Wake flow analysis of a VLCC

The example here presented is the analysis of the wake flow of a VLCC ship. The geometry of this ship has been studied in a wind tunnel and the results are available at http://www.nmri.go.jp/cfd/ cfdws05/ gothenburg2000/KVLCC/tanker.html. The experimental tests were carried out for a model at scale 1:116, resulting in a model of length 2.76 m. The velocity of the air at the inlet of the wind tunnel is 25 m/s, being the density and viscosity ρ=1.01 Kg/m³ and μ=3.045·10^{-5} Kg/ms, respectively.
The mesh used in the numerical analysis consist of 750 000 linear tetrahedral, being refined in the area of interest as shown in

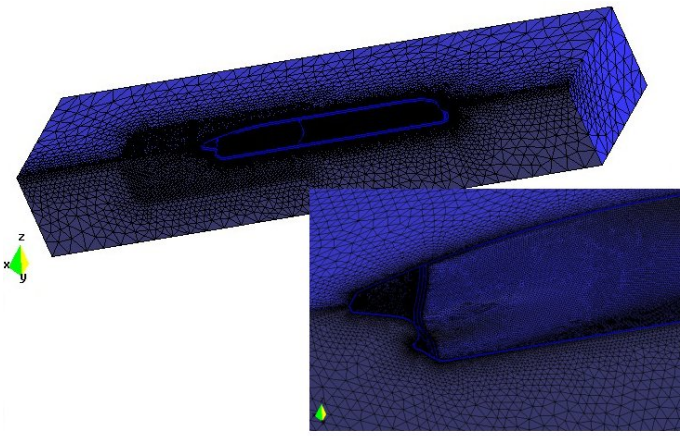

Fig. 1. Mesh used in the numerical analysis of the KVLCC2 model, consisting of 750 000 linear tetrahedral.

The available experimental data, also available at the same web site, consist of different velocity maps obtained at different stations of the stern of the ship and wake area (see
Fig. **3**).

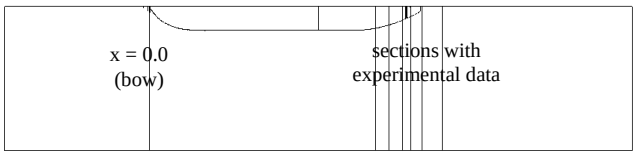

Fig. 2. Sections with experimental data available.

Next, different pictures showing a comparison of the results obtained using FIC/FEM method and the experimental data are presented.

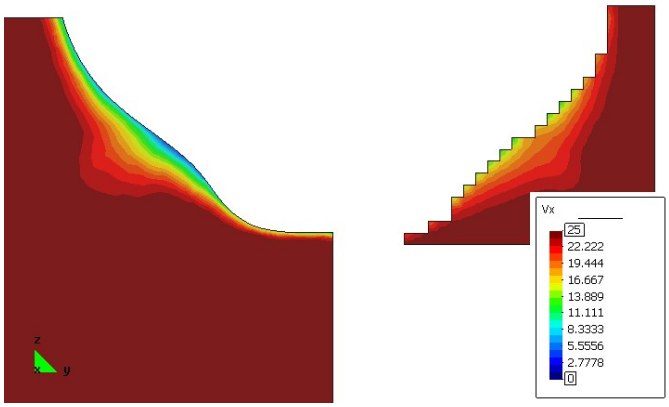

Fig. 3. KVLCC2 comparison of numerical results (left) and experimental data (right) of the x component of the velocity (section at x=2.3448 m).

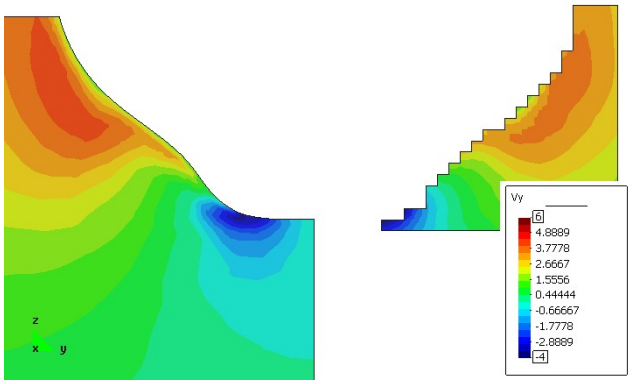

Fig. 4. KVLCC2 comparison of numerical results (left) and experimental data (right) of the y component of the velocity (section at x=2.3448 m).

