



Design Optimization of Exhaust System of Automobile for BS-VI Engine

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ABSTRACT –

The present work aims at improve the Frequency of NSD (Nash Shell Damper) muffler by controlling the noise level of a diesel engine by developing an exhaust muffler for the same, since exhaust noise is the single largest contributor to the overall noise from the engine.

Key Words: Catia v5 Design, Optimization, Automobile Exhaust Muffler.

1. INTRODUCTION

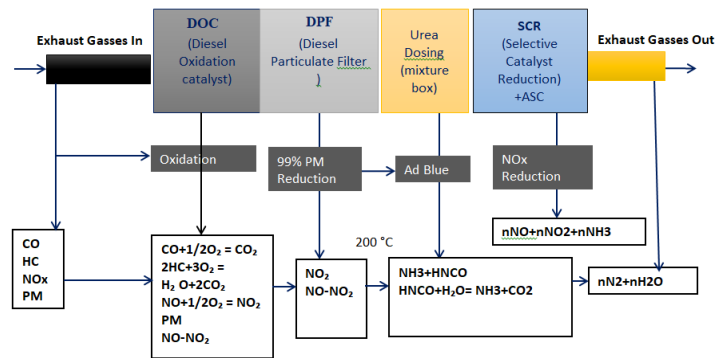
Bharat Stage VI is an emission standard which will bring much-needed changes within the Indian industry in terms of pollutant emissions with this emission norm coming into effect, India will come at par with the US, European countries and other advanced automotive markets across the globe. Muffler sometime also called as a silencer. It is a device through which the exhaust gases from an internal-combustion engine are passed to reduce noise of the engine.

2. LITRATURE REVIEW

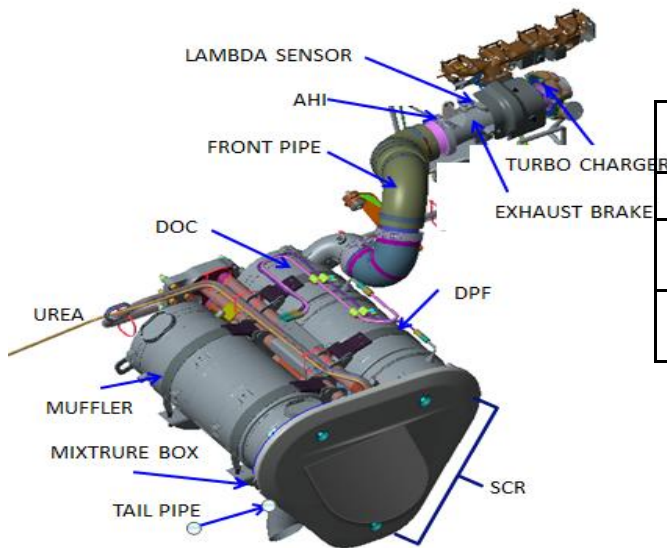
The expression they developed was supported the speed ration concept. Later, Dr. Munjal modified this approach to incorporate the convective effects thanks to flow [1]. Young and Crocker used the finite element method to predict four-pole parameters then the transmission loss of complex shaped mufflers for the case of no flow [2]. Ying-change, Long-Jyi used optimized approach of maximal STL and muffler dimension under space constraints throughout the graphic analysis also as computer aided numerical assessment. [3]. Middlberg, J.M. and Barber T.J. present different configurations of straightforward expansion chamber mufflers, including extended inlet or outlet pipes and baffles are modeled numerically using CFD so as to work out their acoustic response[4]. Presented a comprehensive model covering also heat transfer in takedown pipes. Both models focused, however, mainly on the temperature variation during single engine operating Cycles. Pattas et al. studied the thermal response behavior of diesel exhaust systems equipped with a particulate filter [5].

3. WORKING OF EXHAUST SYSTEM

After the 4th cycle of a combustion engine, exhaust gases are produced. Exhaust gases are collected from the cylinder head in the engine by an exhaust manifold. The exhaust manifold is connected to the engine these exhaust gases then travel through a catalytic converter which removes harmful elements. Stock piping's are made in such a way that they can cut the cost of the car so they have unnecessary tapers that affect the pressure of exhaust gas and can cause back pressure which leads to performance. Finally the exhaust fumes exit via the tail pipe at the rear which carries gases away from the vehicle.



