

# RINA

The Royal Institution of Naval Architects



International Conference

## Marine Heavy Transport & Lift III

24-25 OCTOBER 2012  
LONDON, UK



## day 1

09.00 - 09.35 COFFEE, REGISTRATION & WELCOMING SPEECH

### 09.35 - 10.10 THE TFLINER OFFSHORE WIND TURBINE FOUNDATION INSTALLATION VESSEL CONCEPT

*J. Brouwer, Dutch Offshore Innovators, The Netherlands*

Since the middle of 2010, DOI has been working on the Tfliner, a vessel designed for the installation of monopiles and transition pieces, as well as jacket type foundations for offshore wind turbines. The vessel is designed to shuttle its own cargo between port and wind farm, operate independently of support vessels and install foundations while the vessel is in floating condition. Analyses proved that in terms of operability, the concept vessel can compete with the 1ST generation Wind Turbine Installation Jack-Up Vessels. The cost of building the concept vessel are reduced by about 50% as compared to the Jack-Up Vessels, and also the cost of running the concept vessel are substantially less, due to its compact size and smaller crew.

### 10.10 - 10.45 DSME WINDMILL TURBINE INSTALLATION VESSEL

*Y.K Kim, Daewoo Shipbuilding & Marine Engineering Co.Ltd, Korea*

The renewable energy market is growing up gradually in the world. The needs of windmill turbine installation vessel are growing up accordingly. DSME windmill turbine installation vessel which is equipped with a heavy lift crane is the first vessel as a platform type in the world. The hydraulic jack-up system is used to lift the platform and the jack-up system consists of jack-up frames, LEG, guiding frame and jack-up house. T. On the soft seabed, the platform is lifted by using detachable spudcan to prevent punch through phenomenon. The spudcan is installed by special bolts. The structural analysis of elevated and floated condition has been carried out. Also, transportation and Leg Sea fastening have been verified by FE analysis.

10.45 - 11.05 COFFEE BREAK

### 11.05 - 11.40 WAVE INDUCED MOTION PREDICTION AS OPERATIONAL DECISION SUPPORT FOR OFFSHORE OPERATIONS

*P. Naaijen, TU Delft, The Netherlands*

LNG offloading, wind turbine/topsite installation, cutter dredging, helicopter landing, cargo transfer from supply barges are all offshore operations that have in common that they can be critical with respect to wave induced motions. Having a real time prediction of the ship motions in the near future would enable to identify these workable time windows and anticipate on them. A way to achieve this is to use navigational radar to measure the sea state at a distant location from the vessel. These measured waves can then be used to feed a wave propagation model that makes a prediction of the waves arriving in the near future at the vessel and final a ship motion model translates these predicted waves in a prediction of the ship motions. This paper will consider the technology and research being carried out to develop such a system.

### 11.45 - 12.20 FEASIBILITY OF ELECTRIC PROPULSION FOR HEAVY LIFT VESSELS

*K Korkila, ABB, Finland*

Some of the heavy lift vessels have special requirements that make electric propulsion an attractive alternative compared to conventional diesel-mechanic solution. These requirements include dynamic positioning, redundancy, and space and weight restrictions. This paper evaluates different electric propulsion and thruster solutions and includes comparisons to the conventional mechanical alternative. The presented electric power plant alternatives include both traditional AC as well as new onboard DC grid solutions. In addition to power plant concepts, different propeller and thruster alternatives accompanied with electric propulsion are discussed. These include shaftline propulsion, mechanical thrusters, podded thrusters and retractable thrusters. Finally, a reference electric propulsion package delivered to a heavy lift vessel is presented with inside view to the chosen solutions.

### 12.20 - 12.55 MARINE TRANSPORTATION DESIGN LIFTED TO THE NEXT LEVEL: SAFETRANS 5.0

*R. Grin, Marin, The Netherlands*

SafeTrans is an integrated tool to design marine heavy lift transports by simulating the planned voyage and calculating possible combinations of vessel motions and loads imposed by winds, waves and currents. The SafeTrans development is the result of a Joint Industry Project (JIP) which ran from 1998 to 2000 and continued into a user group, aiming at continued improvement of the tool. This paper will describe the enhancements implemented during the development of the overhauled SafeTrans software, resulting in the release of SafeTrans 5.0 early 2011. Critical cases in the design of marine transports will be discussed as well as the established load factors to be applied in the design, aiming at establishing the techniques used in SafeTrans as the 'de facto' standard for the marine transportation industry.

