

Cavitation Models : Performance and Limitations

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Abstract

Cavitation is usually the main physical phenomenon behind performance alterations in hydraulic machinery. The accurate prediction of this phenomenon is essential for a better understanding of the complex relationship between the cavitation and the associated drop in performance. Many CFD models have been proposed over the recent years. In the present study we evaluate and compare the methods proposed in two commercial codes with the results obtained using OpenFOAM.

Two methodologies are investigated using different cavitation models. First, the so-called 'Homogeneous Multi-Phase Transport Equation', based on one phase transport equation including the liquid-vapour phase change using a mixture multi-phase model. Second, the Non Homogeneous Multi-Phase Model which uses two phases transport equation.

The influence of the numerical scheme on different test cases (NACA0015, Venturi, rectangular orifice and Rouse hemispheric case) is also included. The results obtained point out and stress the limitations of the cavitation models and recommendations are made regarding their use and performance.

Key words: Multiphase, Cavitation, Hydroturbine, CFD, OpenFOAM.

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