

DESIGN AND FABRICATION OF TRI WHEEL E-VEHICLE

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ABSTRACT

The purpose of this study is to design rigid and lightweight chassis for an electric vehicle. Various chassis types with different geometries are considered chassis are designed using Computer Aided Design (CAD) software. Designs are analysed using software and performance characteristics are parametrically and structurally optimized. The automotive chassis is one of the most important structures of any self-propelled construction because of its multifaceted role on vehicle dynamic behavior. The main target is to evaluate chassis deformation, based on static and analysis, in order to reduce weight and at the same time achieve adequate vehicle operation in a demanding low energy consumption race. The design is carried out based on specific standards and limitations set by the competition regulations. The specifications of chassis materials linked to mechanical and physical properties are defined and set .A analysis is also set up and run, to determine the natural frequencies and the mode shapes of the chassis, so to partly understand the dynamic behavior of this structure. In order to improve the fuel efficiency and reduce emissions in air the use of conventional vehicles has to be reduced and the implementation of electric vehicles should be promoted.

Keywords: Design, E-Vehicle, Frame, Chassis.

I. INTRODUCTION

Renewable energy integration to the transportation has been increasing rapidly due to uncertainties in petroleum reserves and increasing environmental pollution caused by carbon dioxide emission. Electricity as a renewable energy is the major alternative to petroleum in transportation. Electric vehicle's environmentally friendly characteristic due to zero carbon dioxide emission makes it a good alternative to conventional internal combustion engine vehicles. Generally, electric vehicles consist of a chassis that resists all the loadings, an electric motor that runs the wheels and battery that supplies energy to the electric motor. Controlling and monitoring of the vehicle overall performance are handled by battery management

system and motor controller system. The battery pack of an electric vehicle has a considerable amount of weight compared to the total weight of the electric vehicle. The weight of an electric vehicle becomes the major consideration because of the heavy battery packs. Weight increase of electric vehicles results in the decrease of the range without recharging. Vehicle manufacturers are striving to balance the heavy battery pack weight using lightweight chassis. Chassis is the main structure of a vehicle that all other components like engine, power train, steering system and wheels assembled on it. The main function of the chassis is to carry all the loads on it and to resist all the forces. Forces on chassis could be an inner force in case of acceleration and braking or could be an outer force due to

road condition or crash impact. Manufacturers aimed to have more rigid and more lightweight chassis for safety and energy consumption. Innovative design and material use could significantly reduce the weight of the chassis and increase the range of the vehicle. The lightening process of the chassis also related with the safety of the chassis and lightweight chassis design must be structurally rigid. Innovative material use for the chassis could meet the desired safety and weight values. Different design types are used in chassis manufacturing. Type of the chassis directly affects the weight, safety vehicle.

Mainly two major types of structures are used for the vehicle production depending on frame and body relations. Body and frame are integrated in most of the today's vehicles and this structure type called unibody the one piece structure of chassis represents the structure of the entire vehicle. The other type of structure is body on frame. This structure type includes chassis and body separately. In body on frame structures, the body is mounted on the chassis and vehicle body shape is independent from the chassis shape. The body on frame structures includes different chassis types such as ladder frame, backbone chassis and space frame. The aim of the present study is to investigate chassis for an electric vehicle and motivated from the uncertainty of petroleum resources and heavy weight of the electric vehicle chassis due to heavy batteries. Design of the electric vehicle chassis is performed under the sub-titles of design, analysis and optimization.

II. FABRICATION

II.I. CHASSIS

A chassis is on structure Chassis is the main support structure of the vehicle which is also

known as 'Frame'. It bears all the stresses on the vehicle in both static and dynamic conditions. In a vehicle, it is analogous to the skeleton in living organisms. A chassis is fabric of the most important components of a vehicle, without which the car would have no striated from steel tubing. It's welded to the axles, and it holds the body and motor include with suspension, the frame should be stiff enough not to break under strain. a vehicle frame forms the basis of an automobile. The material used for the construction of the chassis is usually carbon steel. Typically the material used to construct vehicle chassis and frames is carbon steel to achieve a more weight construction these are ordinarily made of steel channel sections, made by folding, rolling or pressing steel plate



II.II. FRAME

A vehicle frame, also known as its chassis, is the main supporting structure of a motor vehicle to which all other components are attached, comparable to the skeleton of an organism. Until the 1930s, virtually every car had a structural frame separate from its body. This construction design is known as body-on-frame

To support the vehicle's mechanical components and body. To deal with static and dynamic loads, without undue deflection or distortion. Types of frame according to the construction: Ladder type frame-Type frame Offset frame, Off

set with cross member frame, Perimeter .Frame from the types of frame we are made Ladder type because of it has give more support to the components and withstanding quality is high.



