Contribution ID: **20** Type: **Paper**

The use of modern computational tools in the design process of unconventional propellers for performance prediction and full-scale extrapolation

Friday, 22 June 2018 14:30 (15 minutes)

Most of the traditional procedures for the design of conventional propellers do not yield reliable outcomes in the case of unconventional propellers, for which high-fidelity prediction of performance characteristics are necessary. It is generally understood and recognized, for instance, that the standard ITTC'78 procedure for model to full-scale extrapolation of performance is not reliable in case of unconventional propellers.
CFD calculations, on the other hand, are becoming a standard analysis tool to be used for unconventional propeller design and performance prediction.
In the present paper, it will be shown, for both a CLT and a new generation CLT propellers, that the extrapolation from model tests to full-scale cannot be reliably carried out by standard procedures.
A CFD calculations campaign is, consequently, carried out to simulate the performance of both designs in Open Water condition, both at model and full-scale, incorporating transition models to determine with more detail laminar, transitional and turbulent flow areas. Results are also compared with the performance predictions obtained with empirical and strip method scaling procedures developed by SISTEMAR. The comparison shows that both methods are sufficiency reliable in the early design stage and for the extrapolation and comparison of model tests.

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Session Classification: Hydrodynamics

Track Classification: Ship propulsion, machinery and systems