

Transient Flow Simulations and Performance Analysis of a Single-Channel Pump

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Abstract

With the established functionality of the Generalized Grid Interface (GGI) and more robust transient solver implementations, the transient flow analysis of turbomachinery with OpenFOAM has matured to a level, which allows complicated rotating flow systems to be readily simulated with notable accuracy. Since the initial verification phase presented [1] at the 4th OpenFOAM Workshop, the existing technology, together with an improved methodology, has been thoroughly utilized to conduct transient simulations of a single-channel pump. The study entails computational cases which feature two different grid densities and geometry configurations, as illustrated in Fig 1. The quality of the computational grids have been given high priority to ensure good numerical behavior and accuracy.

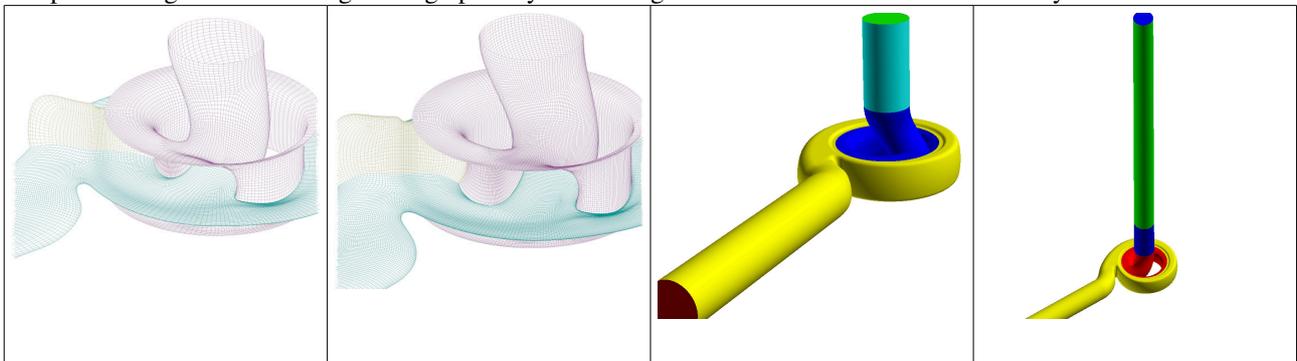


Figure 1: Two grid densities (0.5M cells and 1.5M cells) and geometry configurations.

At the presentation the emphasis will be placed on the description of the analysis methodology and visualization of the results through a series of animations which also include time-accurate experimental LDV velocity profile comparisons (Fig. 2). Since one of the computational cases will be made fully available to the community, a brief account of the utilized tools and function objects will be provided to illustrate that the presented work can be completely reproduced – and improved on – by the community.

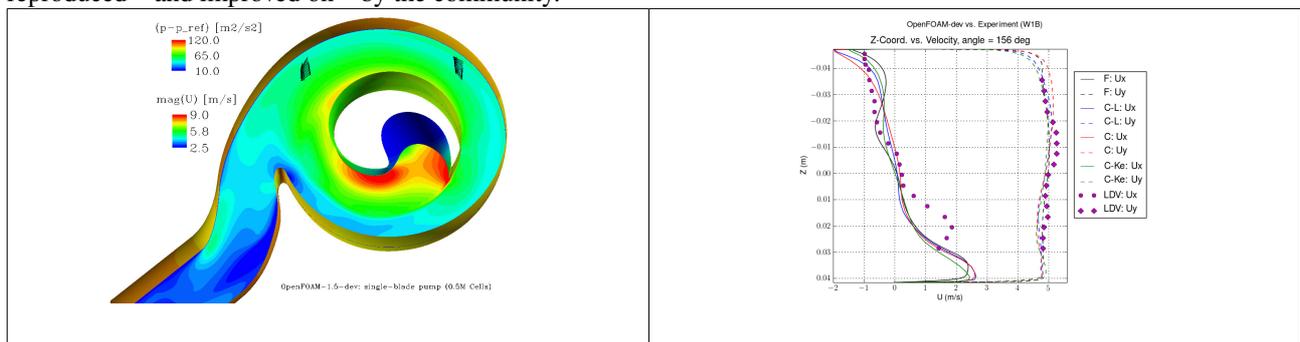


Figure 2: Computational flow field visualization and velocity profile comparison.

Key words: Transient CFD, Time-accurate CFD, Generalized Grid Interface, GGI, Turbomachinery

References

- [1] M. Auvinen: *Flow Analysis of a Single-Blade Pump with OpenFOAM*, Presentation, 4th OpenFOAM Workshop, Montreal, Canada, June 1-4, 2009