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Study of fluid parameters in high pressure descaling valves PARAM ADHIKARI, Department of Mechanical & Industrial Engineering, Youngstown State University, Ohio, YOGENDRA PANTA, Department of Mechanical & Industrial Engineering, College of Science, Technology, Engineering and Mathematics, Youngstown State University, Ohio — Our work is focused on the high pressure valves used for descaling purposes in steel mills. A reverse flow operation was set in one of such valves due to piping constraints. Computational approaches are being utilized to understand the fluid phenomena at such high pressures. Though the valve geometry accounts for the complete fluid flow path, a study has been initiated from an axisymmetric model of the valve core. The highly energized fluid from the descaling pump sets off a static pressure of 5000 psi at the valve inlet. It is responsible for continuous fluid flow rate of up to 208 gpm for fully open position. A Shear Stress Transport turbulence model is utilized to study pressure at nearly closed position of the poppet part while Renormalization Group Turbulence model is compared with Shear Stress Transport turbulence model for full opening position. A very low pressure developed below the poppet seat suggests the onset of cavitation zones which may lead to leakage. A full 3D model is studied after a complete studies of fluid phenomenon in the axisymmetric geometry. Using ANSYS Fluent, a commercial CFD software package, the poppet valve assembly was processed for modeling, meshing and setting up of physical parameters. Computational results show the cavitation intensities higher at small openings than at larger openings which is further verified by literature research and currently comparing with experiments.

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