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DESIGN AND DEVELOPMENT OF SOLAR EQUIPPED MULTIPURPOSE ELECTRIC VEHICLE

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Abstract -

This project aims to design and develop an electric vehicle that is equipped with solar panels to improve its energy efficiency and sustainability. The vehicle will be powered by an electric motor and a rechargeable battery, which can be charged by both the solar panels and an external power source. The solar panels will be integrated into the roof and body of the vehicle, and will generate electricity from sunlight to supplement the battery's charge. The project will also focus on optimizing the vehicle's aerodynamics and energy management system to maximize its efficiency and range. The final product will be a prototype electric vehicle that demonstrates the potential of combining solar power with electric mobility for sustainable transportation.

Keywords: Solar Energy, Electric vehicle, battery development, cruise control, etc.

1. Introduction

The global challenge of greenhouse gas emissions and the depletion of natural fossil fuels has grown recently. We currently rely on energy produced from Earth-based resources like petrol, diesel, natural gas, etc. As we run out of these non-renewable sources of energy, especially in the field of automotive engineering, we should look for alternatives for internal combustion engine vehicles. Since these non-renewable sources of energy won't last forever and we are already beginning to run out, we should look for renewable sources of energy. Due to the gas emissions they produce, internal combustion engines have a number of issues that have an impact on the environment [1]. The increase in internal combustion engine vehicles is to blame for a 23% increase in the amount of air pollution that is warming the planet as a result of pollutants from cars.

Electric vehicles (EVs) are becoming increasingly popular as an environmentally-friendly and sustainable mode of transportation. The need for clean energy and the reduction of greenhouse gas emissions have led to a surge in the development and production of electric vehicles. EVs are powered by electricity stored in rechargeable batteries, and they produce no emissions when they are driven, making them an attractive alternative to traditional gasoline-powered cars.

The purpose of this project is to investigate the feasibility of introducing electric vehicles into the market, analysing the environmental, social, and economic benefits of such a move. The project will examine the current state of the electric vehicle industry, including the technology used, manufacturing processes, and the availability and distribution of charging infrastructure.

2. Objectives

1. To lessen the need for oil and the quantity of carbon dioxide that automobiles produce.

2. To entirely eliminate dependence on fossil fuels by using solar panels as a backup power source that can charge batteries while parked in the sun.

3. To add solar panels to electric vehicles in order to boost their mileage rate.

3. Literature Review

Electric vehicles (EVs) have become increasingly popular due to concerns about environmental pollution and oil scarcity. However, their reliance on electricity from the grid means that they are not entirely clean energy vehicles. Solar-powered electric vehicles (SPEVs) are an innovative solution that integrates solar panels with EVs to create a sustainable and clean mode of transportation. This literature review aims to explore the current research on SPEVs and their potential advantages and limitations.

Research on SPEVs is ongoing, and there have been several notable studies in recent years. Gopalakrishnan et al. (2018) conducted a study on the potential of SPEVs in India, using simulations to determine the optimal design and performance of a SPEV. They found that SPEVs have the potential to be a cost-effective and sustainable transportation option in India. Another study by Li et al. (2020) focused on the optimization of solar panel integration in EVs to improve their energy efficiency. They proposed a new design that integrated flexible solar panels into the roof and hood of the vehicle, which increased the energy output and reduced the weight of the solar panel system.

With the increasingly severe environmental problems around the world, exploitation of clean and renewable energy has been a crucial topic. As indispensable transportation in modern society, vehicles are ubiquitous but also one of the main sources of pollutants. Because of their status, it is almost impossible to decrease the volume of vehicles. One solution to lowering emissions is the electric vehicle. Overall, the electric vehicle is more energy efficient, environmentally friendly, and cleaner than the vehicle that relies on fossil fuels. [1] An electrically powered vehicle has essentially three major electrical components. These include energy source (usually are chargeable battery bank), an inverter or, motor controller and an electric motor. In the case of a solar car, the energy source is typically a bank of batteries, which may be recharged by photovoltaic solar panels. The motor controller is typically a power electronics device which when supplied with the driver's input commands, controls the torque and speed of the electric motor [2].

1. Mr. Yathisha L, Shabaz Ahmed Khan, Ganesh P, Ajay S N and Sathish N., **"ECO-FRIENDLY CAR USING SOLAR AND ELECTRICAL ENERGY,"** International Research Journal of Engineering and Technology (IRJET).In this research paper, "The major goal of this project is to create an entirely eco-friendly, solar and electrically driven vehicle that doesn't release any hazardous gases into the atmosphere. the general public on alternative energy and its uses, as well as to construct a workable solar- and electrically-powered car that uses a dynamo to recycle the electricity and might be used in the real world as technology progresses. This project is very keen to innovate and make use of regional technology and resources. Since petrol and diesel are not needed, it uses the abundant solar energy found in nature, and it also uses the efficient dynamo to regenerate energy".

2. Gangesh Shukla, Karmit Raval, Dhruvi Solanki, Urvashi Patel, Dhaval Dave, **"A study on Campus-Friendly Solar Powered Electric Vehicle,"** International Research Journal of Engineering and Technology (IRJET). In this research paper. "The goal of this study is to develop and build a less expensive solar-powered car. According to a performance study, a storage system can power a solar car for around 12 kilometres. The solar vehicle's top speed has been determined to be 20 km/h. Therefore, because it is less expensive and has no environmental

impact, the solar-powered vehicle that was designed and built in this study can be used as a green vehicle in developing nations".

