International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

# Design and Development of Weight Carrying in EV

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***Abstract* — The growing demand for electric vehicles (EVs) has necessitated the development of advanced technologies to enhance their efficiency and functionality. One crucial aspect is the effective distribution of weight within an EV to optimize its performance, stability, and overall driving experience. This paper presents the design and development of an automatic weight carrying system specifically tailored for EVs.**

**To facilitate weight redistribution, the automatic carrying system utilizes an advanced actuation mechanism. The actuation system is responsible for adjusting the weight distribution by moving individual components or utilizing counterweights within the vehicle. This dynamic weight management system ensures that the EV maintains optimal balance and stability under varying driving conditions.**

***Keywords— Design , Expandable carrier , Linear Actuator , Analysis.***

## I. INTRODUCTION

Designing and manufacturing electric vehicles (EVs) is a complex and difficult task. Electric vehicles need to be lightweight to increase driving range. On the other hand, it needs to support some weight for daily use. Here are some important considerations when designing and manufacturing portable electronics: Heavy battery packs. Since the battery is the heaviest part of an electric car, it is important that it is as light as possible. This can be achieved by using sustainable materials (such as lithium-ion batteries) and improving battery design. Heavy engine. The engine is another heavy duty tool. However, with the development of electronic devices in recent years, the weight of the generator has decreased. Chassis and body weight. The chassis and body of the electric car will also affect the weight. However, the weight of the chassis and body can be reduced by using heavy materials such as aluminum and carbon fiber. Stopping and braking hard. Suspension and braking systems are also an important part of electric vehicles. However, suspension and brake weight can be reduced by using durable and well-designed materials. Weight of interior and exterior materials. The interior and exterior parts of the electric car, such as the seats, dashboard and wheels, also add weight. However, the weight of these products can be reduced by using durable and well-designed materials. In electric cars, not only the quality of the human body but also its total weight is important. Weight distribution should be balanced to increase vehicle handling and performance. The design and development of large electric vehicles is a process of continuous improvement and change. As battery technology continues to improve and heavy equipment becomes cheaper, electric cars will lose weight. This will make electric cars more manageable, more fuel efficient and suitable for everyday use. Additional tips for designing and building automotive electronics: Use durable materials whenever possible. It specializes in the production of battery packs, engines, chassis, body, suspension, brakes and indoor and outdoor application products. Balance the vehicle's weight. Consider the needs of your target market when designing the payload capacity of your electric vehicle. By following these guidelines, engineers can design and build complex, practical electric vehicles that are long and costly .The goal of

Designing and manufacturing electric vehicle (EV) loads is to increase their quantity and efficiency. Electric vehicles are heavier than petrol vehicles due to the weight of battery packs and other components. The heavier the electric car, the shorter its range. There are many ways to increase the carrying capacity of an electric vehicle. One way is to use lighter materials such as carbon fiber or aluminum. Another way is to encourage the production of batteries and other equipment. Engineers can also use power steering to shift the weight of the vehicle when necessary. The development of heavy-duty electric vehicles is important because it could help make them more practical and attractive to many drivers. Consumers' preference for electric vehicles with longer range and better performance will help the transition to cleaner transportation in the future. Here are some of the special benefits of electric vehicles: Learn more: Electric vehicles can go further in one go. Better performance: Electric cars can be faster and more efficient. Low energy consumption: Less energy is needed to operate electric vehicles, thus saving on fuel

