RINA

The Royal Institution of Naval Architects

International Conference

SHIP DESIGN AND OPERATION FOR ENVIRONMENTAL SUSTAINABILITY

10 - 11 MARCH 2010

RINA HQ, LONDON, UK

SHIP DESIGN AND OPERATION FOR

10 - 11 MA

As Mr. Mitropoulos the Secretary General of IMO has stated it is now generally accepted that "The time for apportioning blame as to who is responsible for the state of the planet has passed. Now it is time for action. Developed and developing countries, industrialized and emerging economies alike are left with no option other than to get together and, together, work out solutions that will serve well the good cause of reversing the route to planet destruction."

The environment must be considered in every aspect of the design and operation of all shipping, from construction all the way through to decommissioning. The earlier these issues are addressed in the design stage, the more cost effective and successful they are likely to be at reducing the environmental impact of shipping industry. However, much can also be undertaken on existing vessels to reduce the impact of the remainder of their lives. The IMO is systematically introducing regulations on a number of topics to reduce the impact of the marine industry on both the sea and atmosphere, including exhaust emissions, anti-fouling, and ballast water amongst others.

day 1

08.30 - 09.00 **COFFEE AND REGISTRATION**

09.00 - 09.35 **KEYNOTE ADDRESS - JOHN AITKEN, SECRETARY GENERAL OF SEAaT**

09.35 - 10.10 **DESIGN FOR LIFE**
Helen Farhall MESci AIEMA, MoD, UK
Cynthia Chia MSc CEnv MIEMA, Frazer-Nash Consultancy

This paper explores the concept of applying sustainable engineering principles to enable the design of ships from Concept to Disposal. In addition to environmental legislation compliance and minimisation of environmental impacts, the benefits of incorporating sustainable engineering principles include enhanced through life management, bringing about improved cost efficiencies/savings, safety management and unconstrained global operations/services. The paper introduces fundamental concepts and highlights the inter-dependencies between sustainable engineering, through life management, cost benefits, environmental & safety management and maintaining continuity of global operations/services.

10.10 - 10.45 **A LIFE CYCLE APPROACH TO SHIPBUILDING AND SHIP OPERATION**
T Tincelin, STIRLING DESIGN INTERNATIONAL

Early 2007, Stirling Design International launched a R&D program to develop LCA (Life Cycle Analysis) software to assess the environmental impact of shipbuilding, ship operation and ship recycling at design stage. This software called SSD for "Sustainable Ship Design" has been developed and tested by major shipyards (STX Europe and DCNS) and classification societies (Bureau Veritas). An assessment of environmental impacts of a specific design can be carried out over the various stages of its life cycle according to specific criteria: ecotoxicity, eutrophication, global warming, atmospheric acidification, destruction of the ozone layer, human toxicity, fine particle emissions, exhaustion of natural resources, flow indicators (water, energy consumption, waste production).

10.45 - 11.15 **COFFEE**

11.15 - 11.50 **AN ENVIRONMENTALLY SUSTAINABLE SUPERYACHT**
Keir Gravil and Thomas Taylor Mathews

The Spirit of Gaia is a 53-metre design that features many novel environmental features and places environmental sustainability far higher on the list of design priorities. The paper describes the yacht in detail, demonstrating the efforts that have been made to curtail the environmental impact of modern superyacht design whilst keeping the yacht economically competitive in both the private and charter markets. The design also aims to demonstrate that the design of superyachts and other luxury vessels for environmental sustainability does not necessarily have to impact the aesthetic and luxury factors affecting their design.

11.50 - 12.25 **THE COMPOSITE SUPERSTRUCTURE CONCEPT- AN ENVIRONMENT-FRIENDLY & COST EFFICIENT APPROACH**
Lars-Magnus Efraimsson, DIAB International AB
Tommy Hertzberg, SP Technical Research Institute of Sweden

Results from a LCA (life cycle cost analysis) will be presented that show the ecological benefits of using FRP sandwich instead of steel for ship construction. Firstly the paper will explain how the system was developed as part of the Swedish-based LÄSS Project. It will then cover in some detail the extensive large-scale trials that have been carried out at the Swedish facility of SP Fire Technology. These were undertaken to demonstrate that under SOLAS II-2 regulation 17 (part F) an FRP sandwich structure could safely be used for both decks and bulkheads of commercial ships.

