

Study of the behaviour of a ship with rigid sails using a Velocity Prediction Program

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ABSTRACT

A study of the behaviour of large displacement vessels with rigid sails has been carried out. Introducing rigid sails to the merchant ships as we know nowadays could reduce the ecological footprint and fuel consumption. This work has been followed by studies that helps to understand this technology and prove the potential that it has. A Velocity Prediction Program (VPP) is developed considering the hydrodynamics and aerodynamics forces and moments applied in the sails and in the hull [1] and the meteorological conditions in order to compute the salving fuel achieved with the sail assisted propulsion. The aerodynamics forces and moments applied in the hull has been computed using aerodynamics coefficients of the hull like foil considering the aspect ratio and the bottom edge shape of it [2]. The particular case of a merchant ship has been studied, the rigid sails have been added to this merchant ship and its behaviour has been analysed with the VPP considering that the cruising speed remains constant. The use of rigid sails to assist the propulsion of the ship save fuel, although lead to the main engine to work under the design point. In the particular case analysed, the assistance of the sails makes the engine to work more than 30% below its design point, and this impair the fuel savings achieved with the sails. So it is proposed to add to the propulsive system a diesel-electric system that would produce electricity when the sails reduced more than 30% the power of the main engine and store this energy in batteries to be used afterwards. This technology will be implemented in the near future in order to achieve the values of the Energy Efficiency Design Index (EEDI), the Ship Energy Efficiency Management Plan (SEEMP) and Energy Efficiency Operational Indicator (EEOI) required by the International Maritime Organization [3] on ships already built.

REFERENCES

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