International Conference

Power & Propulsion Alternatives for Ships

8th November 2017,
EUROPORT, Rotterdam, The Netherland

In Partnership with EUROPORT Exhibition for Maritime Technology

www.rina.org.uk/Alternative-ship-power

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Reduce European Port and Shipping Emissions - 3 Step Process

The primary focus for this session is on the real advances made by battery energy storage, and assess whether it can make the leap from small to larger vessels. The acknowledged ship energy expert will be Kevin P. Walsh, Senior Principal, Energy and Maritime Strategies, DNV GL. He will return tomorrow. Drawing on Foreship’s unrivalled experience in cruise ship newbuilding and retrofit design work, Foreship Head of New Technology Jan-Erik Räsänen will discuss the true potential for this technology as a source of marine power and propulsion over the next five years. Is the sky the limit, or do significant gains today promise only diminishing returns? Current and future scale limitations for alternative marine power and propulsion solutions will place that change into perspective, focusing on the change drivers, the barriers & solutions to that and examples of new build and retrofit projects. Firstly, outlining the current state of commercial marine and how we have reached this point from a technical point of view (sail design, rotors, kites and new hull designs), detailing the financial and policy drivers and the market barriers and how these will likely affect uptake of wind propulsion. The International Windship Association (IWSA) establishment is a key development, the first organisation dedicated to the promotion and facilitation of commercial wind propulsion solutions in cooperation with the shipping industry and other major stakeholders. A key focus is on work streams tackling barriers and generating solutions in the policy, technical standards, finance, communication and cargo/market transformation fields. Examples of 2-3 wind propulsion projects at an advanced stage of development will provide the audience a clearer understanding of the potential for change, rating performance and outlining the expected costs, returns and other commercial considerations.

Norsepower Rotor Sails - efficient and reliable auxiliary wind propulsion for ships

The segments of this session will be: 1. Zero Emissions in Port - Tugboats, Cargo & Cruise Ships; 2. Coastal Shipping Hybridization - Battery hybrid types and examples; 3. Shore Power - how batteries reduce burden on local grid and expand availability to Today, more than 100,000 vessels travel through 4,500 ports worldwide, producing emissions equivalent to 220 coal-fired power plants. With seaborne trade expected to double to as many as 24 billion tons annually come 2030, the shipping industry must reduce its carbon footprint and adopt technologies that maintain ability to economically conduct trade. Zero Emissions in Port: Zero or low emission harbour activities are now available to all vessels and machines in ports. Each type utilizes battery power. The presentation will explore how cranes, ORV, tugboats, cruise ships and container vessels can implement the technology today with economic benefit. Coastal Shipping - Short trip ferries and coast is prime for hybrid propulsion. Battery technology has increased and cost has decreased. Coastal ships and ferries can utilize plug-in hybrid propulsion as prime movers to reduce costs and emissions. Shore Power - Traditional shore power connections directly to the grid; the addition of rechargeable battery packs considerably of batteries expands availability. Pack are no longer limited by power availability or infrastructure capacity. Battery packs are charged by grid or other renewable sources, and some cases be used to optimize and reduce on-shore power generation or provide emergency spinning reserve for the port.

Commercial Wind Propulsion Solutions: Putting the ‘Sail’ back into Sailing

Gavin Allwright, Secretary, International Windship Association (IWSA), UK

We have seen a wind change in the industry over the last 4-5 years where it comes to shipping efficiency and this has gone hand in hand with a steady growth in commercial wind propulsion projects, marked by a very small number of projects in the past but a steady growth in numbers and interest. The aim of this presentation will place that change into perspective, focusing on the change drivers, the barriers & solutions to that and examples of new build and retrofit projects. Firstly, outlining the current state of commercial wind propulsion and how we have reached this point from a technical point of view (sail design, rotors, kites and new hull designs), detailing the financial and policy drivers and the market barriers and how these will likely affect uptake of wind propulsion. The International Windship Association (IWSA) establishment is a key development, the first organisation dedicated to the promotion and facilitation of commercial wind propulsion solutions in cooperation with the shipping industry and other major stakeholders. A key focus is on work streams tackling barriers and generating solutions in the policy, technical standards, finance, communication and cargo/market transformation fields. Examples of 2-3 wind propulsion projects at an advanced stage of development will provide the audience a clearer understanding of the potential for change, rating performance and outlining the expected costs, returns and other commercial considerations.

