ABS GLOBAL SHIP SYSTEMS CENTER INNOVATION UPDATE

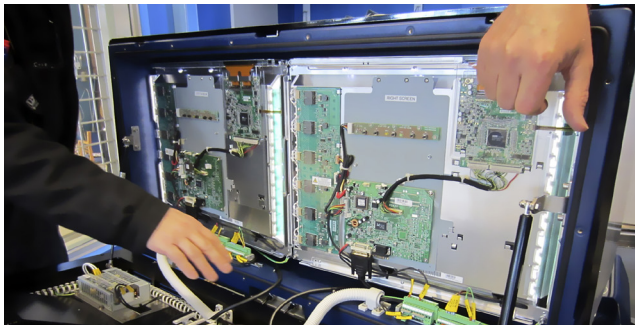
June 2018

ABS

ABS ADVANCED SOLUTIONS

PANTELIS SKINITIS
DIRECTOR, BUSINESS DEVELOPMENT – ABS ADVANCED SOLUTIONS

The current state of maritime has given rise to new challenges that need innovative solutions. The increasing complexity and connectivity of vessels and offshore assets combined with the need for optimized maintenance programs are a few of them. The ABS Advanced Solutions team is addressing these challenges with innovative answers to today's cybersecurity, advanced engineering and asset management challenges. Utilizing deep technical knowledge gained from over 150 years of providing classification and technical services, ABS has created a maritime-specific method for calculating cyber risk and life-cycle solutions for optimizing maintenance programs and vessel operations. As many vessels approach the end of their design life, shipowners and operators are looking for ways to maintain



asset integrity and potentially retrofit their vessels for extended service in a safer, more reliable and compliant manner.

This translates to more agile, reliable and ultimately safer ways of attaining operational excellence.

ABS AND 2020 GLOBAL SULFUR CAP COMPLIANCE

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The marine industry is now facing the challenges of adopting new technologies and/or operational practices to comply with increasingly stricter international, national and local regulations introduced to reduce air emissions from ships.

Critical amongst these regulations are the measures to reduce the Sulfur Oxide emissions inherent with the burning of high sulfur marine fuels. Ship designers, owners and operators have the following options to achieve SOx regulatory compliance:

- Use low sulfur residual or distillate marine fuels in existing machinery,
- Install new or convert existing machinery (where possible) designed to operate on an inherently low sulfur alternative fuel, such as Liquefied Natural Gas (LNG), Liquefied Petroleum Gas (LPG),
- Install an Exhaust Gas Cleaning after treatment system.

Through its Techno-Economic Evaluation services, ABS supports owners in operators in understanding the technical and economic implications of their 2020 sulfur cap compliance options. The evaluation involves performing a Life Cycle Cost Analysis (LCCA) based on costs (investment and operational) and the vessel operating profile (e.g. consumptions, time a sea, running hours), in order to obtain the relevant economic metrics (e.g. discounted payback period, SIR, NS) and quantify the feasibility and desirability of the investment. Due to the uncertainty of some of the parameters in the analysis, sensitivity studies are also included in the study. Finally, a comparison based on a weighted factor system is performed in order to rate the suitability of the systems considered.

ABS PARTICIPATES IN GASVESSEL PROJECT

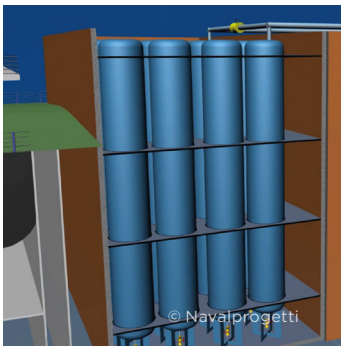
STAVROS NIOTIS
ENGINEER, PRINCIPAL – GLOBAL GAS SOLUTIONS

GASVESSEL is a project that is funded by the EU's Horizon 2020 research and innovation program. The project provides a novel, efficient and flexible method for transporting Compressed Natural Gas (CNG). It introduces an innovative solution for manufacturing pressure cylinder that are 70% lighter than state-of-the-art alternatives. These light pressure vessels enable new ship designs with much higher payloads and lower transportation costs per volume of gas.