12.55 - 13.55 LUNCH

### 13.55 - 14.30 EFFECT OF FREE SURFACE ON THE HYDRODYNAMIC BEHAVIOR OF HEAVY STRUCTURES DURING LIFTING OPERATIONS IN MARINE ENVIRONMENT

*H. Wadhwa, The University of Western Australia*

Due to the increasing availability of hydrocarbons in deep water, subsea operations have gained continuous popularity over the past two decades. The heavy structures used for these subsea operations are of various shapes and sizes and in accordance with the requirement of any particular operation. The major loads on the structure during these operations are mainly dependent on the fluid-structure interaction. The authors have conducted forced heave oscillation experiments on simplified structures of varying porosity. This paper presents the hydrodynamic performance of structures with varying porosities and free surface proximities during lifting and installation operations.

### 14.30 - 15.05 NON-LINEAR HYDROSTATIC ANALYSIS OF THE FLOATING CRANE CONSIDERING THE LARGE ANGLE OF INCLINATION

*K.Y Lee, N. Ku, J.H Cha, K.P Park, Seoul National University, Korea*

Most of problems related wave-induced motion or sea load are used to assume that the initial position of the ship is on an even keel. But when the floating crane is lifting a heavy cargo, the assumption is not valid any more since the floating crane has a different initial position depending on the cargo weight and lifting configuration. Therefore, static analysis is carried out to determine the initial position and orientation of the floating crane in the static equilibrium in this study.

### 15.05 - 15.40 HEAVY LIFTING IN 2,500M WATER DEPTH - CASCADE & CHINOOK FSHR INSTALLATION

*H. van Uijen, Jumbo Offshore, The Netherlands*

This paper focuses on the heavy lift scope that was executed by Jumbo Offshore for main installation contractor Technip USA, as part of installing 5 heavy risers in one of the world's deepest developments to date: the Cascade and Chinook fields in 2,500 to 2,750m water depth. This development by operator Petrobras will see the first FPSO in the Gulf of Mexico. It will also be the deepest FPSO installation in the world. The Free Standing Hybrid Risers are the deepest risers of this type installed in the world to date. As part of Technip's scope for the riser installation, Jumbo's DP2 heavy lift vessel Fairplayer transported and installed 5 buoyancy cans from Finland to the US Gulf of Mexico. At the offshore location each buoyancy can was connected to a 2,260m long riser, fabricated by Technip's vessel Deep Blue. After the connection was made, the Fairplayer lifted the complete assembly of 760 tonnes and lowered to its final water depth.

15.40 - 16.00 COFFEE

### 16.00 - 16.35 REMOVAL AND INSTALLATION OF MODULES ONTO TRUSS SPAR WITH DP HEAVY LIFT VESSEL

*Z. Ayaz, G. Mclelland, P. Smith, V. McCarthy, Saipem Ltd., UK*

The truss spars, due to relatively small water plane area, are sensitive to the weight changes. Furthermore, moored floating structures can have significant horizontal excursion under the influence of waves, winds and currents. Therefore, the use of DP heavy lift vessel is ideal to keep tracking the movements of a floating moored structure during the removal and installation operations. The challenge is to devise an installation method for the operation considering both the interaction as well as independent movements of two floating bodies. This paper gives an overview of the technical and operational aspects of removal/installation of the modules onto truss spars. The offshore operation methods consider step-by-step approach of each stage of removal and installation based on the feedback from the detailed technical analysis.

