

A Sea of Marine Research at BSHC

by Kostadin Yossifov, Stefan Kyulevcheliyev, and Zlatko Zlatev, Bulgarian Ship Hydrodynamics Center, Varna, Bulgaria

The ITTC test case screw propeller 4119

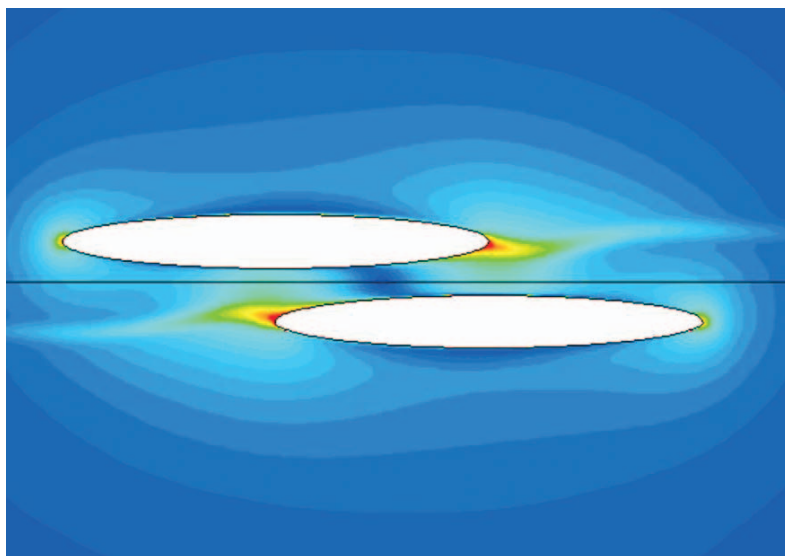
BSHC, THE BULGARIAN SHIP HYDRODYNAMICS CENTER, is dedicated to fundamental and applied research in ship and offshore hydrodynamics, coastal hydraulics, industrial aerodynamics, and environmental protection. Research is performed by means of both small-scale physical modeling and testing in BSHC's rich experimental facilities, and by software analysis tools, mostly of in-house origin.

BSHC's commitment to modern trends in scientific research led, two years ago, to their adoption of FLUENT software for CFD analysis. This was done within an EU Fifth Framework Program grant (1). A two-day presentation and training course was organized at BSHC by SimTec Ltd., the Fluent distributor in Greece. It was attended by BSHC staff, a large group of people from the Bulgarian Academy of Sciences and other research and academic institutions, and people from local industry as well. Following self-training and the completion of a number of simulations, a core of people formed with competence in most of FLUENT's unique capabilities appropriate to the work performed at BSHC. These engineers retrieved well-known benchmark cases from popular CFD databases, such as ERCOFTAC, MARNET, and ITTC, and conducted validations.

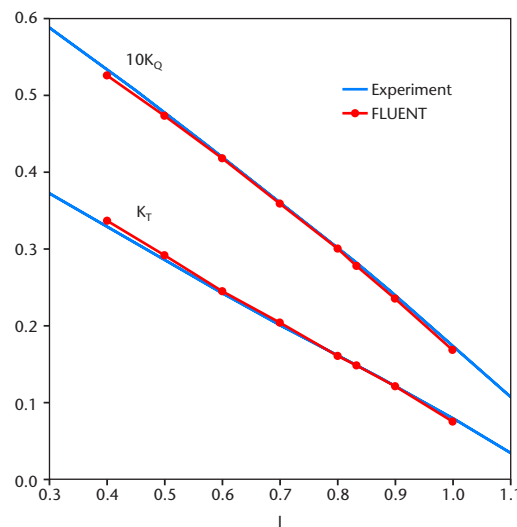
The validation work served to develop confidence among the engineers that FLUENT could be applied to a range of applications at BSHC. Since then, marine studies have included open water tests of isolated cavitating/non-cavitating propellers, isolated surface-piercing or submerged ships, and free surface flows with and without wave making. Other areas of application include analyses of axial fans and incompressible flows inside high-pressure pipelines and their fittings. Recently, ship behavior during passing and overtaking using the dynamic mesh model has been studied, as well as hydrodynamic design and analysis of unmanned underwater vehicles. Another important activity at BSHC is the spreading of CFD information among other institutions in the area also involved in scientific research, demonstrating FLUENT's capabilities at the local level, and performing collaborative investigations with them. Future plans include an analysis of free-floating ships and offshore structures, fluid-structure interaction, and ship maneuvering. ■

Reference:

- 1 HyTech – Promotion of High-Tech in Hydrodynamic Research; EU Fifth Framework Program Project G3MA-CT-2002-04040; Brussels, Belgium, 2002.



The pressure field resulting when two ships pass each other at close range; the upper ship moves to the left while the lower ship moves to the right



Predicted thrust (K_T) and torque (K_Q) coefficients as a function of advance ratio (J) for the ITTC test case screw propeller 4119 compared to experimental data