

## Original Paper

# Internal Flow Characteristics and Aft-cone Angle on Performance of Swirlmeter

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**Received:** 10 September 2015 / **Accepted:** 29 November 2015 / **Published online:** 5 January 2016

## Abstract

The swirler is the main component that leads the fluid spirally into a swirlmeter. The structure of the swirler thus directly affects the internal flow field and meter performance. The present study conducted a numerical simulation and experiment to investigate the effects of the aft-cone angle  $\beta$  of the swirler on the vortex precession characteristics and pressure loss inside a swirlmeter. The RNG  $k-\varepsilon$  turbulent model was adopted in three-dimensional unsteady simulation and a sonic nozzle device was used for calibration in the experiment. The numerical and experimental results obtained for four values of  $\beta$  ( $0^\circ$ ,  $20^\circ$ ,  $30^\circ$  and  $40^\circ$ ) revealed the flow characteristics in detail. The results show that the pressure pulsation at the throat is stronger than that in the convergent region, the swirling flow through the swirler is affected by different outlet velocities with various values of aft-cone angle  $\beta$ , and the aft-cone angle directly affects both the pressure loss and vortex precession frequency of the swirlmeter; i.e., smaller  $\beta$  results in higher pulsation frequency and larger pressure loss.

## Keywords

Swirlmeter; Numerical simulation; Aft-cone angle; Vortex precession