### 16.35 - 17.10 THE CHALLENGES AND THE SOLUTIONS IMPLIED IN THE HEAVY LIFT TRANSPORT OF A LARGE AIRCRAFT CARRIER/ASSAULT SHIP BETWEEN SPAIN AND AUSTRALIA

*A.M Diaz, F.L Rodriguez, Navantia & A. van Ginkel, Dockwise*

Navantia and Dockwise shall be transporting in 2012 the first of the two Royal Australian Navy LHD ships built between Ferrol (Spain) and Melbourne (Australia) on the largest and most capable Heavy Lift Ship to date, the Blue Marlin. The 230x32x27 m LHD ships are naval vessels with aircraft capacity and able to transport troops and assault vehicles and watercrafts to remote locations. The ships are transported unfinished to Australia where BAE Systems will be fitting the ship superstructure and other elements of the combat systems before delivery to the Navy.

17.10 - DRINKS RECEPTION

## day 2

09.00 - 09.30 COFFEE AND REGISTRATION

09.30 - 10.05 **OPERABILITY OF BALLASTING AND LIFTING OPERATIONS OF EXTREME LOADS WITH INTEGRATED HYDRODYNAMICS (OBELICS)**  
*Eelco frickel & Gerben de Vries, Marin, The Netherlands*

The main objective of the OBELICS Joint Industry Project (JIP) is to develop simulation software for ballast and lift operations of extreme loads, incorporating all relevant dynamics. This software is integrated and visualised in a real time environment to verify and/or practice these type of offshore operations.

The foreseen paper will focus on the ballast functionality of the OBELICS software. During the interactive simulation the settings of pumps and values can be manipulated with a dedicated Graphical User Interface (GUI). The vessel's full mass matrix, including mass, centre of gravity and inertia are continuously updated and taken into account in the equation of motion. With this technique a proper and realistic hydrodynamic response can be modelled.

10.05 - 10.40 **TECHNICAL CAPABILITIES And COST BENEFITS OF DOCKWISE VANGUARD**

*M. Seij, Dockwise*

The vessel, DOCKWISE VANGUARD, has been designed to support the conventional heavy transport market and for transportation and offshore dry-docking of complete FPSO's. The paper addresses the design of the vessel. New markets will be addressed with this vessel, which due to its size is suited for FPSO's transportation up to 325m x 65m and a weight of 110,000mt.

10.40 - 11.00 COFFEE

11.00 - 11.35 **FIRST OFFSHORE HEAVY LIFT SUPER FLY JIB WITH FIBRE ROPE STAYS**

*G. Wender, BigLift Shipping, M. Velthuis, Huisman Equipment, W. Van Zonneveld, FibreMax, M. van Leeuwen, Teijin Aramid*

BigLift Shipping purchased at Huisman a 17m long flyjib to increase outreach and lifting height. This paper describes the design of a flyjib on a Heavy Lift mast Crane (HLMC) by Huisman, including the design considerations that lead to the use of fibre stays. Since BigLift foresaw large installation difficulties with the use of conventional steel wire rope stays, Huisman searched for alternative materials for the production of the stays. A solution was found with a product of FibreMax, who developed an innovative production method to use high modulus aramid fibres to very large scale load appliances. Teijin Aramid, producer of aramid fibre under the brand name Twaron, was also involved in this process, especially the certification by class. Aramid is already for 30 years on the market, but this is the first time ever that aramid is used in a Lloyd's certified HLMC design. For this reason, the whole production line, from Twaron fibre to a certified fibre stay had to be monitored and classified. Part of this process was break loadtesting of fully assembled stays in a certified loadtest bench.

11.35 - 12.10 **DEVELOPMENTS IN HEAVY TRANSPORT DESIGN CALCULATIONS**

*M. van Exsel, J. de Jonge, Dockwise*

The paper addresses developments in heavy transport design calculations from a theoretical and an operational perspective. Both view-points contribute to a more detailed analysis of the transports and assure its safety. Theoretical developments of design calculations are achieved by means of a so-called "Global Hull Analysis". The aim is to reach a constant operational margin by increasing the design sea-state at the lower range and reducing the design sea-state at the higher range. This will be implemented in a new design method.

