

Design Modification of Engine Mounting Bracket of Car

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Abstract- Engine mounts themselves are small parts that are meant to stabilize, as well as properly align, a vehicle's engine. So, even though these mounts are small, they play a large role in the overall functionality of the vehicle. In this project we worked on the bracket of sedan car. This thesis presents a comprehensive investigation into the design modification of engine mounting bracket, aimed at enhancing performance through stress and vibration analysis while considering the utilization of different materials. The study addresses the critical role of engine mounting brackets in maintaining structural integrity and vibrations damping. Through finite element analysis (FEA) is done which evaluates the structural integrity and vibration damping characteristics of various materials.

Index Terms: Engine Mounting Bracket, Finite element method, vibration.

I. INTRODUCTION

Engine mounts themselves are small parts that are meant to stabilize, as well as properly align, a vehicle's engine. So, even though these mounts are small, they play a large role in the overall functionality of the heart of your vehicle. Moreover, when these supposedly small and minor Aspects of the vehicle go bad. An automotive engine-body-chassis system is typically subjected to unbalanced engine forces, uneven firing forces especially at the idling speeds, shaking forces and torques due to reciprocating parts, dynamic excitations from gearboxes and accessories, and road excitation. These tendencies give rise to undesired vibrations Which lead to an uncomfortable ride and also cause additional stresses in the automobile frame and body. Brackets plays a vital role when the vibrations are produced it helps engine to maintain a static hold so their far no failure should occur and also while accidents take place it protects them from major damage. If engine brackets are not provided vibration takes place and may fail engine while driving the vehicle.

The car engine bracket is the part that holds the engine in the car. In most cars, the engine and transmission are bolted together and secured together by three or four bases. Part of the car engine bracket is bolted to the body or frame. The other part holds the engine. The engine is a source of vibration because it has many moving and rotating parts. Car engine bracket's job is not only to hold the engine in place, but also to reduce the engine vibration felt in the car.

Brackets plays a vital role when the vibrations are produced it helps engine to maintain a static hold so their far no failure should occur and also while accidents take place it protects them from major damage. In diesel engine, the engine mounting bracket is the major problem as there is unthrottled condition and higher compression ratio and even there are more speed irregularities at low speed and low load when compared to gasoline engines. So due to this there are more vibration excitation. By this vibration engine mount bracket may fail, so by optimizing the shape and thickness of engine mount bracket we can improve the performance at initial design stages.

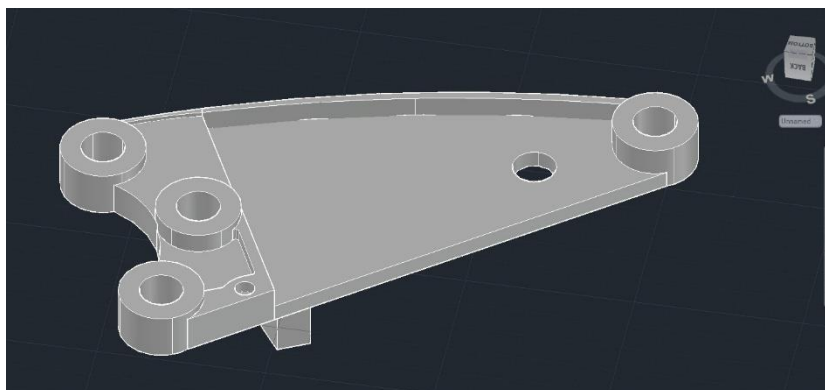


Fig:- Engine Mounting Bracket

II. LITERATURE REVIEW

Sawita D. Dongre et al. [2014] Had studied the design and analysis of Jigs and fixture which is used in the manufacturing of chassis bracket of Bajaj car RE60 (passenger car). The purpose of the jigs is to provide strength, holding, accuracy and interchangeability in the manufacturing of product. By performing analysis on jigs and fixtures we find out stress acting on jigs and fixtures and bracket. The jigs and fixtures are the economical ways to produce a component in mass. So jigs and fixtures are used and serve as one of the most important facility of mass production system. These are special work holding and tool guiding device. What makes a fixture unique is that each one is built to fit a particular part or shape. The main purpose of a fixture is to locate and in the cases hold a work piece during an operation. A jig differs from a fixture in the sense that it guides the tool to its correct position or towards its correct movement during an operation in addition to locating and supporting the work piece. So in this project we will design jigs and fixtures while manufacturing of chassis bracket and analyzing stress and strain developed in jigs and fixtures and chassis bracket. In this we will minimize the different problem of breakage of jigs and fixtures. [1]

