볼밸브를 통하는 압축성유동의 특성에 관한 수치해석적 연구

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A Computational Study of a Compressible Flow Characteristics Passing through a Ball Valve

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Key Words: Compressible Flow(압축성 유동), Flow Oscillation(유동 진동), Coanda Effect(코안다 효과), Flow Choking(유동초킹)

Abstract : A ball valve is one of the flow devices most frequently employed in a pipeline system, but the gas flow passing through it is hardly known since the flow is subjected to extremely complicated, unsteady and 3-dimensional phenomena. Under a certain condition, the flow is choked at the minimum area section of the valve and strong flow oscillations occur inside the valve. For the safe operation and lower maintenance cost of a pipeline system, the flow characteristics around the ball valve should be fully understood. In the present study, a computational work has been made to investigate the flow characteristics passing through a ball valve. The 3-dimensional compressible Navier-Stokes equations have been solved using a fully implicit finite volume scheme. It is found that the oscillations are associated with the rotational flow motions which occur in the passage between the valve and valve seat. The present results show that this oscillation strongly depends on both mass flow rate and valve opening.

직기 노즐을 통하는 기체 유동에 관한 연구

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The Study of the Gas Flow through a Texturing Nozzle

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Key Words: Compressible flow(압축성 유동), Shock wave(충격파), Shear layer(전단층), Texturing Nozzle(직기 노즐), Air Jet Loom(air 제트 직기)

Abstract : An air jet loom as one of shuttleless looms transports a yarn into warps using viscosity and kinetic energy of an air jet. A performance of this picking system depends on the ability of instantaneous inhalation/exhaust, the configuration of nozzle, the operation characteristics of a check valve, and so on. In the recent past many studies have been reported on an air jet discharged from the nozzle exit, but studies for understanding of the flow field characteristics associated with shear layer, and shock wave and boundary layer interaction in the nozzle were not conducted enough. In this paper, computational study was performed to explain the flow field in the air jet nozzle with a acceleration tube and validated with previous experimental data available. The results obtained from computational study show that, in the supersonic flow, the flow field depends significantly on a length of acceleration tube.