

Abstract

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Flow Investigation for Self-Excited Vibrations in a Globe Control Valve

Control valves, used in many of the hydraulic systems, participate in the performance of such systems. Therefore, the control of the operation for these valves is one of the most important problems, which faces the field researchers. The incompressible turbulent flow, passing through a control valve, operating at small openings, is often a major source of vibration in such systems. The complex geometry of the valve, the change of fluid field variables W.r.t. time and the Selection of the appropriate turbulent model tend to the complexity of the study for the self -excited vibration, resulting from the interaction between the passing flow and the valve configuration. In order to obtain a better understanding for the involved phenomenon, a CFD simulation, by using FLUENT 6.3 code, was performed. Accordingly, a three-dimensional numerical solution for the problem was obtained. In addition, an experimental work had been conducted in order to study the exciting force, resulting from the flow passage through the single seat globe control valve. Moreover, the parameters that affect this excitation force were also investigated. Finally, it was concluded that the percentage opening of the valve, in addition to Reynolds and Strouhal numbers have a pronounced effect on the produced hydrodynamic forces and consequently the excited vibrations .