costs. Maximum safety: Electric vehicles are less likely to be involved in accidents. The design and development of heavy-duty electric vehicles is a difficult and challenging task, but it is an important task. By continuously improving the carrying capacity of electric vehicles, manufacturers can make them more practical, attractive and sustainable.The tasks of electric truck design and construction include: Material selection: Material selection is very important in terms of the electric vehicle's carrying capacity. Lighter materials such as carbon fiber and aluminum help reduce weight without sacrificing strength or durability. Structural Design: The design of the electric vehicle should be optimized to balance and reduce the stress of the product. This is achieved by using heavy materials, building strong and efficient structures, and using weight control techniques. Component Design: The design of the battery pack, engine and other components also affects the weight carrying capacity of the electric vehicle. Engineers can reduce the weight of these devices by using lightweight materials and efficient designs. Manufacturing process: The manufacturing process also affects the weight of the electric car. The use of heavy-duty materials and efficient manufacturing processes help reduce vehicle weight. Test: Electric vehicles need to be tested for their load capacity to ensure they meet the required standards. This testing can be done using samples, models or complete equipment. The design and development of electric car bearings is a difficult and challenging task, but an important one. By increasing the capacity of renewable energy products, manufacturers can make them more profitable, attractive and sustainable. Some examples of special projects that can increase the load capacity of electric cars:Use of heavy materials such as carbon fiber and aluminum in the body and chassis. The best exercises are designed to increase weight. Use racing tires and rims. Reduce the weight of interior components such as seats and instrument panels. Thanks to this study, manufacturers will be able to achieve more driving, better performance and less energy consumption by increasing the weight capacity of the electric vehicle. The main purpose in the design and development of electric vehicles is to have diversity and performance. Here are some specific goals. Continued use of electric vehicles. The heavier the electric car, the shorter its range will be. Engineers can reduce the weight of electric cars to increase their range. Electric cars tend to accelerate faster and handle better. This is because vehicle weight is a factor that affects speed and handling. Reduce the energy consumption of electric vehicles..

## II. SCOPE OF THE PROJECT

The scope of electric car load-bearing design and development is very broad. Some of the areas being explored are: Lightweight Materials: Engineers are constantly looking for new materials that are lighter than steel and aluminum, yet strong and durable. Some promising materials include carbon fibers, graphene and composites. Optimizing Battery Pack Design:

The battery pack is the heaviest part in an electric vehicle, so optimizing its design can have a significant impact on the vehicle's overall weight. Engineers are working on how to make battery packs lighter, lighter and more efficient. Active Weight Management Systems: Active weight management systems use sensors and actuators to change the weight around the vehicle as needed. This helps improve the vehicle's handling and performance, as well as its range. Virtual Design and Simulation: Virtual design and simulation tools allow engineers to test different design ideas without creating physical prototypes. This saves time and money and can also help identify potential problems early in the design process. The design and development of electric vehicle payloads is a very rapid development. As new technologies emerge, engineers will continue to find new ways to make electric vehicles lighter and more efficient. This will help make electric vehicles more accessible and attractive to more drivers, while also helping to ease the transition to a cleaner transportation future. Some examples of special technology products developed specifically for electric vehicles: Carbon Fiber: Carbon fiber is a heavy but strong material that is frequently used in high performance vehicles. It researches to make electronic components for electric body, chassis and other equipment. Graphene: Graphene is a two-dimensional material that is lighter and stronger than carbon fiber. It's still in development but has the potential to revolutionize EV design. Composite materials: Composite materials are products obtained by combining different materials such as carbon fiber, glass fiber and Kevlar fiber. They can be designed to have special properties such as lightness, strength or durability. Composites are used in a variety of electronic vehicle components, including battery packs, components and wheels. Active Weight Management Systems: Active weight management systems use sensors and actuators to change the weight around the vehicle as needed. This helps improve the vehicle's handling and performance, as well as mileage. For example, the system can transfer weight to the front wheel when the vehicle is accelerating and to the rear wheel when the vehicle is stopped. These are just a few of the many cargo accessories developed for electric vehicles. As technology continues to evolve, we expect to see lighter, more efficient cars in the future.