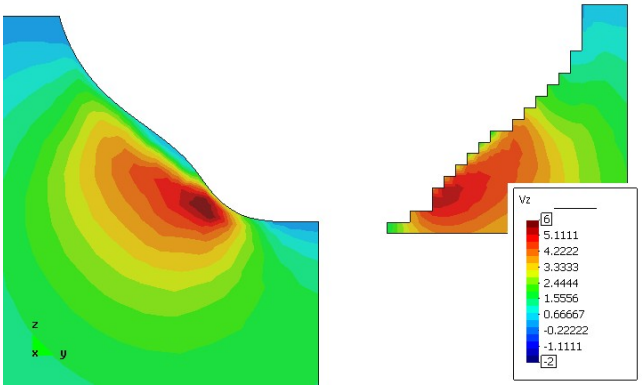

Fig. 5. KVLCC2 comparison of numerical results (left) and experimental data (right) of the y component of the velocity (section at x=2.3448 m).

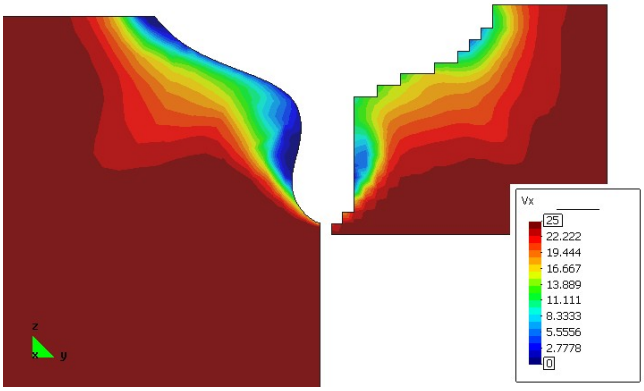

Fig. 6. KVLCC2 comparison of numerical results (left) and experimental data (right) of the x component of the velocity (section at x=2.6207 m).

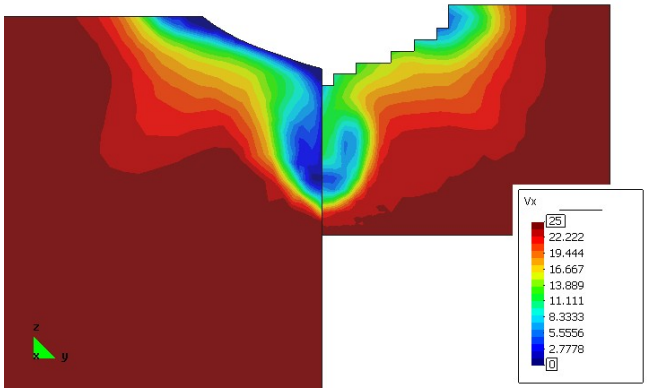

Fig. 7. KVLCC2 comparison of numerical results (left) and experimental data (right) of the x component of the velocity (section at x=2.7103 m).

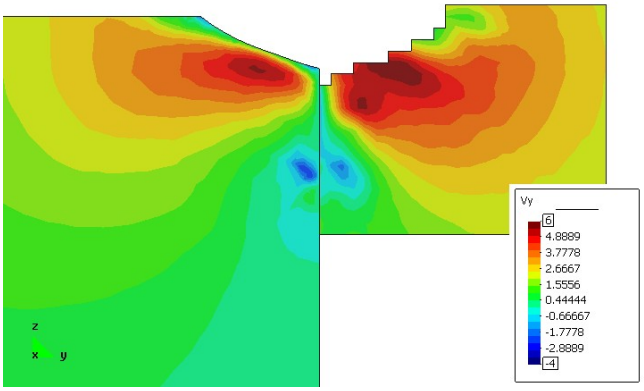

Fig. 8. KVLCC2 comparison of numerical results (left) and experimental data (right) of the x component of the velocity (section at x=2.7103 m).

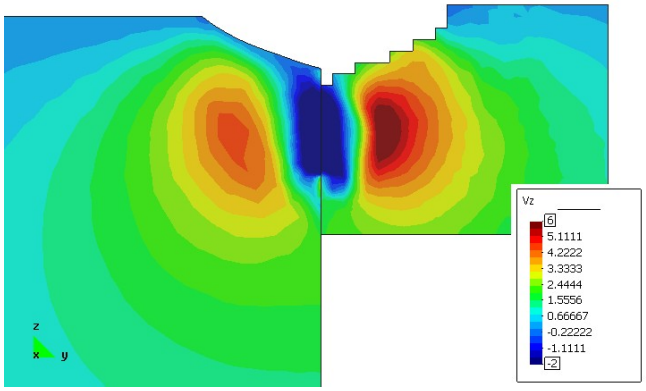

Fig. 9. KVLCC2 comparison of numerical results (left) and experimental data (right) of the x component of the velocity (section at x=2.7103 m).

As can be seen, FIC/FEM matches well the experimental results. In particular, we note how this method can predict the generation of the characteristic ‘hook’, appearing just after the stern of the ship (see Fig. 7).