

Effect of Geometrical Parameters on Vortex Fluidic Oscillators Operating with Gases and Liquids

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Abstract: The fluidic oscillator is an interesting device developed for passive flow measurement. These microsystems can produce a high oscillating jet frequency with high flow velocity. The main advantages of fluidic oscillators are that no moving parts is included in the device. Commercial CFD code FLUENT was used to perform analysis of flows in fluidic oscillator. Numerical simulations were carried out for different flow conditions, where water and air were used as working fluids. The oscillation frequencies were identified by the discrete fast Fourier transform method (FFT). Furthermore a low-pressure vortex of fluid flow in the oscillating chamber was observed. The effect of the operating pressure and the oscillating chamber shape on the fluidic oscillator performance is investigated. Moreover the velocity fluctuations of the feedback flows through both feedback channels and the output were determined quantitatively. In addition, the behaviour of the low-pressure vortex in both models is analysed. Also, numerical result revealed small vortices are developed at the end of nozzle while oscillation, which maintains the deflection of jet flow between attachments wall. Comparison of our numerical simulations with available results showed reasonably and good agreement.

Keywords : fluidic oscillator, CFD, oscillating chamber, vortex, size effect, Coanda effect.