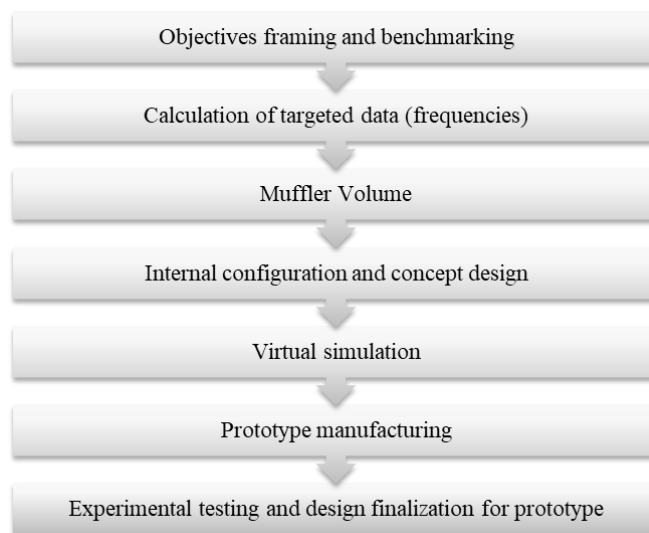
4. DESIGN CONSIDERATIONS



Bharat Stage	Technology
BS III	EDC (Electronic Diesel Control)
BS IV	EGR (Exhaust Gas Recirculation) or SCR (Selective Catalytic Reduction)
BS VI	EGR + SCR+ASC (includes DCO, DPF,UREA etc.)

Fig.3 Exhaust System

Design consideration flowchart



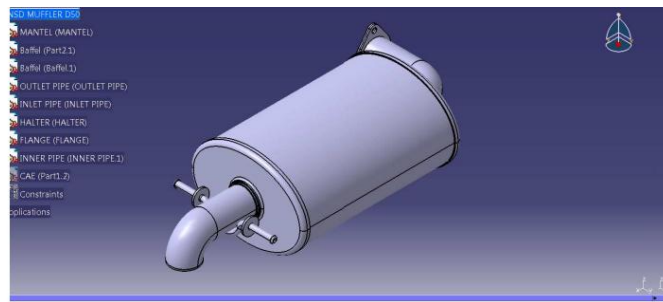


Fig.4 Design of Exhaust Muffler Using Catia V5

5. SIMULATION

Automotive simulation enables engineers to deliver innovations faster with safety and reliability. It is achieved by digital prototyping and rapid virtual testing. With ANSYS solutions, you can comprehensively simulate system

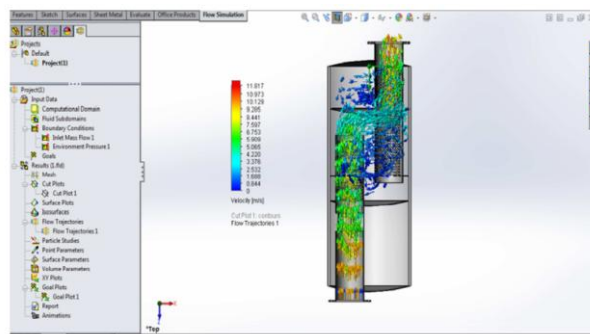


Fig.6 Velocity Distribution

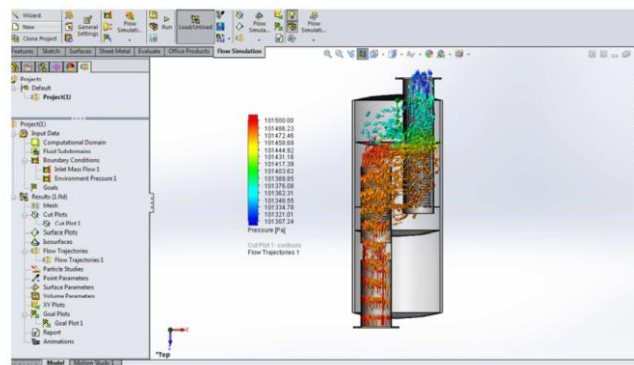


Fig.7 Pressure Distribution

6. CONCLUSION

Double expansion chamber gives better results as compared to single expansion chamber. The muffler reduces exhaust noise by dampening the pulsations in the exhaust gases and allowing them to expand slowly. As per our design and simulation analysis with CAD software and ANSYS software exit velocity and pressure of double expansion chamber is satisfactory.

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