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## **DESIGN, CONSTRUCTION & OPERATION OF SUPER AND MEGA YACHTS**

5 - 6 MAY 2011

GATATA MUSEO DEL MARE, GENOVA, ITALY

## day 1

09.00 - 09.30 Coffee and Registration.

09.30 - 10.05 **Development of an Advanced Rational Design Not a Utopian Project but a Real Case**  
*M. Nattero, Studio D'ingegneria Navale*

The paper introduces a real case of luxury large pleasure yacht especially in terms of; hydrodynamic basic concept, stability, preliminary power prediction, CFD optimization basing on an extended research performed by RAPID software about best body fearing, minimization of resistance and power consumption for different stern and stem configurations, sea-keeping prediction, model basin results and sea-trial results getting a lot of significant parameter measurements in full scale. In other words, we want to show a "Road Map" concerning a sophisticated and modern design applied to a private yacht.

10.05 - 10.40 **Luxification and Design-Driven Innovation in Superyacht Design**  
*S. McCartan and L. Moody, Coventry University*  
*D. McDonagh, University of Illinois*

Luxury has a transcendent quality related to a clients' aspirations. Luxification is the continual need for designers to evolve the perception of luxury in their design process. Boat designers must implement a design-driven innovation strategy, as clients use objects for profound emotional, psychological, and sociocultural reasons as well as utilitarian ones. Designers should therefore look beyond features, functions and performance and understand the real meanings users give to things. This paper presents three design concepts which engaged in design-driven and technology-push innovation to achieve a "technological epiphany".

10.40 - 11.15 **The Environmental Challenge**  
*P. Moretti, RINA Services SpA*

This paper attempts to highlight the most significant aspects of the present and upcoming environmental regulations: the Marpol NOx and SOx requirements, the Ballast Management Convention, the sound recyclability of ships and the new IMO Energy Efficiency Design Index for the reduction of the CO<sub>2</sub> emissions. The paper will also focus on how the new regulations will affect the design and operation of mega-yachts, which are the new technologies available in the market and how the boat-builders are investing on the environmental performance of their projects.

11.15 - 12.00 Coffee

12.00 - 12.35 **Breathe**  
*R. Schouten, Feadship De Voogt*  
*G. Loeff, MARIN*

Designers love to speculate on how the next generations of superyachts might look like. *Breathe*, shows how sustainable development can also reduce costs. With its intelligent propulsion concept *Breathe* demonstrates that eco-consciousness and economic benefits can easily go hand in hand. The concept is characterized by simplicity and a minimum of components, reduced energy consumption for both propulsion and hotel loads and at the same time guaranteeing a higher level of reliability and better engine load.

12.35 - 13.10 **Reducing the Environmental Impact of Large Yachts'**  
*A. Meredith-Hardy, P. Shallcross and J. Roy, BMT Nigel Gee Ltd*

This paper looks at two mechanisms through which yachts can reduce their environmental footprint; compliance with regulation, and optimisation of design. Progress on environmental regulation at the IMO has seen recent amendments to MARPOL and the introduction of the Ballast Water Convention. The paper will examine MARPOL exhaust emissions, MARPOL fuel tank protection and BWB requirements and qualify the impact that these environmentally targeted regulations will have on large yacht design practices and vessel arrangements. The operating profile of a modern yacht dictates that auxiliary systems far outweigh the propulsion system in terms of contribution to the operational environmental footprint. The paper will illustrate how ancillary systems can be optimised in order to reduce auxiliary loads and therefore overall environmental impact of the vessel

13.10 - 14.25 Lunch



14.25 - 15.00 **Ocean Empire LSV (A life Support Superyacht)**  
*R. Sauter, Sauter Carbon Offset Design*

The *Ocean Empire* life support Superyacht is the worlds first totally self sufficient Zero Carbon Life Support Vessel (LSV). She is a 44m Solar Hybrid SuperyCat with 2 Hydroponic farms and fishing facilities to harvest the sea. Her solar propulsion systems and all the Hotel amenities of a luxury global voyager are supplied by harnessing the energy from the Sun, wind and waves

15.00 - 15.35 **Numerical and Experimental Fluid Dynamics in the Modern Design Process**

*I.M. Viola, Newcastle University, S. Bartesaghi, Politecnico di Milano, S. Della Rosa, Silverio Della Rosa Naval Architect and S. Cutolo, Hydro Tec*

The hull resistance of 3 modern power yachts of 70', 105', and 163', respectively, were computed with a viscous code and compared with the experimental data. The sections of a fin stabilizer were optimised with an inviscid code coupled with a genetic-algorithm-based optimiser. Viscous and inviscid codes were used to investigate several fin configurations and the fin efficiency at zero-speed. The flow pattern upstream the propeller was computed with a viscous code, while the propeller was successively designed with a potential flow code. Finally, the comfort and the drag of the superstructure of an 80' yacht were investigated.

