

Engine and Auxiliary Systems

Edited by
Prof. Dr. A.K.M. Mohiuddin



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Chapter 5

Experimental analysis to determine the relationship between noise and back pressure for muffler design – Part I: Muffler design requirements

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Abstract

This chapter describes part of the detailed methodology of relationship between noise and back pressure for muffler design. Starting with a brief introduction, an attempt is made here to present different steps of muffler design considering the relation between noise and back pressure. The design of the muffler chamber separation and arrangement is essential in determining the muffler characteristics. Some design considerations are proposed in order to come up with an optimum muffler design.

Keywords: back pressure, exhaust noise, muffler design, static pressure.

Introduction

Performance of an automotive muffler is essential to calculate the car overall performance. The amount of the backpressure produced by the exhaust system especially by the muffler is closely related to the noise they produced. In an automobile, the exhaust system carries exhaust gases from the engine's combustion chamber to the atmosphere. Noise can be described as any sound that annoys or disturbs people (unwanted sound) or causes or tends to cause an adverse psychological or physiological effect on human. Fortunately, however, this noise can be reduced sufficiently by means of a well-designed muffler which is also known as silencer. The main objective of this chapter is to find the relationship between the back pressure and the noise level. Back pressure represents the extra static pressure exerted by the muffler on the engine through restrictions in the flow of exhaust gases. This needs to be kept to a minimum.

The conventional muffler is an enclosed metal tube packed with sound-deadening material. Mufflers are conventionally classified as dissipative or reflective, depending on whether the acoustic energy is dissipated into heat or is reflected back by area discontinuities. However, no practical muffler or silencer is completely reactive or completely dissipative. Every muffler contains some elements with impedance mismatch and some with acoustic dissipation.