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#### “A REVIEW ON DESIGN OF BIKE FRAMES”

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#### ABSTRACT

*The frame is an important part in a Two Wheeler and it carries the load acting on the vehicle. So it must be strong enough to resist the shock, twist, vibration and other stresses. In vehicle frame different types of failure occur due to static and dynamic loading conditions. Natural frequency, damping and mode shapes are the inherent structural properties and can be found out by modal analysis. Authors will be taking ideal procedure for improve strength of chassis with respect to stability and comparison result of both existing and modified chassis.*

*Keyword: Stress, Rigidity, Bike Chassis, Natural Frequency, Structure.*

#### I. INTRODUCTION

A variety of weight reduction strategies are adopted by different automakers to minimize weight in automobiles. Using lightweight materials such as aluminum and carbon-fiber or optimizing existing vehicle designs are some of the key strategies adopted by manufacturers in the automotive industry.

This work deals with study of a two wheeler chassis which serves as a skeleton upon which parts like gearbox and engine are mounted. It contributes around 14% in the total vehicle weight. It is thus significant to improve the design of the chassis to provide good balancing and improved fuel efficiency. This work deals with the performance improvement of the existing chassis of a two wheeler with certain design changes (trying different materials). The parts are developed with Computer Aided Design software (CATIA) & analysis is done using Hypermesh & ANSYS software. Aluminum alloy 6063 is used to replace the existing Mild Steel material and study the results. Analysis is done under static loading conditions. The loads studied are tank load, engine load, rider load & pillion load. From this proposed study, it is expected that the chassis with alternate material is performing better with a satisfying amount of weight reduction and the weight reduction will hence lead to better fuel efficiency of the vehicle without disturbing strength of chassis.

#### II. LITERATURE SURVEY

C. H. Neeraja a C. R. Sireesha and D. Jawaharlal [1] have completed the examination on displayed suspension outline for the bikes. Displaying had being done on a 3D demonstrating programming Pro/Engineer. To examine the quality of an edge, auxiliary examination is done by applying the wheel powers. The point of this investigation had being practiced by finding an extreme pressure limit for the bike suspension. The investigation was completed for four unique materials, call as, compound steel, magnesium, aluminum combination A360 and carbon fiber strengthened

fiber to comprehend which material is best for bike frame and can convey a generally excellent quality. Investigation is done on the ANSYS programming. By having taken a gander at the outcomes, for various materials and stress esteems observed to be in breaking point and not exactly reasonable limits affirming to wellbeing of passenger.[1]

**Teo Han Fui, et. al. [2]** deals with the Statics and Dynamics, Structural Analysis of a 4.5 Ton Truck Chassis, he inquired about and decided the dynamic normal for the truck body, exploring the mounting areas of parts on the truck frame and watched the reaction of the truck body under static stacking conditions. He found that the nearby twisting vibration in the skeleton of the truck happens at the top cap cross part where the gearbox is mounted. What's more, the mounting area of the motor and transmission framework is about the balanced hub of the suspension first torsion mode where the impact of the principal mode is less relatively. The aftereffect of the investigation and the examination in this dad per demonstrates that the most extreme pressure happening of the truck skeleton is concentrated to be 490 Megapascals and the greatest interpretation to be 33.6 mm. These qualities are adequate as compared to the yield quality of the body material and the tolerance took into account the chassis.[2]

**S. Agostoni, A. et. Al [3]**, he had attempted to improve vibration execution of the hurrier by an analysis done while doing this examination is for discovering nearby vibration modes. Strategy created will have the option to recognize the nearby vibration modes permit to discover if/when/how undercarriage parts' resonances are energized. By executing this technique auxiliary alterations have been read for different sort of body models. New handlebar development multi DOF mass damper vibration results are operation timized. In this paper foot plate geometry is been adjusted for decrease of nodal dislodging of hassock pillar authoritative. In this examination suspension has been created with the sole point of improving rider comfort. What's more, consideration is been straightforwardly given to deal with bar, segment related legitimately to driver.[3]

