

Investigation of the Flow Characteristics in a Catalytic Muffler with Perforated Inlet Cone

Authors : Gyo Woo Lee, Man Young Kim

Abstract : Emission regulations for diesel engines are being strengthened and it is impossible to meet the standards without exhaust after-treatment systems. Lack of the space in many diesel vehicles, however, make it difficult to design and install stand-alone catalytic converters such as DOC, DPF, and SCR in the vehicle exhaust systems. Accordingly, those have been installed inside the muffler to save the space, and referred to the catalytic muffler. However, that has complex internal structure with perforated plate and pipe for noise and monolithic catalyst for emission reduction. For this reason, flow uniformity and pressure drop, which affect efficiency of catalyst and engine performance, respectively, should be examined when the catalytic muffler is designed. In this work, therefore, the flow uniformity and pressure drop to improve the performance of the catalytic converter and the engine have been numerically investigated by changing various design parameters such as inlet shape, porosity, and outlet shape of the muffler using the three-dimensional turbulent flow of the incompressible, non-reacting, and steady state inside the catalytic muffler. Finally, it can be found that the shape, in which the muffler has perforated pipe inside the inlet part, has higher uniformity index and lower pressure drop than others considered in this work.

Keywords : catalytic muffler, perforated inlet cone, catalysts, perforated pipe, flow uniformity, pressure drop

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