15.35 - 16.10 **Method for Improving Rudder Design of High Speed Craft Using CFD Simulation**

*S.G. Lewis and M. Skrzynski, CJR Propulsion Ltd*  
*S.R. Turnock and A.M. Wright, University of Southampton*

Stern gear design for luxury high speed yachts currently relies on an estimation of the inflow velocity at the propeller plane and the propeller race. These components are often located within tunnel features on the hull and the flow regime will be influenced by the vessel trim and planning speed. Typically, the flow into the propeller is taken as an average over the entire propeller area and does not take into account the variation of the flow into the propeller due to appendages and hull shape. A method of introducing the propeller forces back into the CFD flow is presented. This improved method has the advantage of a more accurate flow field into the rudder, which allows the rudder design to be optimised.

16.10 - 16.45 Coffee

16.45 - 17.10 **Dynamic Positioning: Only One Aspect of Improving the Handling of Large Yachts**

*M.Noordegraaf and P.G.M. van der Klugt, Imtech Marine & Offshore*

Imtech Marine & Offshore software "toolbox" that can be turned into various systems for manoeuvring a yacht, ranging from a modern conning display or stand-alone autopilot to an advanced, though easy to operate, dynamic positioning and tracking system that can be used not only at low or reversed speeds but also at very high speeds. The paper will describe how this "toolbox" approach has initiated various trends in the top of the luxury yacht market with respect to the design and use of the "nerve centre" of a modern yacht: the integrated bridge.

17.10 - 17.45 **The Design of At-Anchor Stabilization Systems for Mega Yachts Based on Calculations and Model Tests**

*L.Sebastiani, D. Ruscelli and M. Peverero, CETENA SpA, S. Crupi, PSC Engineering srl., G. Schiaffino, Fincantieri Marine Systems and M. Giannini, Fincantieri Yachts*

The paper describes the design methodology developed by Fincantieri and CETENA with reference to a real prototype. The shaft force and torque which rule the dimensioning of the hydraulic motor are predicted by a design tool based on the main characteristic parameters of ship / fins / hydraulic motor. The tool is based on semi-empirical formulas validated against existing model test data. Once the system has been properly dimensioned the stabilisation performance in irregular waves is assessed by a time domain simulator, which has been validated against existing model test data. The same simulator also serves as a tool for the controller supplier in order to optimize the control law. This methodology has been applied to a prototype system developed and recently tested in sea-keeping basin. The results of the comparison between design simulations and model tests are presented in the paper.

17.45 - Drinks Reception

# ATION OF SUPER & MEGA YACHTS

EO DEL MARE, GENOVA, ITALY

## day 2

09.00 - 09.30 Coffee and Registration.

09.30 - 10.05 **An Emotional Design Approach to Luxury in Superyacht Interior Design**  
*S. McCartan and L. Moody, Coventry University*  
*D. McDonagh, University of Illinois*

Superyacht interior design from an industrial design perspective is about understanding the needs of the client. Clients want design functionality and usability as well as products that elicit other feelings such as luxury and pleasure. Emotional design involves developing an understanding of user characteristics, expectations; desires and needs, translating them into a sensitive and balanced design solution. This paper presents a design case study which applied a methodology framework for emotional design to a superyacht interior for a Chinese client.

10.05 - 10.40 **The Interaction of Human and Yacht Interior: The Relation Between the Physical Discomfort and Psychological Discomfort**  
*I. Ernis and R. Zengel, Dokuz Eylul University*

Yachts have complex interior systems, in which human and space interaction became an important issue. The subject of human and space perception has a great amount of research data which can be applied to the field of yacht design. The psychological needs of human are perhaps not taken into enough consideration while designing yacht interiors. In this paper the relation between psychological discomfort and physical discomfort in the scope of interior design features, will be explained. Different approaches from the architects applying the data from environmental psychology to the buildings to create un-stressful interiors for human will be given to support the concept development of future pleasure yachts.

10.40 - 11.15 **An Update on Yacht Classification Services**  
*E. Brina, ABS*

This paper will discuss the applicable class rules for respective yacht classes and service with a particular focus on future rule developments and the impact of regulatory requirements. It will also address the class survey regime for yachts and class initiatives to improve survey and maintenance management.

