عنوان مقاله:

Numerical Investigation of an Unsteady and Anisotropic Turbulent Flow Downstream a ۹۰° Bend Pipe with and without Ribs

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نویسندگان:

Rachid Chiremsel - *Department of Hydraulics, University of Batna ۲, Research Laboratory in Applied Hydraulics, Constantine road N°۵۳.Fesdis, Batna, ۰۵۰۷۸, Algeria*

Ali Fourar - *Department of Hydraulics, University of Batna ۲, Research Laboratory in Applied Hydraulics, Constantine road N°۵۳.Fesdis, Batna, ۰۵۰۷۸, Algeria*

Fawaz Massouh - *National Higher School of Arts and Crafts (ParisTech; ENSAM), Laboratory of Fluid Mechanics, France*

Zakarya Chiremsel - *Safety Department, University of Batna ۲, IHSI-LRPI, Constantine road N°۵۳.Fesdis, Batna, ۰۵۰۷۸, Algeria*

خلاصه مقاله:

In this work, a numerical study of the dynamical behavior of unsteady and anisotropic turbulent flow downstream a ۹۰° bended pipe was presented. For this purpose, comparative computations are carried out employing two flow configurations, bend pipe with ribs and bend pipe without ribs with a curvature radius ratio Rc/D=۲.۰. In the bend pipe with ribs, the pitch ratios Pt/e=۴۰ and the rib height to pipe diameter e/D is ۰.۱. This model has been utilized to assess the effect of ribs on flow where the presence of the ribs leads to a complex velocity field with regions of flow separation upstream and downstream of the ribs. The Reynolds-Averaged Navier–Stokes (RANS) approach is employed and the computational model is validated by comparisons with the existing experimental data. The simulations are conducted with the commercials CFD software FLUENT for Dean number varying from ۵۰۰۰ to ۴۰۰۰۰. The result analysis shows that the higher resistance generated by the ribs produced relatively larger velocity gradient (∂U/∂y) compared to the case of bend pipe without ribs where a more uniform mean velocity profile is observed. The turbulence intensities are higher in the ribbed bend pipe compared to those in the non-ribbed case and depend faintly on the Dean number. The levels of the Reynolds shear stresses are significantly enhanced by the ribs compared to the case without ribs. This increasing is explained by significantly higher levels of turbulence production over those ribs produced by large values .of ∂U/∂y

کلمات کلیدی:

RANS, Anisotropic, Dean number, Reynolds stresses tensor, RSM