12.25 - 13.30 **LUNCH**

13.30 - 14.05 **ASSESSING THE FUEL SAVING BY USING AUXILIARY WIND PROPULSION FROM TRACTION KITES**
Peter Naaijen, Delft University of Technology

This paper describes an estimation tool to assess long-term benefits of auxiliary wind propulsion means of traction kites. A method is described to estimate kite propulsion force. Together with existing approaches to determine ship resistance and propulsion performance this method has been used to develop an estimation tool for fuel consumption without using any specific experimental data of the considered ship and kite system.

14.05 - 14.40 **SAIL MODULES FOR WIND ASSISTANCE**
Richard Dryden, Transition Sailing Rigs

Sails and kites are both viable options for wind assistance. They each have advantages and disadvantages. The proposal put forward here is for folding sailing rigs contained in streamlined pods that can be reversibly fitted to existing ships such as tankers and bulk carriers to reduce their fuel use on favourable routes by approximately 20%. When wind assistance is not required, as for example in adverse conditions or in port, the rigs can be folded and stowed within their pods. The modules are removable for servicing or when not required for the next stage of the voyage. It is proposed that the modules could be leased to the ship operators to make wind assistance financially attractive while a new generation of specialised wind ships is being developed.

14.40 - 15.10 **COFFEE**

15.10 - 15.45 **THE POTENTIAL OF THE RENEWABLE ENERGY DIRECTIVE TO STIMULATE THE RETURN OF COASTAL SAILING CARGO VESSELS.**
David Surplus, B9 Shipping Ltd

B9 Shipping is developing the design of a 3,000dwt coastal sailing cargo vessel to import biomass from the Baltic States. In preparing its "national renewable energy action plan" the UK should introduce an associated marine "economic support scheme" along similar lines to its Renewables Obligation which has been so successful in stimulating the deployment of wind turbines and other renewable energy technologies on land. A description of the transformation that such a scheme would have on the project value proposition is provided and the argument is made that this would be sufficient to stimulate the commercial return of sailing cargo vessels to Europe's coastal waters.

15.45 - 16.20 **THE EFFECT OF FOUL RELEASE COATING ON VESSEL OPERATING EFFICIENCY AND EMISSIONS**
J Willsher, International Paint Ltd.

Whilst the shipping industry is more energy efficient than other forms of transport, however, with an estimated 300 million MT of fuel consumed annually, there is an increasing focus on shipping's environmental impact. Antifouling coatings improve energy efficiency of ships by preventing fouling on the hull, restricting the ships movement through the water. Independent research has proven a direct link between hull roughness and vessel efficiency. The latest f1uoropolymer foul release systems have exceptionally low hull roughness and can reduce drag significantly compared to biocidal antifoulings.

16.20 - 16.55 **THE IMPORTANCE OF SHIP HULL COATINGS AND MAINTENANCE AS DRIVERS FOR ENVIRONMENTAL SUSTAINABILITY.**
Dr Geoffrey Swain, Florida Institute of Technology

The commercially mature systems maybe broadly divided into biocide based copper and copper free coatings, biocide free silicone fouling release technologies and inert hard coatings combined with underwater cleaning. These systems are performing remarkably well; however, there is no universal system that works satisfactorily under all operational conditions and improvements are still required to qualify as a truly environmentally sustainable system. This presentation will review the requirements for antifouling systems and compare these to the performance of the commercially mature technologies. It will then consider new research directions and how they are likely to improve on existing methods.

