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Design of Electric Vehicle by Using Renewable-Energy Sources

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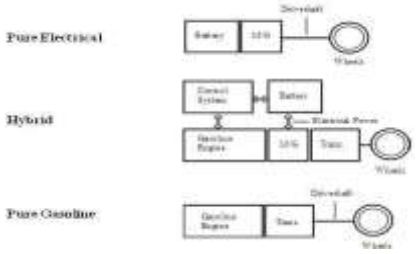
ABSTRACT

The ever-rapidly growing transportation sector consumes about 49% of oil resources. Following the current trends of oil consumption and crude oil sources, the world's oil resources are predicted to be depleted by 2038. Therefore, replacing non-renewable energy resources with renewable sources and use of suitable energy saving technologies seems to be mandatory. Electric vehicles (EVs) as a potential solution for alleviating traffic related environmental problems have been investigated and studied extensively. Compared to ICEV, the attractive features of EVs mainly are the power source and drive system. Electric vehicles (EVs) have been researched extensively as a promising way to reduce the greenhouse effect. This vehicle also provides a safe driving experience to a driver with a disability.

Index terms: Fossil fuels, renewable energy sources (wind energy), battery energy storage system, hybrid vehicle.

Introduction: An electric vehicle is one powered by an electric motor rather than a traditional petrol/diesel engine. This electric motor is powered by rechargeable batteries that can be charged by common house hold electricity. Consistent with the definition of hybrid above, the hybrid electric vehicle combines a gasoline engine with an electric motor. An alternate arrangement is a diesel engine and an electric motor, a HEV is formed by merging components from a pure electrical vehicle and a pure gasoline vehicle. The Electric Vehicle (EV) has an M/G which allows regenerative braking for an EV; the M/G installed in the HEV enables regenerative braking. For the HEV, theM/G is tucked directly behind the engine. In Honda hybrids, the M/G is connected

directly to the engine. The transmission appears next in line. This arrangement has two torque producers; theM/G in motor mode, M-mode, and the gasoline engine. The battery and M/G are connected electrically.An electric scooter is a battery-operated one-person capacity vehicle that is specially designed for people

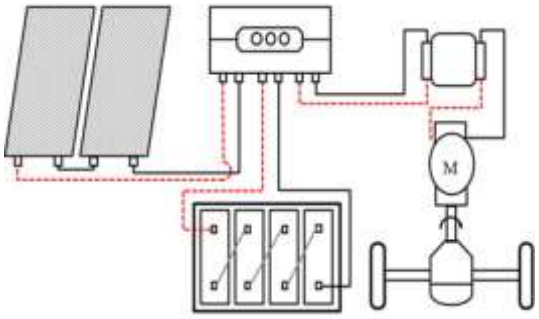


with low mobility. It is generally used by those who have difficulty walking for long periods. Scooters are available in three common designs, those intended for indoor use, those for outdoor use, and those that are used for both. An electric scooter may have three or four. Since it runs on battery power, it does not create pollution. The servicing requirements for electric vehicles are lesser than conventional petrol or diesel vehicles. Therefore, the yearly cost of running an electric vehicle is significantly low. So, behalf of these advantages, we have chosen this project.

The above information and introduction, working principle gathering from the above two references

Methodology and working principle

Block diagram



Vehicle block diagram

The research methodology is carried out based on the following:

Information gathering: The information for this exploration is accumulated through the audit of existing reports on Electric Vehicle, uses and sorts of sun based, wind, and programmed slowing mechanism, and the monetary significance of electric vehicles through looking through books, articles, diaries, and producer sites and furthermore space master was evaluated to figure out how things are as of now finished.

Data Analysis: Data analysis is done through a feasibility study to determine if this project work is worth doing and how to do this task at a sensible expense. This assisted in this undertaking in view of with costing, dependability, similarity, and accessibility rules. Specialized, financial, and functional practicality questions were tended to.

Coding:

TheArduinoboardwouldbecodedusingtheArduinoIDEwhichisbasedonCprogrammingto drive theArduino microcontroller and controls the two-way DC Converterandsendsthespeedcomparisonsignal tothe frequencyconverter.Furthermore,electricalandmechanicalparameterssuchasvoltage,current,andspeed have been noticed.

Testing:

Bothunitandsystemtestingwouldbeperformedtoensuretheproperfunctioningof the equipment parts and programming of the framework.

Solar panel

The term sunlight powered charger is best applied to a level sun based warm gatherer, for example, a sun powered boiling water or air board used to warm water, air, or generally gather sun based nuclear power. However, 'sunlight powered charger' may likewise allude to a photovoltaic module which is a gathering of sun-oriented cells used to produce power. In all cases, the boards are regularly level, and are accessible in different levels and widths an exhibit is a get together of sunlight based warm boards or photovoltaic (PV) modules; the boards can be associated either in equal or series relying on the plan objective. Sunlight based chargers normally track down use in private, business, institutional, and light modern applications. Sun-powered warm boards saw far- reaching use in Florida and California until the 1920s when tank-type water radiators supplanted them.