3. Mohammad Aadil Shaikh **"Design of an Electric Golf Cart with Batteries & Solar Panel for 6 Seat Capacity,"** International Research Journal of Engineering and Technology (IRJET). In this research paper, "The design of the electric golf cart was the result of extensive market research, which produced positive outcomes. Lead acid batteries, which cannot be discharged below 50% for long-term, high-quality use, provide a great range of 37 km, which was further enhanced by 12 km with the installation of two solar panels. The vehicle's entire performance, including its speed, stopping distance, and turning radius, met the pre-determined anticipated parameters".

4. Mohamed El-Semary, Mahmoud Hamdy, Mohamed Khaled, Mohab Mohamed, **"Development of a light solar-powered electric vehicle"** 5th IUGRC International Undergraduate Research Conference, Military Technical College, Cairo, Egypt, Aug 9th – Aug 12st, 2021. In this research paper, "Creating an unmanned solar-powered electric vehicle for surveillance and reconnaissance was the goal of this study. A case study based on a golf cart that is now on hand at the military technical college's automotive department was presented. Its specs were evaluated and utilised as a standard. The efficiency of the cart in terms of weight and operation time was continuously improved through a number of design iterations. A new design was developed that took advantage of covering the exterior in flexible solar panels and swapping out the heavy, inefficient electric batteries for lighter ones. Range increased by 34% as a result of this".

5. Harin M Mohan , Akash M Nair , Akhil B Chandran , Anuraj P , Aromal B Chandran, **"Solar Powered Plug-in Electric Vehicle,"** International Journal of Engineering Research & Technology (IJERT). In this research paper, "It is imperative to move to a new source of energy, namely solar power, which would be a cheap, efficient, inexhaustible, and of course environmentally benign alternative to meet the rising fuel demands and the catastrophic environmental pollution caused by driving carbon-based automobiles. Electric cars driven by solar energy are safe because they don't have hot exhaust systems or volatile fuel. They produce no emissions and are also odourless, smokeless, and silent. They are easier to maintain, have fewer or no moving components, and can be efficiently charged almost anywhere. The end users of the solar-powered EV, such as industries, college campuses, and theme parks, would benefit from them. The SPEV's technological components enable green mobility".

6. V. Naveen Prabhu1 and N. Manigandan, **"Design and Fabrication of Solar Transport Vehicle,"** IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE). In this research paper, "After much debate and input, a series-parallel hybrid system was chosen. In order to properly operate this technology, calculations were used to determine how best to use solar energy, and a panel was ultimately chosen. The backup source for the motor power is estimated based on the panel that was used and that powered the motor. Finally, a controller and battery are employed. The car would be designed with a new, successful hybrid gearbox system from all the choices stated above. One to two hours every day would see the car powered by solar energy. As a result, urban areas would experience a 30% reduction in air and noise pollution".

7. Mohamed M, G Tamil Arasan and G Sivakumar, **"Study on Electric Vehicles in India Opportunities and Challenges,"** International Journal of Scientific Research in Environmental Science and Toxicology In this research paper, "The Indian Government's vision 2030 is an ambitious and challenging task, and the Government should make the most out of the opportunities available and find appropriate ways to tackle the challenges impending over the implementation of EVs. India's obligation towards many environment friendly agreements has given it a situation where it is prompting the implementation of EVs".

8. Ella Seshu, B. Vamshi Yadav, M. Sai Durgesh, P. Durga Prasad **"Design and Fabrication of Portable Electric Vehicle,"** International Research Journal of Engineering and Technology (IRJET). With the use of this research paper, we are able to develop an EV that might be the answer to the issues we currently face, such as traffic, pollution, parking issues, and a host of others. We develop a novel concept for a portable electric vehicle, stimulating interest in the use of electric vehicles.

9. Arulious Jora A, Earlina D , Harish D , Sakthi Priya P , Inba Rexy A , Nancy Mary J S **"Design of Solar Powered Electric Vehicle,"** Journal of Physics: Conference Series. In this research paper, "The use of these cars in developing nations is made possible and practicable by the results that have been provided as well as the design for a solar-powered vehicle. The PMDC motor-equipped solar-powered electric car is a wise choice for the Indian market. The solar-powered electric car excels in terms of safety, performance, and cost effectiveness. The effectiveness of the power system in a vehicle is increased by the use of a charge controller and speed controller. Future generations may want to consider the eco-friendly solar-powered electric vehicle that has been offered"

10. P. O. Babalola, O. E. Atiba **"Solar Powered Cars – A Review,"** International Conference on Engineering for Sustainable World (ICESW 2020). In this research paper, "Since more than 10 years ago, solar cars have been able to reach speeds of 80 km/h on average. So, the question would be why one needs a 2500 kg vehicle powered by dirty fuels to travel to and from work each day. The key challenge with the solar car is how to use high-efficiency PV cells on a vehicle that weighs less than 300 kg and still achieve high motor output and good aerodynamic efficiency. Solar automobiles would soon become commonplace with effective batteries and energy management techniques. The shift from solar vehicle prototyping to commercial transportation may be aided by rising gasoline prices and breakthroughs in photovoltaic technology".

4. Conclusion

In conclusion, incorporating electric vehicles (EVs) with solar panels can have numerous benefits. Both technologies are environmentally friendly and help to reduce greenhouse gas emissions. Solar panels can produce renewable energy to charge EVs, which in turn reduces our dependence on fossil fuels. This can also help reduce the cost of transportation over time, as EVs are generally cheaper to operate and maintain than traditional gasoline-powered vehicles.

References

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