11.15 - 12.00 Coffee

12.00 - 12.35 **Building A Yacht For Charter**  
*H. Lowe, Royale Oceanic Superyachts*

Whilst many yachts are specified to comply with LY2 or equivalent to engage in commercial activities what does this really mean for the owner's team when building the yacht. Who is responsible for what in order to achieve compliance at delivery? The commercial aspects and technical aspects that need to be considered can form part of a simple task list with responsibilities assigned between the yard & owner's team. This paper aims to clarify what is required for a new yacht to be both "commercially ready" and "charter compliant" on delivery considering the following: Code compliance - SOLAS, LY2 or PYC, flag authority, logistics and ergonomics of the design with regard to charter guests, owning company arrangements, crew and crew management, yacht management - ISM/ISPS compliance, security and access requirements, chartering operation, tenders and toys (incl. helicopters), entertainment and IT systems and aspects/facilities to maximise charter income.

12.35 - 13.10 **The Application of the Maritime Labour Convention 2006 to Large Commercial Yacht**  
*M. Towl, Maritime and Coastguard Agency UK*

The Maritime Labour Convention 2006 was adopted by the International Labour Conference in February 2006. The Convention consolidates and updates over 60 maritime labour instruments adopted by the International Labour Organization since 1920. This new Convention is expected to come into force in 2012. The Convention applies to all 'seafarers', meaning any persons who are employed or engaged or in any capacity on board new ships covered by the Convention. This includes all new yachts ordinarily engaged in commercial activities. Full application of the Convention, in particular the accommodation and recreational facilities standards, would have a substantial impact on the superyacht sector. It is possible that it would no longer be financially viable for some new yacht designs to be used for charter

14.25 - 15.00 **Improving Mega Yacht Development Processes with an Integrated Solution of Product Lifecycle Management (PLM)**  
*F. Mathieu, Dassault Systems*

Product Lifecycle Management (PLM) is helping the yachts Industry to improve projects development and production, from requirement management, preliminary design to detailed engineering and manufacturing of structure, systems and interiors. By implementing PLM shipyards can accelerate the introduction of new designs and technologies. It is possible to have a permanent access to the project information in a virtual 3D universe making it easily check and validate the impacts of a modification on the entire project. This 3D digital mockup, initiated at the first stage with the naval architecture work, is becoming progressively more and more detailed, showing all the components in a virtual assembly where most of the interferences and coordination problems are solved earlier.

15.00 - 15.35 **Is LNG the Future of Yacht Propulsion?**  
*J. Strachan - Burness Corlett Three Quays*  
*S. Haberg, Rolls-Royce*

The increasingly stringent emissions targets are forcing commercial ship operators to seriously consider LNG as a fuel. In an effort for Yachting to remain at the forefront of ship and propulsion design, Burness Corlett Three Quays and Rolls Royce have recently undertaken an extensive joint feasibility study into LNG propulsion culminating in the design of a 120m LNG Yacht. This paper describes the propulsion system and the special features of the LNG Yacht. The paper goes onto detail the benefits of LNG propulsion along with discussing the infrastructure issues and other potential drawbacks along with possible solutions to these issues.

15.35 - 16.10 Coffee

16.10- 16.45 **Advanced Propulsion Gears for Super and Mega Yachts**  
*F. Hoppe, RENK AG*

Different operating modes require different propulsion system characteristics and call for intelligent combination of diesel engines, gas turbines and/or electric motors. Hence, main reduction gears onboard mega yachts transmitting power and reducing speed to controllable pitch propellers or water jets feature similar demands. The variety of operating modes, general arrangement, reduction ratio, distance between input and output, and finally auxiliary equipments have to always be adjusted to the propulsion plant concept and vessel's design. This paper will introduce the technical considerations and technologies to be applied to main propulsion gear systems, accompanied with some prominent application examples..

16.45 - 17.10 **How to Optimise the Machinery Solution of a Megayacht**  
*R. Doddis and S. de Marco, Wärtsilä Italy*

Building a megayacht is a process where many parameters need to be taken into consideration: vessel dimensions, design, interiors and number of passengers among others. For a megayacht it is essential that no smoke or soot is visible and the comfort level is high (no noise or vibration is transmitted from the engine room machinery to other parts of the vessel). Therefore special consideration needs to be pointed for selecting the best machinery concept fulfilling these requirements and at the same time being economical to both operate and own. In order to accommodate the machinery to a ship general arrangement, the concept evaluation should be done in early stage of the project enabling efficient use of spaces. This study will concentrate on evaluating the alternative machinery concepts for a megayacht. The performance (operating cost, first cost, exhaust emissions, efficiency etc.) of the alternative concepts is benchmarked against the "standard" setup. Related to machinery, reliability is highly valued by the owner. Regarding machinery selection, this can be maximised by assuring the compatibility (interfaces) of the products and control systems.

17.10 - General Discussion

13.10 - 14.25 Lunch



