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OpenFOAM Research Migration Project
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KCS Bare Hull Resistance

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Synopsis

In this research migration project, the bare hull resistance of Kriso Container Ship (KCS) is computed in OpenFOAM-9. The resistance computation involves a multiphase flow with two phases air-water are captured using Volume of Fluid method. As the flow physics operates in high Reynolds number two equation turbulence models are used to resolve the turbulence.. In this project, the results of ship resistance are estimated using *k-Omega-SST* turbulence model is used with adaptive time step.

The computational domain is meshed using *blockMesh*. Mesh refinements are provided at various locations of air-water interface, bow, kelvin-wake and in the ship wake region. The refinement blocks were prepared using *toposet* module of openFOAM with five levels of refinement. The cleaned KCS hull geometry is imported in the '.stl' format and final meshing is carried out using *SnappyHexMesh*. The computational domain is modeled similar to the towing tank. Since, the hull is symmetry only half the domain is solved by giving mid-plane symmetry boundary condition.

The simulation is performed in OpenFOAM-9 with *interFoam* solver. The run is carried out in parallel using 48 core server which took 3-6 hrs to complete the simulation of 73-190 sec for speed ranging from 2.38 m/s to 0.912 m/s with a time step of 0.0001 sec. The X-component drag component gives the resistances of the vessel and it is seen that there is a variation of maximum 9% in higher Froude numbers.

References

Marcu, O., Obreja D., "Model tests on the KRISO hull for the powering performance assessment", The Annals of "Dunarea deJos" University of Galati, Fascicle XI-Shipbuilding, pp. 17-22, 2011.