**FA Conle et. al [4]**, the exploration is being done in this paper in the field of weakness examination and the nearby pressure – strain approach in the complex vehicular structures. The paper infers that the harm appraisal ought to be adaptable henceforth to deal with a few multiaxial weakness harm criteria. And furthermore a versatility adjustment strategy for multiaxial neuber type ought to be utilized to interpret the flexible neighborhood stress which can wipe out for the plastic pressure strain conduct. A basic plane quest for the most harming direction is fundamental. [4]

**Abhishek Sharm et. al [5]**, have planned the substantial vehicle frame and dissected with the assistance of ANSYS-15.0. The TATA LPS EX suspension is utilized in the examination for the auxiliary investigation of the substantial vehicle frame with three different composites oppressed having similar states of the steel body. Three-material utilized in this paper for the investigation of the suspension are dark solid metal, AISI 4130 compound steel and ASTM A710 STEEL GRADE A (CLASS III). There are various states of the cross segments that were utilized for their work which are C, I and Box type cross areas. A three-dimensional strong Model was worked in the CATIA V5 parametric. The outcome demonstrates that AISI 4130 steel compound shows preferred execution and lighter over the majority of the other metal amalgams with giving quality as well.[5]

**Jakub Šmiraus1 et. al [6]**, he considered on the structuring of the bike and reasoned that the framework with controlling geometry changes may be a spearheading thought in development of the 21st century bike case. The trail modification alongside changes in wheelbase and ground leeway of the bicycle open up numerous alternatives in the field of negative impacts guideline coming about because of the dynamic characteristics of bike movement. Such an answer for bike sus-benefits with variable geometry subject to driving conditions was structured in the proposition by Jakub Šmiraus and constructed at the Institute of Transport VŠB - Technical university of Ostrava under tutelage of MSc Michal Richtář. In the future ages, the entire framework could be completely mechanized, in which case it could work together without trouble with the previously mentioned effectively used strength and help systems.[6]

**Haval Kamal Asker1 et. al [7]**, had made research and taken a shot at the Stress Analysis of a Standard Truck Chassis during sloping on square utilizing limited component technique and he concentrated on the force and the quality of the casing assume a major job in the truck's structure. He had been studying and analyzing utilizing the Ansys bundle programming. Additionally, vibration modes and the diversion in the individuals from the skeleton have been investigated during the stacking conditions.[7]

**CicekKaraoglu et. al.[8]** did the limited component investigation of a truck undercarriage. The investigation demonstrated that expanding the side part thickness can lessen stresses on the joint territories, however understand that the overall weight of the suspension edge increments. Utilizing neighborhood plates only in the joint territory can likewise build side part thickness. Therefore, over the top load of the skeleton edge is prevented.[8]

**Karaoglu . C. et. al [9]** explored pressure investigation of a truck undercarriage with bolted joints utilizing FEM. Numerical results demonstrated that weights as an afterthought part can be reduced by expanding the side part thickness locally. Fermer et al examined the exhaustion life of Volvo S80 Bi-Fuel using MSC/Fatigue.[9]

**Conle and Chu et. al [10]**. researched about fatigue examination and the neighborhood stress – strain approach in complex vehicular structures.[10] Auxiliary advancement of car parts connected to durability issues has been explored by **Ferreira et al Filho Et et. al[11]**. have examined and advanced a skeleton plan for a rough terrain vehicle with the suitable dynamic and basic behavior.[11]

**Kutay Yilmazcoban, Yaşar Kahraman et. al[12]**., puts some takes a shot at the body streamlining by utilizing the finite analysis, his principle spotlight was on the decreased heaviness of the frame for that he utilized three thickness 4 mm, 5 mm and 6 mm and after examination he inferred that the 4 mm thickness is better in light of the fact that the pressure and the dislodging in that is better than other two thickness.[12]

