assessments have traditionally been made using wind and wave data derived from wave atlases, but there are several drawbacks, including the fact that they are usually based on observation rather than measurement, and that spreading or directional effects are lost - such as the separation of sea and swell directions. An alternative approach is demonstrated here, instead of the data summarised in the wave atlas scatter diagram, long term hourly historical wave buoy data may be used. Detailed data sets, including directional wave spectra, are available for a number of specific sites. Direct use of many years' hourly wave data involves significant computational effort, but results may be achieved within a reasonable time. The technique is demonstrated with the examples of four naval ships and two sites. Analysis considered two main themes, the differences in the ship

16:30 - 17:00 **An Investigation into the Dynamic Response Characteristics of Bulk Carriers**
A. Ergin, Istanbul Technical University, Turkey

In this paper, a hydroelasticity study is presented for investigating the dynamic response characteristics of a group of bulkers. Six bulkers with different load carrying capacities are adopted for the calculations.

17:00 - **General Discussion**

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International Conference

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24 - 25 NOVEMBER 2010
ACTION STATIONS, ROYAL DOCKYARD, PORTSMOUTH, UK

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VENUE
The Venue for the conference is Action Stations, 19 College Road, HM Naval Base, Portsmouth, PO1 3LJ

EVENING DRINKS RECEPTION
Following the end of day one (24/10/2010), delegates are invited to attend an evening drinks reception and tour at the QinetiQ Haslar facility, transport to and from Haslar will be provided.

ACCOMMODATION
Upon registration you will be provided with details of a hotel booking service offering reduced rate accommodation for conference participants.

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