



# Design and Analysis of a Muffler for Engine Exhaust Noise and Heat Reduction

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## Abstract

Engine exhaust noise and heat are significant sources of emissions in the environment. Engine exhaust systems are designed to minimize noise and heat while maintaining the necessary db levels and sound quality, as well as emissions in accordance with environmental regulations. Mufflers remain an integral portion of the IC engine arrangement are widely used in IC engine exhaust arrangements to reduce sound generated by engine exhaust gases as well as to reduce heat. The most efficient way to reduce noise and heat is to install a exhaust muffler in the engine tail pipe. The aim of our project is to design and analysis an engine

exhaust muffler for reducing exhaust noise and heat. Appropriate design and analysis would aid in the reduction of noise and heat, while at the same time, the backpressure generated by the muffler should not affect the engine's efficiency. 3D models are developed in Solid Works software before being exported to ANSYS FLUENT CFD software for review in this report. Pressure conditions will be defined as the inlet and outlet boundary conditions in ANSYS/FLUENT, respectively. Then, in the proposed model, the problem is solved to simulate internal fluid flow (exhaust gas). The simulation result and experimental results are compared.

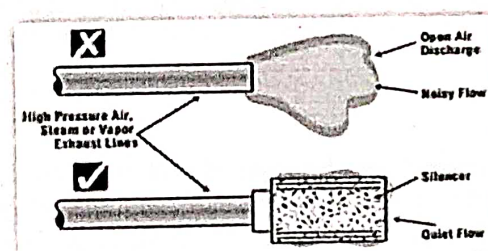
## Key Words

Muffler, Noise, Heat, Design, Analysis

## Introduction

The primary purpose of an automotive muffler is to reduce engine heat and noise emission. You'll understand how much of a difference a muffler will make in terms of noise level if you've ever heard a car without one. If cars did not have mufflers, the amount of engine exhaust noise in our atmosphere would be unbearable. Noise is the term for unwelcome sound. Sound is a pressure wave formed by air pressure pulses that alternate between high and low [1, 2, 3]. Pressure waves are generated when the exhaust valve in an automobile engine repeatedly opens and lets high-pressure gas into the exhaust system. The vibration we hear is the product of these pressure pulses. The rpm of the engine rises, and the rpm of the engine rises with it [4, 5, 6] Because of the pressure fluctuations, the sound produced has a higher frequency. The exhaust system does not generate all of the noise generated by a vehicle. Vehicle noise pollution is caused by intake noise, mechanical noise, and vibration-induced noise from the engine body and transmission. The vehicle

**FIGURE 1** Reducing air exhaust noise by installing muffler



muffler must be able to transfer exhaust gases while still preventing noise transmission [7, 8, 9, 10].

## Requirements of a Muffler

When designing a engine exhaust muffler for a particular application, there are a range of technical criteria to consider.