An Investigation into Making Ships Cleaner and More Energy Efficient

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Abstract

This lecture focuses on the recent research findings including the EU funded MariEMS project initiated to make ships more energy efficient. The projects have contributed to regulate the engine performance parameters and the navigational equipment for minimum fuel consumption and exhaust emissions by also taking advantage of the wind and sea conditions ensuring compliance with EEIO and EEDI without the risk of intentional reduction

of speed. The primary experiments on the propulsioin system and the ship navigatioin syatem have shown substantial fuel saving potential. Recent experiments allowed the study of key operating factors affecting the efficiency of ship propulsion and ship operational factors to be investigated and methodologies concerning engine control and navigaation systems, for safe operations and efficient performance, to be optimised. In the experiments a digital twin of the engine was developed; the overal system included also a set of high fidelity tools and processes for the accurate and efficient analysis of air and sea conditions. These experiments included limited hydrodynamic analysis for ships' operational performance in normal running condition as well as slow speed behaviour. The experimental work concerned the adaptation of multi-objective optimisation and integrated design environments for holistic operational performance and minimum powering requirement predictions; this is expected to ensure safe application of the design rules guaranteeing, at the same time, the right balance between economic efficiency, environmental performance and safety. The reason for the experiments was a decision support system to regulate engine running conditions and to provide navigation knowledge to for minimum fuel consumption and lowest feasible CO_2 emission. The experiments are on going and the overall system comprised a standalone platform composed of all harware and software systems. The intention of MariEMS project is to take advantage of the outcome of a recently conlcuded projects such as IdealShip, this latter project proved that it is possible to make considerable fuel saving when sailing the ship through the path of least resistance (sea and air) in its jouney from one location to antoher. The lecture will also make special references to the efforts to develop the digital twin of the engine and to make the marine diesel engines more efficient and the recent work in reducing their exhaust emissions.