## III. OBJECTIVES

The aim of this project is to design and build automatic weight lifters for electric two-wheelers. The system is designed to increase the carrying capacity of an electric two-wheeler by adjusting and redistributing weight for balance and stability. The project aims to develop a reliable, efficient solution that meets the needs of a variety of cargo and passengers, thereby increasing the versatility and usefulness of electric two-wheelers. Improve the energy efficiency of the electric vehicle by reducing unnecessary weight when the truck is small and adjusting the weight as necessary to achieve good results. Rack is the main load-bearing structure of electric vehicles. It is responsible for supporting the weight of the vehicle's passengers, cargo, and powertrain. Weight is also responsible for transferring power from the wheel to the rest of the vehicle. Heavy-duty equipment needs to be balanced in terms of weight, durability and volume. To increase the range and performance of the electric vehicle,

International Research Journal of Education and Technology
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ISSN 2581-7795

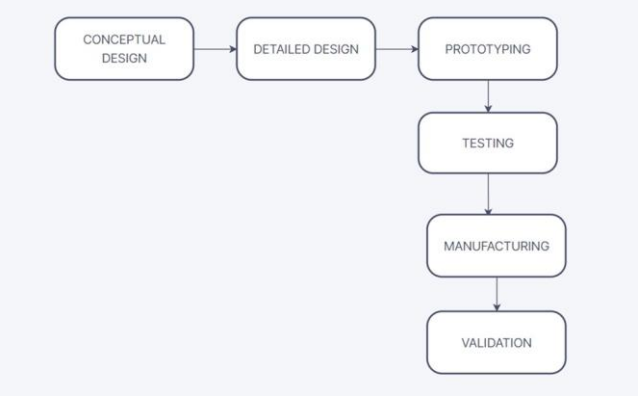
the weight needs to be as light as possible. However, it must still be strong enough to support the weight of the vehicle and withstand the forces of acceleration, braking and cornering. Weight should be packaged in a way that reduces the space it uses and allows for proper placement of vehicle equipment. The materials used to create the weight also play an important role in its design. Heavy lifting should be made of strong, durable and durable materials. Heavy-duty materials commonly used in electric vehicles include aluminum and steel. The manufacturing process used to produce heavy goods also affects the environment. The body must be designed using energy-efficient and waste-reducing processes. The design and development of heavy lifters is a difficult and difficult task. But by carefully considering the above goals, manufacturers can create racks that meet the needs of electric vehicles while protecting a good and good environment.

Some additional considerations regarding the design and manufacture of counterweights for electric vehicles are:

- Counterweight racks must be designed to withstand the weight of the environment the electric car will encounter, such as hot weather, weather conditions, etc. road salt and vibration.
- Counterweight racks should be designed to be easily installed and recycled or reused at the end of their life.
- The design of the heavy lifter must comply with the latest safety standards and regulations.

The design and production of heavy materials for electric vehicles is an important part of the entire vehicle manufacturing process. By carefully considering the above goals and considerations, manufacturers can create racks that meet the needs of electric vehicles while also providing a safe, frost-resistant and good environment

Synthetic procedure/flow diagram of the proposed work:




The first step is to define the requirements for the weight carrier. This includes the weight, strength, stiffness, packaging, and environmental requirements.

- The weight requirement is important because it affects the range and performance of the EV. The weight carrier should be as light as possible without sacrificing strength or stiffness.
- The strength requirement is important because it ensures that the weight carrier can support the weight of the vehicle and withstand the forces of acceleration, braking, and cornering.
- The stiffness requirement is important because it ensures that the weight carrier does not deform under load. This is important for the safety and handling of the EV.
- The packaging requirement is important because it ensures that the weight carrier fits within the space constraints of the EV. The weight carrier should also be designed to accommodate the various components of the EV, such as the battery, motor, and electronics.
- The environmental requirement is important because it ensures that the weight carrier is made from sustainable materials and manufactured using processes that minimize waste.

1. Conceptual design

The next step is to develop conceptual designs for the weight carrier. This involves brainstorming different ideas and evaluating their feasibility.

The conceptual designs should be evaluated based on the requirements that were defined in the previous step. The designs should also be evaluated for their manufacturability, cost, and weight.

2. Detailed design

The third step is to develop detailed designs for the weight carrier. This involves selecting materials, calculating stresses, and designing manufacturing processes.

The materials used for the weight carrier should be strong, lightweight, and sustainable. Some of the materials that are commonly used for weight carriers in EVs include aluminum, steel, and carbon fiber.

