International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 06 | June 2020 www.irjet.net p-ISSN: 2395-0072

Design and Analysis of Automobile Exhaust System For-BS VI

Patil Mahesh Yuvraj[1], Prof. Kamal Ukey[2]

[1]*Student, M.tech. Computer Aided Design & Manufacturing Engineering, G. H. Raisoni College of Engineering & Management, Wagholi, Pune, India.*
[2]*Professor, Department Mechanical Engineering, G.H. Raisoni College of Engineering & Management, Wagholi, Pune, India.*

Abstract – *Exhaust muffler is designed to reduce sound levels at certain frequencies. New regulations and standards for noise emission increasing complete the automotive firms to form some improvements about decreasing the engine noise. Developments on automobile technology and increasing competition between manufactures reduced weight, capability of higher sound absorption and lower back pressure mufflers. Lightness is possible if the thickness is decreased and the volume is reduced. This causes high back pressure. Muffler design is iterative process. The theories and science has been development in recent years. In today's competitive world market, it is important for a company to product development cycle time. This paper deals with a practical approach to style , develop and validate muffler particularly the muffler for exhaust , which can give advantages over the traditional method with short development cycle time and validation. In order to maintain a desired noise and comfortable ride, the modes of a muffler need to be analysed. Dynamic modal analyses to determine the mode shapes, stresses and deformations of exhaust muffler using CAE analysis.*

Key Words: Design, Analysis, Automobile, Exhaust Muffler.

1. INTRODUCTION

The different norms are brought into force in accordance with the timeline and standards acknowledged by the Central Pollution instrument panel which comes under the Ministry of Environment and Forests and global climate change. Bharat Stage emission standards, introduced in 2000, are emission standards that are acknowledged the Central government to manage the output of air pollutants from combustion engine equipment, including automobiles. The Bharat Stage norms are supported European regulations. In 13 major cities, Bharat Stage IV emission standards were put in situ in April 2010. BS-IV norms were alleged to inherit effect nationwide from April 2017.

1.1 Emissions Norms for BSVI Step I – Year 2020

Government proposed BSVI norms from 2020.Emission compliance on World Harmonized Steady Cycle (WHSC) &World Harmonized Transient Cycle (WHTC). BSVI - OBD I (Limit for NOx & PM monitoring)

1.2 Emissions Norms for BSVI Step II - Year 2023

Additional requirement of in service conformity for manufacturing from April 2023, ISC factor will be decided based on monitoring during 2020-2023.BSVI–OBD II (tightening of NOx limit and introduction of limit for PM).

2. LITRATURE REVIEW

Mufflers have been developed over the last ninety years based on electro- acoustic analogies and experimental trial and error [1]. Muffler dimension under space constraints throughout the graphic analysis as well as computer aided numerical assessment [2].Also this approach will design quality at earlier stage of muffler design, evaluate quality of design, proto design and improves the same throughout the product design steps and reduce cost of proto development. The study of heat transfer in automotive exhaust system has only recently attracted the importance it deserves due to its key role in the design of modern exhaust after treatment systems [3]. Pattas et al. studied the thermal response behaviour of diesel exhaust systems equipped with a particulate filter [4].Developed a model computing the steady state temperature distribution in exhaust systems with single wall and with double wall, air gap insulated piping [5]. The experimental acquisition of useful data for the estimation of heat transfer rates and their application in the optimized design of various exhaust configurations forms the subject of the present paper [6].

3. WORKING OF EXHAUST SYSTEM

3.1 Electronic Diesel Control

(EDC) may be a diesel fuel injection system system for the precise metering and delivery of fuel into the combustion chamber of recent diesel engines utilized in trucks

3.2 Exhaust Gas Recirculation

(EGR) may be a oxide (NOx) emissions reduction technique utilized in petrol/gasoline and diesel engines). EGR works by recirculating some of an engine's exhaust gas back to the engine cylinders.

Fig.-1 Exhaust System

3.3 Selective Catalytic Reduction

(SCR) is a complicated active emissions control technology system that injects a liquid-reductant agent through a special catalyst into the exhaust stream of a diesel.