**Teo Han Fu et. al[13]**, works on the Statics and Dynamics, Structural Analysis of a 4.5 Ton Truck Chassis, he decided the dynamic characteristic, of the truck body, researching the mounting locations of segments on the truck suspension and observing the reaction of the truck case under static loading conditions. The neighbourhood bowing vibration happens at the top hat cross part where the gearbox is mounted on it. And thus, the mounting area of the motor and transmission framework is along the even pivot of the chassis' first torsion mode where the impact of the first mode is less. Notwithstanding, the mounting of the suspension framework on the truck undercarriage is marginally away from the nodal purpose of the first vertical twisting mode. [13]

**O Kurdi, et. al [14]** , chips away at the, Stress Analysis Of Heavy Duty Truck Chassis Using Finite Element Method, he basically center around the significant strides in improvement of another truck undercarriage is the expectation of fatigue life expectancy and sturdiness stacking of the body frame. Fatigue study and life forecast on the suspension is vital in request to check the wellbeing of this undercarriage during its operation. Stress investigation utilizing Finite Element Method (FEM) can be used to find the basic point which has the most elevated pressure. This basic point is one of the variables that may cause the fatigue failure.[14]

**Haval Kamal Asker1 et. al [15]** , put a few takes a shot at the Stress Analysis of Standard Truck Chassis during Ramping on Block Using Finite Element Method and he concentrated on the power and the quality of the edge assume a major job in the truck's design.[15]

**Maulik Lohia et. al [16]**, The frame is an important part in a Two Wheeler and it carries the load acting on the vehicle. The objective of thesis is to analysis of double cradle frame under rider weight case and engine weight case and comparison of both existing and modified double cradle frame in static structural analysis by using Solid Work 2015 simulation module. Our goal is to minimize the effect of these vibrations, because while it is undesirable, vibration is unavoidable. The dynamic characteristics of the two wheeler chassis such as the natural frequency and mode shape will determine by using finite element (FEM) method in Solid Work 2015 frequency analysis. Author will be taking ideal procedure for improve strength of chassis with respect to stability and comparison result of both existing and modified chassis[16]

**Ms. Priyanka Pandit Kore et[17]**. al. In this work, different analysis techniques for automobile frame are studied under different loading conditions. The loading may be static or dynamic. Also studied analytical and experimental techniques available for automobile frame analysis. This overview helped to study how to reduce weight of automobile

chassis. It contributes around 14% in the total weight of vehicle. It is thus significant to improve the design of the chassis to provide good balancing and improved fuel efficiency. The proposed work deals with the performance improvement of the existing chassis with certain design changes. In this, Chassis is manufactured by using material Aluminium alloy and Stress and Deformation analysis is done by using software and load vs deformation as well as load vs stress graph for both materials are studied in this work.[17]

**P. N. V balasubramanyam et. al[18]**, The Electric Bike is an eco-friendly transport system which will be useful for present and broadly for future generations, so that they can use renewable energy resources to power their vehicles instead of fossil fuels and produce less pollutants or no pollutants. reviews, suggestions and experience which will improve the accuracy and precision of the overall bike by the acceptance of all the engineering principles. The main objective of our paper is to design the frame for the bike and to perform three types of impact analysis i.e. side impact analysis, front impact analysis and combined impact analysis for different speeds using finite analysis software.[18]

### III. PROBLEM STATEMENT

Mass or weight reduction is becoming an important issue in automotive industry. Weight reduction will give substantial impact to fuel economy, efforts to reduce emissions and therefore, helps to the save environment.

Chassis is a prominent structure for bike body, which takes the loads during serious accidents, costly recalls; chassis also has an impact on product image. Commonly used material for chassis is mild steel which is heavy in weight or more accurately in density. From the literature reviewed it has been observed that for weight reduction there are various alternate materials available for chassis which are lesser in weight and provides high strength. But these materials are used for heavy vehicles, all terrain vehicles. The same can be used for two wheeler chassis. And static characteristics can be studied for the vehicle. So, the overall weight of the vehicle can be reduced for better fuel efficiency.

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