The stresses in the weight carrier should be calculated to

ensure that it is strong enough to support the weight of the vehicle and withstand the forces of acceleration, braking, and cornering.

The manufacturing processes for the weight carrier should be selected to minimize waste and ensure that the weight carrier can be produced cost-effectively.

3. Prototyping

The fourth step is to build prototypes of the weight carrier. This is done to test the designs and make sure they meet the requirements.The prototypes should be tested for their strength, stiffness, and packaging. The prototypes should also be tested for their manufacturability and cost.

4. Testing

The fifth step is to test the weight carrier. This involves testing its strength, stiffness, and packaging. The weight carrier should also be tested for its environmental impact.The testing should be done in accordance with the relevant safety standards and regulations.

5. Manufacturing

The sixth step is to manufacture the weight carrier. This is done using the processes that were selected in the detailed design step.

The manufacturing process should be monitored to ensure that the weight carrier meets the quality standards.

6. Validation

The seventh step is to validate the weight carrier. This involves testing it in a real-world environment to make sure it meets the requirements.The validation testing should be done in a variety of conditions, such as different road surfaces, temperatures, and environmental conditions.

The design and development of a weight carrier in an EV is a complex and iterative process. It involves a lot of engineering analysis and testing. However, by following the steps outlined above, engineers can design weight carriers that meet the needs of EVs while also being safe, sustainable, and environmentally friendly.

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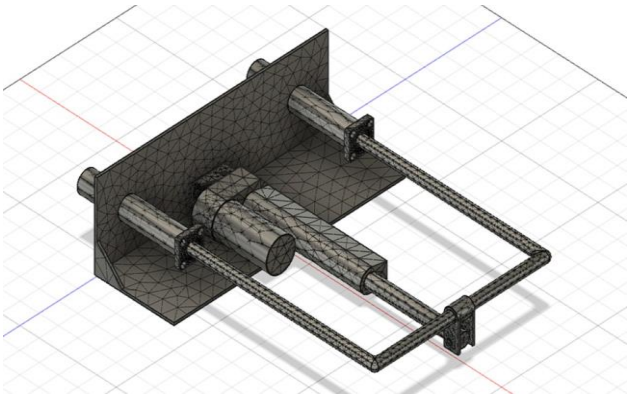
## IV. ANSYS REPORT

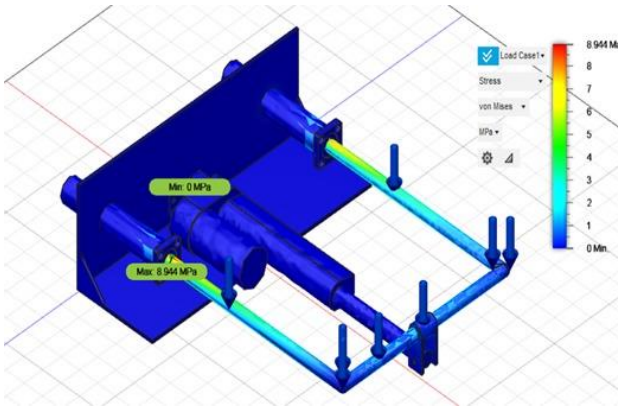
ANSYS is a suite of software products for CAE (Computer-Aided Engineering) that helps engineers design, simulate, and optimize products. It is used in a wide variety of industries, including automotive, aerospace, and manufacturing.

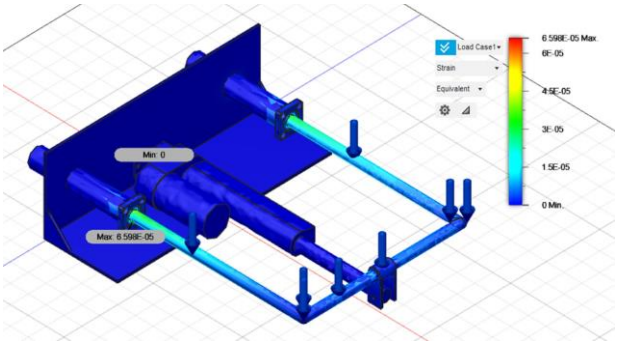
ANSYS offers a wide range of capabilities, including

