Effect of Mesh Refinement on Vertical and Lateral Velocity Profiles of the Wake Flow behind a Spire based on CFD

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Abstract

The application of CFD to simulate the phenomenon based on a wind tunnel experiment has been widely studied. A large number of cells may produce accurate results but requires a high computational load. In this study, the effect of mesh refinement on the vertical and lateral velocity profiles of the wake flow behind a single spire is discussed. Three different mesh refinement levels, i.e. coarse, medium and fine, each with 9 million, 12.7 million, and 16.9 million cells, respectively, were applied to the computational domain. The standard k-ε model was used for CFD simulations. The variable mesh was generated by using *blockMesh* and *snappyHexMesh* features in the OpenFoam® software. The result shows no significant difference between the various mesh refinement levels for the velocity profiles. However, there is a significant difference in the time needed to complete the iteration for each case whereby the shortest duration was taken for the coarse mesh.

Keywords: Computational fluid dynamics; Mesh refinement; Spire; Wind tunnel; Velocity profiles.