3.4 NOx Sensor

The sensor is use to measure Nox levels very sensitive. The levels of NO are around 100–2000 ppm.

3.5 DP Sensor

Is used to measure "Diesel Particulate Filter Differential pressure" and indicate the amount of accumulated soot level in DPF.

3.6 Temperature Sensor:

It detects exhaust gas temperature and converts it into a voltage and feeds back to the engine ECU with the voltage signal so as to regulate engine conditions to effectively reduce emission.

3.7 Exhaust Outlet

The tail pipe is end of the ultimate length of pipe which ends with just a straight or angled cut where it vents to outdoors.

4. DESIGN CONSIDERATIONS

It is important to the exhaust system refer to tuned exhaust for optimal efficiency. Also this could meet the regulation norms maintained in each country. The exhaust of a generator has several inherent design problems that has got to be considered. These characteristics impose severe limitations on what are often done to silence the engine exhaust noise:

- Very High Noise (100 to 120 dBA @ 1 m)
- High Temperatures (950 to 1050 o F)
- High Velocities (5,000 to 15,000 fpm)

4.1 Designing of Parts

The parts are designed on the Pro.E by referable Conditions. Catia is mechanical design automation software that takes advantage of the familiar Microsoft Windows graphical user interface.

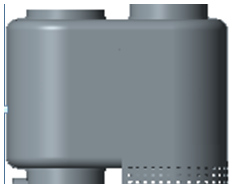

Fig.2 Mixture Box

TABLE 1: BILL OF MATERIAL

Sr.No.	Parts Name	Quantity
1	Tail Pipe	1
2	Turbo Charger	1
3	Exhaust Brake	1
4	Lambda Sensor	1
5	AHI	1
6	Front Pipe	1
7	DOC	1
8	DPF	1
9	Mixture Box	1
10	ASC	1
11	Muffler	1
12	Urea Tank	1
13	Urea Pump	1
14	Base Plate	1
15	Various Sensor	3

5. SIMULATION

A fluid flow analysis using Flow Simulation involves a number of basic steps that are shown in the following figures

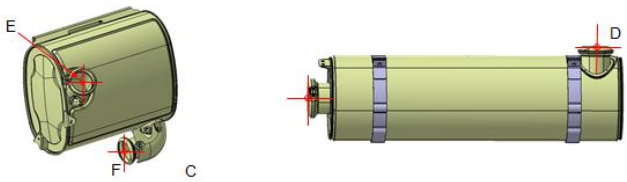

Fig.3 In and outlet positions on mufflers

Pipes inside Muffler should be meshed to capture its stiffness accurately.

6. CONCLUSION

1. Design and analysis of muffler guard is done in Catia.
2. Modelling of muffler is done with proper dimensions.
3. Dynamic analysis is carried out to determine the modes and stresses.

7. Future Work

Use performance Ratio (IUPR) for OBD, IUPR ratio to be defined at later stage. In service testing after Engine Type using PEMS needs to be done within 15 months of first vehicle and same to be repeated after every 16 months.

8. ACKNOWLEDGEMENT

In the due course of project with the valuable guidance of Guide Prof. Kamal Ukey, the paper was completed as per schedule & desirable results were achieved.

9. REFERENCES

[1]. Auto Fuel Vision & Policy 2025, Report of the Expert Committee, Government of India, May 2014.
[2]. Gazette of India BS-VI Notification, Ministry Of Road Transport and Highways Notification, New Delhi.
[3]. Emission Norms for truck and buses, ECMA, http://www.ecmaindia.in/iestandards.aspx?mpgid
[4]. India:Light-duty:Emissions, http://transportpolicy.net/index.php?title=India:_Lightduty:_Emissions
[5]. India:Heavy-duty:Emissions, http://transportpolicy.net/index.php?title=India:_Heavyduty:_ Emissions
[6]. Accelerating progress from Euro 4/IV to Euro 6/VI vehicle emission standards, S.Chambliss and A.
[7]. Chaitanya, P. and Munjal, M. L. Tuning of the extended concentric tube resonators, SAE International Symposium on International Automotive Technology (2011).