Where the exploitation of stranded gas is currently economically not viable, GASVESSEL brings a solution. As a cost-efficient and flexible CNG transport system that can unlock energy resources and decrease Europe's dependence on a single supplier.

The main objective of the project is to prove the feasibility of the new CNG transportation concept. Three geo-logistic gas exploitation scenarios within the Europe continent were analyzed to establish where and how the GASVESSEL concept adds value. Research and development efforts will include the functional design of the pressure vessel, the prototype facilities and the ship design including gas-compression and decompression systems. This new concept will finally be validated through a cost-benefit analysis and a class design review and safety assessment.

ABS will attend the necessary material and prototype testing for the cylinders, support the other partners during the design development of the ship and will review the final drawings and documentation for compliance with applicable Rules and Guides.



To find out more about this project please visit **www.gasvessel.eu**

LNG-POWERED DRY BULK CARRIER

MARIOS IOANNOU
ENGINEER, PRINCIPAL – CORPORATE TECHNOLOGY

LNG as fuel is an important option for owners and operators looking to meet environmental regulations. A study was conducted with the aim to address the challenges involved in considering LNG as fuel in an ocean-going dry bulk carrier employed on varied international shipping routes. The study focused on optimizing the selection of the propulsion arrangement and tank containment system and was based on an 82,000 dwt Kamsarmax bulk carrier design.

The study concentrated on the review of the available technologies for the main engine and the size and position of the LNG tank on board, whilst taking into account the applicable classification requirements, relevant statutory safety regulations (IGF code) and the shipowners operational requirements to deliver a highly efficient competitive solution with increased reliability and redundancy characteristics.

The concept has sufficient LNG tank capacity to allow the vessel to sail as long as 40 days at full speed without having to refuel or switch to another source of fuel. The new engine room arrangement with the two 4-stroke engines provides enhanced safety and redundancy. Despite the higher CAPEX incurred when applying LNG as a fuel, the payback period can be only a few years. Applying LNG as fuel can support a more competitive and environmentally-friendly vessel with favorable total cost of ownership.

ABS-LED RESEARCH IDENTIFIES KEY RECOMMENDATIONS FOR EVALUATING ENVIRONMENTALLY ACCEPTABLE LUBRICANTS (EALs)

MARIOS IOANNOU
ENGINEER, PRINCIPAL – CORPORATE TECHNOLOGY

(Houston) ABS, in partnership with Vickers Oil and Imperial College London, completed a joint study on use of environmentally acceptable lubricants (EALs) on stern tube bearings. The study evaluated EAL properties relative to mineral oil-based lubricants and concluded oil viscosity is the primary property in selecting an EAL.

"Interest in EAL performance has grown following an increase in the number of new build stern tube bearing failures in 2014," said ABS Principal Engineer, Marios Ioannou. "Working closely with our project partners, we did an extensive study of EAL properties and found oil viscosity is the main determinant in choosing the optimal EAL for normally operating stern tube bearing installations."

Primarily driven by U.S. EPA requirements put in place in 2013, EALs were intended to replace mineral oil lubricants in marine vessels. During this joint project, ABS and its partners identified, through experimental research, key characteristics of EALs compared to mineral oil lubricants:

- Viscosity of EALs is more stable than that of mineral oils, with respect to changes in temperature;
- EALs demonstrated relatively lower pressure-viscosity coefficients than mineral oils, indicating EALs may form thinner oil films, potentially insufficient to protect surfaces from wear under edge loading conditions;
- Using EALs with higher pressure-viscosity coefficients, compared to other EALs of the same viscosity, may provide some safety margin in shaft-alignment sensitive installations;

- EALs may offer less margin in shaft misalignment conditions, therefore particular attention should be taken for correct shaft alignment.
- Using EALs with higher viscosity, compared to a mineral oil of lower viscosity, may provide an additional tolerance for edge loading wear.

"The results of this study offer important insights into both viscosity selection and the more specialized area of pressure-viscosity coefficient behavior, where no universally-adopted measurement standard exists," said Vickers Oil Technical Director, Chris Wholley. "By tackling this issue together with ABS and Imperial College, we were able to develop a deeper understanding of lubricant behavior in a journal bearing, operating both normally and under edge loading conditions, which will help us to give the best advice to owners and operators wishing to reduce the adverse effects of shaft misalignment, and inform our product development process."

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