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NUMERICAL ANALYSIS OF TURBULENT FLOW CHARACTERISTICS OF AN INCOMPRESSIBLE FLUID IN A VENTURI-TYPE DEVICE

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Abstract. The Venturi is a device widely used in various industrial applications: automotive, food, agricultural, oil, among others. The Venturi has circular cross section or polygonal, depending on your application and it consists of three sequential parts: the convergent, the throat and the divergent. The industrial applications of the Venturi can vary fromminor adjustments in the mechanismto more complex engineering adaptations. The development of a computational model for flow in a Venturi constitutes an additional tool for the analysis and determination of flow variables involved in the equipments which apply the Venturi principle. This paper presents a numerical study of the characteristics of turbulent flow of incompressible fluids in Venturi-type devices, through the use of different turbulence models. The Reynolds decomposition process usually applied to incompressible flow was used as a mathematical tool in the formulation of the turbulent flow. This decomposition provides the Reynolds Averaged Navier-Stokes (RANS) equations. For the closing of the mean equations it is necessary to model the unknown terms (Reynolds stresses) that arise from nonlinearities in the instantaneous mean flow equations. In the present study, the Reynolds stresses were modeled using different versions of the k-epsilon model, among others. For this study, Ansys/Fluent commercial software for Computational Fluid Dynamics (CFD), which uses a finite volume method in the discretization of the governing equations, will be used.

To validate this computational model, their results will be compared against pressure experimental data. The study of the flow field, the pressure distribution and the turbulent stresses is of great importance in understanding the flows in these equipments, as well as in the improvement of some of its applications and developing new applications of the Venturi principle.