16.55 - 17.00 **GENERAL DISCUSSION**

17.00 - **EVENING DRINKS RECEPTION**

day 2

08.30 - 09.00 **COFFEE AND REGISTRATION**

09.00 - 09.35 **LOW CARBON SHIPPING – A SYSTEMS APPROACH**
T Smith, R Bucknall, University College London
J Dinwoodie, University of Plymouth Business School
D Gibbs, University of Hull
J Mangan, University of Newcastle
O Turan, University of Strathclyde

Shipping was estimated in 2007 to account for 3.3% of global anthropogenic CO2 emissions. In the second IMO GHG study (MEPC59/INF.10, IMO 2009), it was predicted that shipping would account for between 12-18% of global CO2 emissions by 2050 if no action is taken to reduce emissions from shipping (allowing for no greater than 2°C global temperature rise by 2100). This paper outlines the approach and objectives of a multi-million pound, multi-disciplinary programme of research funded by EPSRC and the international ship and shipping industry, currently underway across 5 UK universities.

09.35 - 10.10 **DEVELOPMENT OF VOYAGE SUPPORT SYSTEM "SEA-NAVI" FOR LOWER FUEL CONSUMPTION AND CO2 EMISSIONS**
H ORIHARA, Universal Shipbuilding Corporation

This paper describes the design and evaluation of a new voyage support system called "Sea-Navi®". "Sea-Navi®" has been developed for use on ocean-going ships to achieve lower fuel consumption and CO2 emissions. The most efficient route of voyage is calculated with onboard PC using all relevant ship, propeller and engine data and weather forecast data sent from shore-based supplier by means of satellite communication. The route of the ship is optimized by taking into account the influence of wind, waves and tidal current. Avoidance of excessive encounter weather and ship motions can also be accounted for in the route-optimization.

10.10 - 10.45 **OFFSHORE SHIP DESIGNERS LAUNCHES GREENTUG**
Merijn Brusselers, Offshore Ship Designers

This new harbour tug will be able to remain on standby, and mobilise/demobilise with zero emissions, and will save up to 90 per cent of SOx, NOx and particulate matter and 50 per cent of CO2 emissions in total compared to a conventional harbour tug over the whole employment cycle. The 65 tonne bollard pull tug is fitted with fuel cells and hydrogen tanks, where hydrogen is stored under high pressure. The fuel cells, in combination with batteries, are able to provide sufficient power to operate the tug during standby and mobilisation/demobilisation periods. Only when substantial bollard pull is required to actually perform a berthing operation are the diesel generator sets used.

10.45 - 11.15 **COFFEE**

11.15 - 11.50 **INSUFFICIENT LEGISLATION REGARDING SEWAGE TREATMENT ON COMMERCIAL SHIPS**
Jakob le Fevre, Gertsen & Olufsen

In 2009, 1st Jan. new rules will come into force regarding treatment of sewage onboard commercial ships above 400GT or carrying above 15 persons. The authors postulate is that these rules are insufficient. The presentation will clearly outline the new set of rules and demonstrate that the subject must be re-evaluated as soon as possible to ensure nations world wide against severe pollution with dangerous bacteria. The presentation will outline why Chlorine should not be accepted for disinfection, why the borders of discharge should be extended, why special areas for zero discharge or only discharge of disinfected water should be introduced, why grey water should be included in the rules, why ships must fill out a discharge log, why authorities must agree to a common value for BOD5 per person/per day and why it is problematic that only TSS is measured on influent. The paper is intended as inspiration to owners, authorities and suppliers operating in the commercial world of shipping.

11.50 - 12.25 **ELECTROCHEMICAL CHLORINE GENERATION APPLICATIONS FOR BALLAST WATER TREATMENT**
Fatma Yonsel, Ceren Bilgin Guney, Istanbul Technical University

There are a number of techniques to eliminate the organisms in ballast water: physical, mechanical and chemical options. Chlorine disinfection is a well known chemical technique for ballast water treatment. Chlorine is widely used as a disinfectant, however handling and storage of chlorine on board is a safety risk. It is determined by the present study that the cell FTEC 500 produces an Ano-fluid with the best disinfectant content. The cells 'Standart' and FTEC 100 follow with their performance. Even worst results of FTEC 500 (with seawater) is better than best results of FTEC 100 and standart cell.