Mohmmad Faraz Rayeen and Arun Singh Patel, [2019] Carried out design and study of automotive chassis bracket using structural finite element analysis in which FEA model has been generated for different chassis parts with the specified quality criteria and analyzed for optimized results. Static analysis is carried out on bracket which is integral part of the chassis. FEA model has been generated for truck cross member with the specified quality criteria and analyzed for the optimized results. Static analysis are carried out iteratively for various cases of bracket and the following conclusions are enumerated Carbon epoxy composite material of 12 mm thickness is preferred than High Carbon Steel of 6 mm thickness. For fabricating bracket due to maximum displacement is reduced by 41% , maximum stress is reduced by 53% and weight is reduced by 61%. Among these the High Carbon Steel bracket is fabricated having 30mm, 50mm and 64 mm hole at the base. From this he observed that the last one gave 5 the optimum results provisions of chamfers at outer corners of the bracket reduced the displacement and weight considerably. [2]

Sagar B. Awate and Prof. Vidyasagar R. Bajaj et al. [2016] This paper is about, physical validation & testing of newly designed brake chamber mounting bracket. Brake chamber mounting bracket is a part of air brake system. It is mounted on rear axle of vehicle. Air chamber / spring brake actuator is mounted on the bracket so it's called as "brake chamber mounting bracket or spring brake actuator mounting bracket". Critical tests are identified for brake chamber mounting Bracket such as endurance test, deflection measurement test, vibration test & natural frequency detection test. The detail procedure, setup & test methods are described in the paper. [3]

Polusani Sampath Rao, [2018] Carried out optimum design of automobile chassis bracket based on topography optimization in which the objective of the research work is study the static behavior of the truck cross member bracket, failure analysis and reduction of weight by changing the geometrical features and structural properties. [4]

Rajath J K and Dr. L Chandrasagar [2017] Dynamic Response Analysis of Compressor mounting Bracket of an Automobile Vehicle for Aluminum 6061T6 The compressor plays a vital role in the air conditioning system of an automobile. The compressor mounting bracket is a rigid structure which is used to mount the compressor to the engine. Design includes modelling of the bracket by considering all the constraints. Analysis comprises of normal modes analysis and frequency response analysis for aluminum 6061T6. The aim of this work is to find the natural frequency of the bracket for the self-weight by modal analysis and the stresses induced in the bracket due to external excitation by frequency response analysis using FEA method. The analysis is performed using ABAQUS tool and the results are interpreted. [5]

Jasvir Singh Dhillon and Priyanka Rao et al. [2014] Design of Engine Mount Bracket for a FSAE Car Using Finite Element Analysis Engine mounts have an important function of containing firmly the power-train components of a vehicle. Correct geometry and positioning of the mount brackets on the chassis ensures a good ride quality and performance. As an FSAE car intends to be a high-performance vehicle, the brackets on the frame that support the engine undergo high static and dynamic stresses as well as huge number of vibrations. [6]

Tushar P. Kamble and Rajratna A. Bhalerao [2016] Optimization & Modal Analysis of Engine Mounting Bracket for Different Materials by Using Finite Element Analysis The Engine in the vehicle is one of The most important components of on road vehicle such as Car. High performance sports car has their engine Component supported by the mounting bracket to its chassis Frame. It plays a very much important role in improving the Comfort & work environment of a car as well as the engine Component. The improvement of the engine bracket system Has been the subject of intense interest for many years. It is Required to design the proper engine mounting bracket for a Road vehicle. [7]

Sahil Naghate and Sandeep Patil, [2012] Modal Analysis of Engine Mounting Bracket Using FEA The engine mounting plays an important role in reducing the noise, vibrations and harshness for improving vehicle ride comfort. The first and the foremost function of an engine mounting bracket is to properly balance the power pack (engine & transmission) on the vehicle chassis for good motion control as well as good isolation. Present work deals with FEA analysis of engine mounting bracket. It includes the modeling of the engine mounting brackets by changing the material of component. [8]

III. PROBLEM IDENTIFICATION

Engine mounting bracket is one of the main considerations while the vehicle is running when the vehicle dis-passes from the road brakers there may be a chance of displacement in the engine due to high vibrations. To make it rigid or hold it this project helps in various considerations. If engine brackets are not provided vibration takes place and may fail engine while driving the vehicle. Vibrations comes from inside the engine due to unbalanced engine forces, imbalances in the rotating and reciprocating parts and from firing pulses. Also there are other things which causes engine movement which are accelerating and decelerating and torque of the engine itself and if the brackets are fracture or deformed then it can also lead to damage the engine. Therefore it is decided to design modification of engine mounting bracket car.

IV. METHODOLOGY

- Study of existing design, working and operation.
- Data accumulation
- Design Calculations
- Modification in existing design
- Result discussion
- Validation of result

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