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Experimental investigation on sound of a centrifugal blower and fluctuating pressure on its volute

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Abstract

The Research has shown that the primary sound source in centrifugal turbomachines is the blade passing frequency noise, which is caused by due to impac rotor exit flow with the volute and the wild pressure fluctuations. In this paper, a centrifugal blower with forward facing blades has been selected and the sound created by it in the output channel has been investigated in different operating conditions. Also, to study the relationship between the pressure fluctuations on the volute and the radiated sound, the amplitude of the pressure fluctuations in different volutes areas (from the cutt-off to the near-outlet channel) has been investigated. The results show remarkable noise at the blade passing frequency in all fan state modes. It also increases by increasing the fan outlet flow. The pressure fluctuations on the volute are also evidence of pressure in the blade passing frequency. The intensity of this pressure is reduced far from the volute tongue, which means that the flow of jet in those areas is lower. Also, at 300 degrees from the cut-off, a strong pressure fluctuation was observed that is the second primary source of the tonal sound (other than the cut-off).

Keywords: Tonal sound, Dipole noise, Blade passing frequency, Centrifugal fan, Aerodynamic sound, Volute tongue.

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