Computational analysis of the groove effect to reduce the cavitation in ball valves

Abstract

Cavitation is a phenomenon that frequently creates fear within the engineering industry as the violent and critical attacks by cavitation can cause a lot of damage to ball valves. This paper is presented to reduce the risk of cavitation attack due to dramatic pressure drop and to demonstrate the ball valve performance. The ball valve with grooves was simulated and compared with current method under same boundary conditions as with existing experimental of ball valves. The proposed device can be operated in aircraft to isolate the fuel system and the engine fuel system after engine shutdown or emergency. The proposed implementation has successfully shown to eliminate the dramatic pressure drop effects to the ball valve. In the case study, at a closing angle of 40° at which violent cavitation occurs, the ball valve showed increasing cavitation intensity performance to 0.3 or 30%. The average performance of the cavitation index for all cases also increased to 24%.

Keyword: Ball valve; Computational fluid dynamics; Energy losses; Solidworks flow simulation