12.25 - 13.30 **LUNCH**

13.30 - 14.05 **MARINE PASSIVE SAFETY DEVICES – FAST OIL RECOVERY SYSTEM**
Roch Hallopeau, JLMD Ecologic Group

In the current industrial context, the maritime sector is expected to reduce significantly its impact on the marine environment. In that respect, efforts have been made to reduce, in a normal framework of navigation, the foot print of the maritime transport by better managing: The ballast water treatment, the fuel consumption, the CO and NO emissions, the sewage treatment, the use of anti fouling paint. However, the scope of the incident, heavy source of environmental and financial damages, is not considered and suffers a lack of technical consideration. This need of technical solutions is being fulfilled by a new group of product entitled Marine Passive Safety Solutions which aims to make the ship proactive after an incident.

14.05 - 14.40 **FULL STEAM AHEAD FOR BALLAST WATER TREATMENT SYSTEMS**
Peter Wolf, RWO- Marine Water Technologies

With the new IMO regulation coming into force, an increasing number of ballast water treatment technologies been developed and brought to the market by various manufacturers, as well as more stringent limit values coming-up from the United States, shipyards and owners ask themselves: What is the proper product and reliable technology to meet our individual requirements? The objective of the paper is to inform about the new regulations, its effects, the treatment processes available and providing an overview of RWO's ballast water treatment system CleanBallast, for which orders for more than 40 units are already on hand and under execution.

14.40 - 15.10 **COFFEE**

15.10 - 15.45 **FINDING THE RIGHT TECHNOLOGIES TO REDUCE FUEL CONSUMPTION**
John Buckingham, BMT Defence Services Limited, UK

This paper presents a range of energy saving technologies and shows how they might be applied to achieve the required fuel savings with the best match to the operating profile. The general impact of such technologies on the ship design is identified along with the consequential propulsion performance. The estimated acquisition costs are compared with the benefits to the ship's in-service costs. The paper concludes with a comparison of the cost of the set of technologies compared to their through-life benefits onboard. This approach demonstrates how the choice of an energy saving solution needs to be considered in conjunction with the ship's overall design and its operating role.

15.45 - 16.20 **REDUCTION OF VOC EMISSIONS FROM CRUDE OIL TANKERS.**
Hans Richard Hansen,

Norwegian authorities introduced requirements for an about 80% reduction in CO2 emissions during offshore loading of crude oil with effect from 2002. The operators on the Norwegian continental shelf have since invested about 250 million USD in VOC plants on the offshore loading shuttle tankers, and the emissions have as a result been significantly reduced. The plants are however not only expensive but also complex to operate. Teekay did as a consequence in 2007 start to investigate whether it was possible to obtain significant emission reductions with simpler means. A solution consisting of a combination of operating the tanks under an increased pressure of about 0.2 barg, combined with a simple re-absorption unit, was tested out in 2008 with very promising results.

16.20 - 16.55 **EFFICIENCY AND ENVIRONMENTAL SUSTAINABILITY THROUGH THE IMPLEMENTATION OF THE SSS CLUTCH"**
Gianluca de Arcangelis, Transmission Technology (Europe) Ltd

Recently, the SSS Clutch has been implemented successfully on a number of vessels to allow the surplus exhaust gases to be recovered and produce power generation and electricity on-board. In these vessels, the surplus gases are fed to a recovery turbine that engages to the main Generator through the SSS Clutch according to requirement and availability. The same Generator, which is typically double-ended, is driven by a Steam Turbine on a continuous basis. The SSS Clutch provides flexibility of operation, allowing the recovery turbine to engage and disengage automatically at any time, as well as isolating it from the Generator in case of no propulsion.

17.00 - **GENERAL DISCUSSION**

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EVENING DRINKS RECEPTION
Following the end of day one (10/03/2010), delegates are invited to attend an evening drinks reception at the conference venue.

ACCOMMODATION
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