

REDUCTION OF AERODYNAMIC NOISE IN AUTOMOBILE  
ENGINE SILENCER IN THE TROPICS

BY

SURAJUDEEN OLANREWAJU OBAYOPO B.Sc., (Mechanical  
Engineering); MNSE

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF  
MASTER OF SCIENCE IN MECHANICAL ENGINEERING,  
FACULTY OF TECHNOLOGY,

OBAFEMI AWOLowo UNIVERSITY, ILE-IFE.

2007

## ABSTRACT

This study investigated practical methods of reducing noise pollution from automobile exhaust in our environment. This is with a view to get a design with the lowest noise level.

A critical study of models of silencers available on vehicles plying roads in Nigeria was carried out. Different types of silencers were sectioned and appropriate measurements of build parameters (inlet pipe size, orifice size and resonating chamber length) were taken. Models of the silencers were developed using these parameters and flow experiment was carried out on the models in a smoke tunnel to assist in obtaining an optimum model. Based on the preliminary results of the flow experiments, silencer prototypes of varying inlet pipe sizes (ranging from 25 to 40 mm), resonating chamber lengths (ranging from 120 to 132 mm) and orifice sizes (ranging from 2.6 to 3.4 mm) were constructed and tested on a laboratory Volkswagen Passat Internal Combustion (IC) engine of capacity 1921 cm<sup>3</sup>. Further noise reduction was achieved by incorporating sound absorbing material (fiber glass) of varying thicknesses (15 mm, 20 mm, 25 mm) within the silencer plate enclosure without creating excessive silencer weight. The level of noise generated was measured using a Sound Level Meter.

The results showed that the level of noise obtainable from a silencer increased with flow turbulence pattern in the silencer compartment. The lowest noise levels obtained were 67.9 dB at resonating chamber length of 120 mm, 70.0 dB at inlet-pipe size of 35 mm. and 70.7 dB at 2.8 mm orifice size. Incorporating absorbing material without exceeding the allowable silencer weight in practice (23 kg for mini vehicles) gave minimum noise level of 63.7 dB at a thickness of 25 mm. A reduction of 13.2 dB in noise level was obtained

throughout the experimentation on the Volkswagen Passat IC-engine when compared with the initial noise level of the silencer (baseline level of 76.9 dB).

In conclusion, the study revealed that flow linearization by modifying silencer build-up parameters influenced the level of noise generation in automobiles; and provided significant parameters for the design of appropriate automobile silencers for the environment.