Influence analysis of the wingsail system configuration on the technical performances and financial return of the technology on sail-assisted vessels

Juan Cuuskoski, Norsepower Oy Ltd, Finland

The segment of this session will be: 1. Zero Emissions in Port - Tugboats, Cargo & Cruise Ships; 2. Coastal Shipping Hybridization - Battery hybrid types and examples; 3. Shore Power - how batteries reduce burden on local grid and expand availability to Today, more than 100,000 vessels travel through 4,500 ports worldwide, producing emissions equivalent to 220 coal-fired power plants. With seaborne trade expected to double to as many as 24 billion tons annually come 2030, the shipping industry must reduce its carbon footprint and adopt technologies that maintain ability to economically conduct trade. Zero Emissions in Port: Zero or low emission harbour activities are now available to all vessels and machines in ports. Each type utilizes battery power. The presentation will explore how cranes, ORV, tugboats, cruise ships and container vessels can implement the technology today with economic benefit. Coastal Shipping - Short trip ferries and coast is prime for hybrid propulsion. Battery technology has increased and cost has decreased. Coastal ships and ferries can utilize plug-in hybrid propulsion as prime movers to reduce costs and emissions. Shore Power - Traditional shore power connections directly to the grid; the addition of rechargeable battery packs considerably of batteries expands availability. Pack are no longer limited by power availability or infrastructure capacity. Battery packs are charged by grid or other renewable sources, and some cases be used to optimize and reduce on-shore power generation or provide emergency spinning reserve for the port.

Wind Pioneers with Hybrid and Autonomous Technologies

Ken Goh, Knud E. Hansen, Australia

Reduction of CO2 emissions has been a priority but making small efficiency gains in current internal combustion engines is unlikely to make the significant changes to greenhouse gases that are being sought. In 1989 KNUD E HANSEN developed an innovative concept design for a fully wind powered vessel sponsored by the Danish Environment Agency - The WindShip. Comprehensive research into the economics and sail technology showed that a wind powered vessel for bulk and liquid cargo was entirely feasible. Recent developments in materials and power systems make the concept even more viable and the successful sea trials and extensive testing during operation on the North Sea route, the two 18 m high and 3 m diameter Rotor Sails are confirmed to save an average of 6% of Estraden's annual fuel consumption on the North Sea route. A fuel saving potential of up to 20% can be estimated for vessels with multiple, large Rotor Sails sailing in favourable wind conditions. The paper describes the modern design of the Flettner rotor which Norsepower has developed and the operating experiences from the first two years onboard the Estraden. Various aspects related to ship design and operation with Rotor Sails are discussed and recently announced delivery projects for the Viking Line cruise ferry Grace and Maersk Tankers LR2 tanker are presented.

Influence analysis of the wingsail system configuration on the technical performances and financial return of the technology on sail-assisted vessels

David Ferrer Desclaux1, Mario Mantilla Sánchez, Albert García Pizao, Fran Serna Sanz, José Miguel Bermúdez Miquel, Cristina Alessendri Muñoz, Nuria Ferrés Rubau; 1 2 3 4 5 6 7 Research and Development Department, Bound 4 Blue S.L., Spain

Shipping industry’s economic efficiency is highly influenced by fuel-related OPEX, being at the mercy of fuel volatile cost, with an increased pressure from IMO regulations. Various fuel savings innovations and power systems make the concept even more viable and the successful sea trials and extensive testing during operation on the North Sea route, the two 18 m high and 3 m diameter Rotor Sails are confirmed to save an average of 6% of Estraden's annual fuel consumption on the North Sea route. A fuel saving potential of up to 20% can be estimated for vessels with multiple, large Rotor Sails sailing in favourable wind conditions. The paper describes the modern design of the Flettner rotor which Norsepower has developed and the operating experiences from the first two years onboard the Estraden. Various aspects related to ship design and operation with Rotor Sails are discussed and recently announced delivery projects for the Viking Line cruise ferry Grace and Maersk Tankers LR2 tanker are presented.
Alternatives for Ships Rotterdam, The Netherlands

Lunch

Replacement of a diesel generator with a containerised battery system on-board a container ship
Petros Menegakis, Ioannis Dimakopoulos, Georgios Panagoulias, Spyridon Gkinis and Nikolaos Lampiris, Newcastle University

This design proposes an energy efficient solution aiming at the reduction of emissions generated by the fleet of one of the largest sections of international shipping, container ships. By designing a containerised battery system capable of providing 10.3MWh of useful energy, the ultimate aim is to replace an existing diesel generator and to operate the battery system on manoeuvring. Using a load planner software, it was ensured that such a system can be loaded on-board a specific container ship, without negatively affecting the stability and the structural integrity of the vessel. The battery system can be charged both by a shore supply as well as during the seagoing part of the voyage, by using excess power produced, operating the running generators at their optimum point. The energy feasibility of such a system and the emissions reduction were verified by developing several software models, allowing various case study trips to be investigated. Results suggested that such a system on-board, emissions can be reduced by 18.55% when the ship carries only normal containers and by 43% when the ship carries normal and refrigerated containers, showing that battery systems on-board can be used in benefitting green container carriers.

