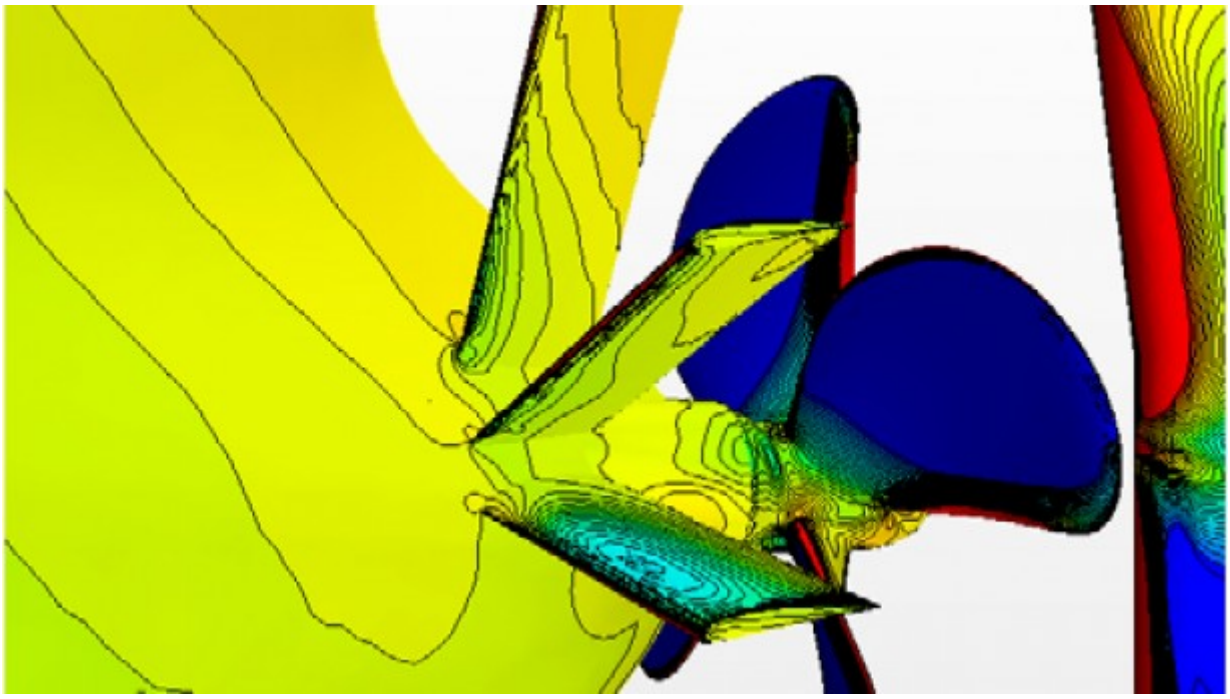
CFD based investigation of potential power saving for different rudder types, positions and pre-swirl fins



Date:
Thursday, November 1, 2012
Abstract:

FORCE Technology and Grontmij?Carl Bro in Denmark have been involved in a joint project under DCMT (Danish Centre for Maritime Technology). Based on promising CFD results obtained in , and plus indications that the rudder size or type and rudder leading edge-propeller distance could influence the propulsive power, the goal of this project was to investigate the fuel saving effect of different rudders and their longitudinal position behind the ship. Further, the intension was also to study pre-swirl stators located
in front of the propeller. The investigation was conducted as a combination of CFD and towing tank testing to enable validation of the CFD computations.
Focus was on a complete CFD model for hull, propeller and rudder, which can account for the mutual interaction between all three components when the flow field is calculated. In the present work the propeller is the same, while three different rudder types (horn, spade and flap) were evaluated behind a 180m bulk carrier in order to study how the different rudders influence the propulsive performance for a given speed at the ships selfpropulsion point. Further, for two of the rudders (horn and spade) a study of the longitudinal position was made. It should be noted that by introducing different rudder types with different sizes the lift characteristics of the rudders will be different. This can potentially influence the maneuverability of the ship, since the rudders produces different steering forces for a given rudder angle. The ship was originally fitted with a horn rudder, so the idea was to use a new

spade and flap rudder that should produce same steering force to maintain the maneuverability. So to check the designs, an additional study was made, where the rudders were deflected to a specified rudder angle and the steering force was determined. This check was made both with CFD and in the towing tank. It should be noted, that the maneuvering aspect was not originally included in the project, but it was judged to be important. Therefore more focus was placed on this and less on the pre-swirl stators.All experimental data was measured in FORCE Technology?s towing tank and all meshing and flow simulation were conducted with Star-CCM+ provided by CD-adapco.

Simonsen_et_al_final_report_II.pdf[1]

Author Name:
Claus D. Simonsen
Casper Nielsen
Christian Klimt-Møllenbach
Christian Råe Holm
Anton Minchev

Products:

Industries:

Links:
[1] http://www.cd-adapco.com/sites/default/files/technical_document/pdf/Simonsen_et_al_final_report_II.pdf