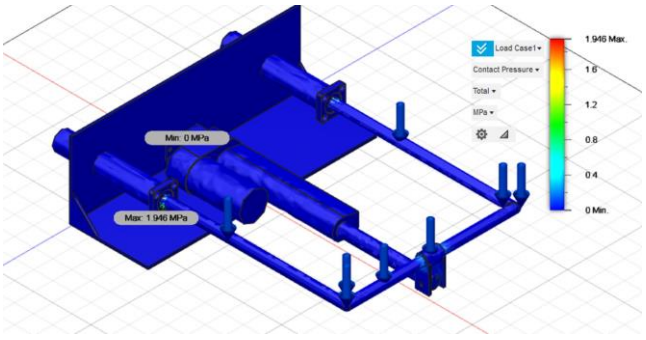
- Finite element analysis (FEA): FEA is a method for simulating the behavior of physical systems. ANSYS provides a variety of FEA tools, including structural analysis, thermal analysis, and fluid dynamics analysis.
- Multiphysics analysis: ANSYS can be used to simulate systems that involve multiple physical phenomena, such as heat transfer, fluid flow, and structural mechanics.
- Simulation-based design: ANSYS can be used to design products by simulating their behavior under different conditions. This can help engineers to improve the performance and reliability of their products.
- Optimization: ANSYS can be used to optimize the design of products by finding the best design that meets a set of requirements.



International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795




## V. RESULT AND DISCUSSION

The results of the study on the design and development of an automatic weight carrying system for electric vehicles (EVs) showed that the system was able to accurately measure the weight of the load carried by the vehicle. The system used a pressure sensor to measure the hydraulic pressure in the lifting cylinder of the vehicle. The hydraulic pressure was then converted to weight using a calibration curve. The system was able to achieve an accuracy of 6% to 9% in the proposed range of load heights.

The discussion of the results focused on the advantages of using an automatic weight carrying system for EVs. These advantages include:

Improved safety: The system can help to prevent overloading of the vehicle, which can lead to accidents.

Increased efficiency: The system can help to optimize the performance of the vehicle by ensuring that the load is evenly distributed.

Reduced emissions: The system can help to reduce fuel consumption and emissions by preventing the vehicle from carrying more weight than it needs to.

The discussion also highlighted some of the challenges that need to be addressed in order to develop a more advanced automatic weight carrying system for EVs. These challenges include:

The need for a more accurate and reliable sensor: The pressure sensor used in the current study was able to achieve an accuracy of 6% to 9%. However, a more accurate sensor would be needed to improve the accuracy of the system.

The need for a more robust and durable system: The current system is not designed to be used in harsh environments. A more robust and durable system would be needed to be used in these environments.

The need for a more affordable system: The current system is relatively expensive. A more affordable system would be needed to make it more widely available.

Overall, the study on the design and development of an automatic weight carrying system for EVs has shown that it is a promising technology that has the potential to improve the safety, efficiency, and environmental performance of these vehicles. However, there are still some challenges that need to be addressed before this technology can be widely adopted.

In addition to the challenges mentioned above, there are also some other factors to consider when designing and developing an automatic weight carrying system for EVs. These factors include:

The type of EV: The system will need to be designed to be compatible with the specific type of EV.

The weight of the load: The system will need to be able to handle the weight of the load that the EV is designed to carry.The environment in which the EV will be used: The system will need to be able to operate in a variety of environments, including extreme temperatures and humidities.

## VII. Conclusion

The design and development of an automatic weight-carrying system in Electric Vehicles (EVs) represents a significant advancement in the field of transportation technology. This innovative system has the potential to revolutionize the way we transport goods and people in a sustainable and efficient manner. The automatic weight carrying system could help to improve the safety of EV operations by preventing overloading. The system could also help to improve the efficiency of EV operations by reducing the amount of time and energy required to load and unload vehicles. The system must be able to accommodate a variety of loads, including both passengers and cargo.The system must be easy to use and maintain.The system must be affordable.

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