Wind assisted ships design exploration and operational constraints
R. Eggers, Maritime Research Institute Netherlands, The Netherlands; G. Gaillard, Maritime Research Institute Netherlands, The Netherlands;

The Maritime Research Institute Netherlands (MARIN) is progressively working in several projects to better understand and to increase the performance of wind propelled/assisted vessels. The present paper will highlight two developments: The influence of (null form) design variations on overall performance; testing of manoeuvring and seakeeping operational constraints. As a part of a collaboration with Delft University of Technology, Dykstra Naval Architects and Damen Shipyards, MARIN analysed the hydrodynamic forces for a systematic series of hull forms that were analysed for performance as wind assisted ships. This systematic series was taken and enhanced with a description of aerodynamic, rudder and propeller performance data leading to an overall Power Performance Prediction. The hull form variations in the systematic series were matched with appropriate variations in aerodynamic, rudder and propeller characteristics. The overall performance is studied. Amongst others emphasis is given to the trade-off between maximum righting moment too be able and carry a lot of wind power at low heel angles on hand and the poor lift/drag performance of wide shallow hulls that realise such high righting moment on the other hand. Secondly, the relevance of operational constraints are discussed. Firstly this relates to the IMO resolution MSC. 137(76) on manoeuvring. Recent draft guidelines by e.g. DNV GL indicate that the criteria on performance in zig-zag and turning circle manoeuvres therein also need to be met with wind propulsion engaged. Further, the combined need of high speed and the course keeping abilities of wind assisted ships, related to typical criteria are discussed. The implications of these constraints and the possibilities for testing are discussed.

LNG powered dry bulk carrier
A. Trakakis, Arista Shipping, GR; M. Ioannou, M. Penfold and E. Kariambas, American Bureau of Shipping, GR and UK; D. Antonopoulos, Wärtsilä

In recent years, marine engine exhaust emissions legislation has become increasingly stringent. The upcoming global sulfur fuel content limit of 0.5%, effective from the 1 January 2020, constitutes a large percentage of the total energy required and emissions as well as a significant cost reduction in operation. After some ample and intensive analysis and measurements of multiple operational profiles of ships, it was determined that a new, hybrid propulsion system (similar to hybrid buses), will be the optimal solution to reduce fuel consumption in timetable operation. This parallel hybrid system which incorporates propulsion as well as the general energy management of all energy consuming parts on board is composed of different components which are controlled by a dynamic management system in such a way, that the distinct, transient processes can be smoothed out as much as possible. This allows the multiple diesel engines which are the main energy producers, to work at their most efficient operating point (or they may at times be shut off entirely due to battery buffers). The focus is set on considering the integration of the different systems, their optimal cooperation with each other and the required system dynamics. First substantiated calculations show that fuel consumption can be reduced by up to 17%. Also they show that, with the additional help of downsizing relevant components, the costs of operation can be reduced up to 40% (excl. crew costs). Within the framework of this paper, the project will be presented how the base system was developed, build and tested. Real measured values, collected during the first six regular operating months of the pilot vessel supports the paper with newest data.

Coffee

Role of Rim Driven Propulsors in Future Electric Ships
Steven Fletcher, Senior Engineer, Frazer-Nash Consultancy Ltd, UK

Rim-driven propulsors could come to play an important role in the propulsion of future electric ships. RDPs are a novel and emerging electrical propulsion system that integrates an electric motor within a ducted propeller, resulting in a compact, electrically driven propulsion package. RDPs have huge potential benefits for a range of applications because they remove the need for conventional mechanical drivetrains and open up a wide range of alternative platform arrangements. This paper will discuss why electrical propulsion is advantageous and the types of power levels required to help illustrate what RDP systems must be capable of, before offering further detail on RDP systems and discussion of the challenges associated with their future application on large commercial ships. Key areas of interest include the impact of such systems on ship architecture and electrical integration challenges.

Hybrid energy and propulsion system for vessels in timetable operation
Martin Einsiedler, SHIPTEC AG, Switzerland

The energy consumption of propulsion and all on board systems is becoming more and more the focal point of attention in shipbuilding and operation. The target is to reduce the total energy required and emissions as well as a significant cost reduction in operation. After some ample and intensive analysis and measurements of multiple operational profiles of ships, it was determined that a new, hybrid propulsion system (similar to hybrid buses), will be the optimal solution to reduce fuel consumption in timetable operation. This parallel hybrid system which incorporates propulsion as well as the general energy management of all energy consuming parts on board is composed of different components which are controlled by a dynamic management system in such a way, that the distinct, transient processes can be smoothed out as much as possible. This allows the multiple diesel engines which are the main energy producers, to work at their most efficient operating point (or they may at times be shut off entirely due to battery buffers). The focus is set on considering the integration of the different systems, their optimal cooperation with each other and the required system dynamics. First substantiated calculations show that fuel consumption can be reduced by up to 17%. Also they show that, with the additional help of downsizing relevant components, the costs of operation can be reduced up to 40% (excl. crew costs). Within the framework of this paper, the project will be presented how the base system was developed, build and tested. Real measured values, collected during the first six regular operating months of the pilot vessel supports the paper with newest data.

17:00h General Discussion & Evening Drinks Reception
International Conference
POWER & PROPULSION ALTERNATIVES FOR SHIPS

8th November 2017, EUROPORT, Rotterdam, The Netherlands

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VENUE
The Venue for the conference is Europort, Ahoy Congress Centre, Rotterdam.

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Following the end of day one, delegates are invited to attend an evening drinks reception at the conference venue.

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

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