12.10 - 13.10 LUNCH

13.10 - 13.45 **THE LCAC CARRIER: A HEAVY-LIFT SHIP FOR THE TRANSPORTATION OF ACVS**

*G. Gougoulidis, Massachusetts Institute of Technology*

This paper presents a concept design called the LCAC Carrier. The LCAC (Landing Craft Air Cushion) Carrier is a heavy-lift ship designed for the transportation of Air Cushion Vehicles, using the LCAC of the U.S. Navy as a reference vehicle. The U.S. Navy operates approximately 96 crafts of the type, primarily from the LPD (Landing Platform Dock), LSD (Landing Ship Dock), and LHD (Landing Helicopter Dock) classes of ships. The main disadvantage of this scheme is the fact that a great number of vehicles is required to transfer a significant number of LCACs to the operational theater. The proposed carrier offers an economic and workable solution to the aforementioned drawbacks. It offers independence of operations and can be combined with other platforms within the context of the

Seabasing project.

13.45 - 14.20 **A CHALLENGE - HEAVY TRANSPORTATION ON AUSSA-CORNO RIVER**  
*M. Nattero, Studio d'Ingegneria Navale Ing. Mario Nattero, Italy*  
This paper introduces a real case of a boarding and transport by barge of 2 pieces of the ship which will be subsequently spliced onto a floating dock in Croatia. The peculiarities of what happened are the following:

- High dimensions, shape and weight of blocks transported
- Number of blocks transported n° 6
- total blocks rather restrictive operating Limits

In other words, we want to show a "Road Map" concerning a sophisticated and modern design applied to heavy and unusual marine transportation

14.20 - 14.55 **CONVENTIONAL TRANSPORT METHODS USED IN AN UNCONVENTIONAL WAY**

*J. Ras, Rolldock, The Netherlands*

Recently RollDock has finished a technically and operationally very challenging project. A large floating object was loaded onto the vessel by means of the float-on method whereby it was placed onto a dedicated designed 1.5 meter high steel support. At the discharge location, upstream a river with sometimes high currents, no harbour facilities were available. The vessel was to be located perpendicular to this quay with the current beam on. Resulting in a special mooring arrangement with the need of additional equipment besides the standard vessel's mooring. The cargoes were discharged onto the shore side by means of the roll-off method. The roll-off operations were all restricted to a small tidal range, resulting in delicate ballast operations, whereby the vessel was to be ballasted for weight compensation and tide compensation.

14.55 - 15.15 COFFEE

15.15 - 15.50 **CARRYING THE WEIGHT OF DEFENDING THE NATION**

*G. Williamson, Matchtech Engineering Services*

The Queen Elizabeth Class aircraft carriers are being built in blocks at shipyards around Britain. These blocks have then to be transported to the assembly site at Babcock Marine's facility in Rosyth. BAE Systems' build yard in the Portsmouth Naval Base have built three of these blocks, two in the hull and the forward island. Once prepared the island is then lifted into position on the flight deck of the ship using a 1000 tonne crane. To protect the build schedule and improve efficiency of outfit a decision was taken to lift the forward island from the base utilising a purpose designed grillage and rigging arrangement. This paper discusses the reasons behind the decisions and the way in which the resulting problems were overcome.

15.50 - 16.25 **MARINE DOMAIN AWARENESS AND SAFETY OF HEAVY LIFT OPERATION**

*S. Yasseri, Safe Sight Technology Ltd, UK*

Demanding and critical marine operations, like heavy lift, push people, vessels and systems to their limits. Heavy lift operations must contend with challenging environments and threats that necessitate greater Marine Domain Awareness (MDA), especially when many contractors are operating at the same time within the same arena. We present a structured systems engineering approach to MDA, and propose a model for developing an information exchange system between parties, in order to enhance MDA. The proposed model enhances the understanding of MDA during demanding and complex marine operations; also helps in developing procedural and training programs to promote situational awareness and the use of MDA as a decision support tool.

16.25 - 17.00 **MARINE DESIGN ASPECTS FOR LARGE MODULES ON HEAVY TRANSPORT VESSELS**

*A. Crowle, Cb&I Lummus, UK*

This paper investigates the naval architecture and structural design of onshore and offshore modules on self propelled Heavy Transport Vessels. The scheduling of design, fabrication, shipping and on site completion are discussed.

17.00 - GENERAL DISCUSSIONS

**[www.rina.org.uk/marineheavylift2012](http://www.rina.org.uk/marineheavylift2012)**