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An experimental analysis on efficacy of perforated plates of varying orifice quantity[1] T DHANACHANDRAN THANAPAL, JINLIANG HENG, BASMAN ELHADIDI, WAI LEE CHAN, Nanyang Technological University — Combustion engines typically generate significant noise signatures and the latter constitutes a source of noise pollution. One method of reducing such noise is by disrupting the acoustic waves using acoustic dampers, which in this work is in the form of perforated plates. As air flows through the orifices of the plates, an unsteady jet flow is generated, which will further interact with the acoustic noise and, through viscous dissipations, convert the acoustic fluctuations into non-radiating vortical fluctuations. With the recognition of this fundamental mechanism, the objective of this work is to understand the effectiveness of the perforated plates as acoustic dampers. Fast Fourier transformation was used to analyse the resulting microphone data, showing that the single-orifice plate functioned as an acoustic resonator instead of a damper. In contrast, the multiple-orifice plate functioned as acoustic damper, producing approximately 50% reduction in noise. This finding is consistent with prior investigation where plates with higher open area ratios perform better at reducing acoustic noise. Both single- and multiple-orifice plates were relatively insensitive to the bias flow rate, although the single-orifice plate performance did improve slightly when the bias flow rate was increased.

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