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Are the Dynamics of Fluid Injection a Mechanism of Improving the Acoustic Characteristics of Performance Exhaust Mufflers?

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Abstract content
   (Max 300 words)

Exhaust mufflers consist of perforated tubes, which are used to reduce the noise generated by the exhaust gases leaving the combustion chamber of internal combustion engines. Performance exhaust mufflers improve engine performance by reducing back-pressure losses associated with the muffling effect. Thus, the reduction in back-pressure and increase in performance affect the acoustic refinement of such systems when they are compared to ordinary exhaust mufflers. Hence, the industry would benefit from understanding other physical mechanisms of improving the acoustic characteristics of exhaust mufflers without increasing back-pressure losses. This paper reports the dynamics of fluid injection on pressure drop fluctuations measured across perforated tubes with fluid injection. The measurements were conducted on three perforated tube patterns with varying longitudinal perforation pitch to hydraulic diameter ratios of 0.375, 0.75 and 1.5. The tests were performed with water as test medium and the injection ratios ranged from 0-5%. The Reynolds numbers of the experiments varied between 20 000 and 60 000 in copper tubes with an internal diameter of 20.8 mm and a wall thickness of 1 mm.The results indicated that the pressure drop fluctuations of the experimental set-up are influenced by fluid injection. Some levels of injection reduce pressure drop fluctuations below the fluctuation values when injection is absent. In addition to the reduction in pressure drop fluctuations, fluid injection also has the potential of reducing frictional losses experienced in pipes when a diffuser is installed at the outlet of the tube. Are the dynamics of fluid injection a mechanism of improving the acoustic characteristics of performance exhaust mufflers?

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Main supervisor (name and email)
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Professor Josua Meyer
josua.meyer@up.ac.za
University of Pretoria

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Primary author: Mr MATHEBULA, Ipeleng (CSIR)

Presenter: Mr MATHEBULA, Ipeleng (CSIR)

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