II.III.FORKS

A motorcycle fork connects a motorcycle's front wheel and axle to its frame, typically via a yoke, also known as a triple clamp, which consists of an upper yoke joined to a lower yoke via a steering stem, a shaft that runs through the steering head, creating the steering axis. Most forks incorporate the front suspension and front brake, and allow the front wheel to rotate about the steering axis so that the bike may be steered. Most handlebars attach to the top clamp in various ways, while clip-on handlebars clamp to the fork tubes, either just above or just below the upper triple clamp. The fork and its attachment points on the frame establish the critical geometric parameters of rake and trail, which play a major role in defining how a motorcycle handles and dives during braking. While the standard telescopic fork arrangement is found with few major differences among mainstream street motorcycles since the 1970s, historically there have been many variations, including trailing or leading link, springer, earles, girder, and others, as well as non-fork steering such as hub-center steering.

II.IV. DIFFERENTIAL

The differential is a system of gears that allows different drive wheels (the wheels to which power is delivered from the engine) on the same axle to rotate at different speeds, such as when the car is turning. A differential is also the component through which a rotating driveshaft can change direction; for example, in a rear-wheel-drive car whose driveshaft runs the length of the car, it joins and transfers its power to an axle that runs perpendicular to the car to drive the left and right wheels. Differentials are low-maintenance, sealed components that are expected to last the life of the vehicle but may have a recommended service interval to check and/or replace the oil. Types of differential according to the wheels: Open Differential, Limitedslip Differential, Locking Differential, Torque-Vectoring Differential.



II.V. VEHICLE BODY

Vehicle body is the main supporting structure of a vehicle, to which all other components are attached. Truck uses a separate frame as chassis. The body style of a vehicle refers to the shape and model of a particular automobile make, such as Ford, Chevrolet or Chrysler. Contemporary passenger-car body styles generally include two-door coupes, four-door sedans, hatchbacks,

station wagons, sports cars, minivans, sport utility vehicles and convertibles. Vehicle body is most expensive part of a EV. Vehicle body could be the main supporting structure or its particular element. Vehicle body is the main supporting structure of a vehicle, to which all other components are attached.



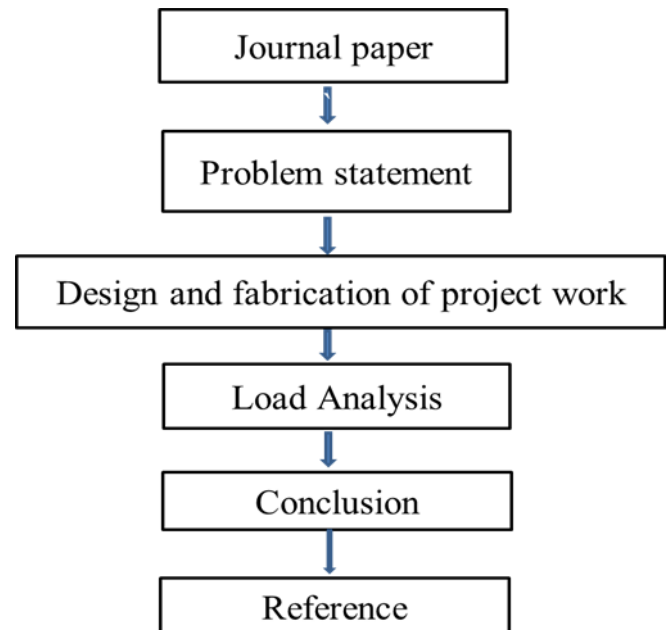
II.VI. LEAF SPRING

A leaf spring is a simple form of spring commonly used for the suspension in wheeled vehicles. Leaf spring takes the form of a slender arc-shaped length of spring steel of rectangular cross-section. In the most common configuration, the center of the arc provides location for the axle, while loops formed at either end provide for attaching to the vehicle chassis. For very heavy vehicles, a leaf spring can be made from several leaves stacked on top of each other in several layers, often with progressively shorter leaves. Leaf springs can serve locating and to some extent damping as well as springing functions. While the interleaf friction provides a damping action, it is not well controlled and results in station in the motion of the suspension. For this reason, some manufacturers have used mono-leaf springs.

III. METHODOLOGY

The tri wheel E-Vehicle has some methodology

they are design for required condition, analysis the load capacity or strength and fabrication work.



IV. CONCLUSION

- To design a chassis for an electric vehicle and main purpose of the design was to obtain a rigid and lightweight chassis.
- A preliminary design of the electric drive system, which involves estimation of the required battery capacity and motor power, is carried out
- Various chassis designs are created using computer aided design software, considering the dimensions and locations of the other electric vehicle components like battery, electric motor, steering system, seats and rear axle by using three chassis types with two different section geometries.
- Design and fabricate a prototype three-wheeled battery electric vehicle of highly compact to be used in several applications
- From these literature surveys, the properties of various alternate materials like carbon fiber, aluminum alloy,

titanium have been studied and been compared with conventional mild steel.

- To predict life of a chassis there is need to research for the base material for the load variation and impacting static as well as in dynamic.

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