Solar panel

No one the less, sunlight- based warm boards are still under way, and are normal in bits of the reality where energy costs, and sun-oriented energy accessibility, are high.

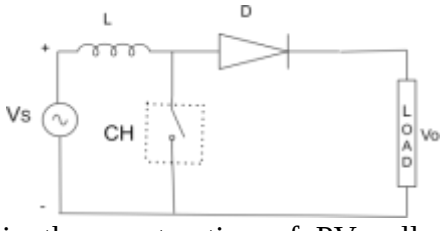
PV module production on a large scale has recently grown in popularity. In regions of the planet with fundamentally high in isolation levels, PV yield and their financial aspects are upgraded.PV modules are the essential part of most limited-scope sun-based electric power- producing offices. Bigger offices, for example, sun-oriented power plants ordinarily contain a variety of reflectors (concentrates), a beneficiary, and a thermodynamic power cycle, and in this manner utilize sun-based warm as opposed to PV.

DEFINITION

*"*A photovoltaic framework is a framework that utilizes at least one sunlight-powered charger to change sun- oriented energy into power. It comprises numerous parts, including the photovoltaic modules, mechanical and electrical associations and mountings, and method for controlling and additionally altering the electrical result"

PHOTOVOLTAICCELL

Silicon and other semiconductors are used



in the construction of PV cells. For sun-based cells, as lender semiconductor wafer is uniquely treated to frame an electric field, positive on one side and negative on the other

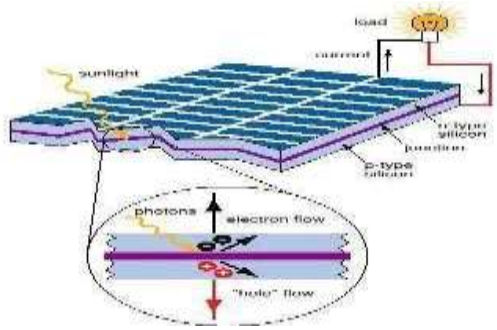


Photo voltaic cell

At the point when lighten energy strikes the sun-powered cell, electrons are thumped free from the molecules in the semiconductor material. Assuming electrical conveyors are appended to the positive and negative sides, shaping an electrical circuit, the electrons can be caught as an electric flow-that is, power. This power can then be utilized to drive a load. A PV cell can either be round about or square in development

DC to dc converter

A DC-to-DC converter is a gadget thatacknowledgesa DCinputvoltage andproducesaDCyieldvoltage.Regularly, Theresultdeliveredisatanalternatevoltage level than the info. Also, DC-to-DCconvertersareusedtogivecommotionseclusion,powertransportguideline,and soon.

Boost converter –step up converter

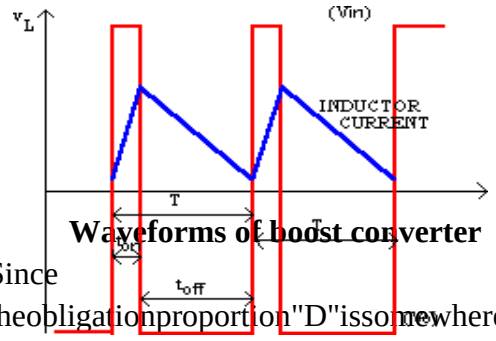
Boost converter schematic diagram

fundamental lift converter. This

circuit is utilized whenahigherresultvoltagethaninputis required.

WhilethesemiconductorisONVx=Vin ,and the OFF express the inductor currentmoves through the diode giving Vx =Vo.For this examination it is expected thattheinductorcurrentgenerallystaysstreaming(ceaseless conduction).Thevoltageacrosstheinductorandthetypicalshouldbezeroforthetypicalcurrentto stayingconsistentstate. This can be modified and for a losslesscircuitthepowerbalance guarantees

Voltageandcurrentwaveforms(BoostConverter)



Waveforms of boost converter

Since theobligationproportion"D"issomewhere in the range of 0 and 1 theresultvoltageshouldcontinuouslybehigher than the info voltage in size. Thenegative sign demonstrates an inversionofthe feeling oftheresultingvoltage

Materials and model

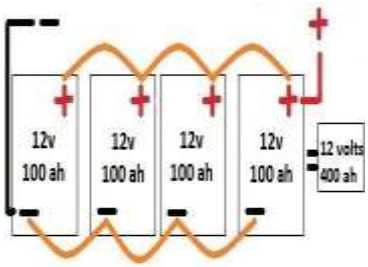
Battery

A rechargeable battery, storage battery, or accumulator is a type of electrical battery. It comprises one or more electrochemical cells and is a type of energy accumulator. It is known as a Secondary cell because its electrochemical reactions areelectrically reversible. In this project, we are using a12v, 7A1ed dry acid battery.

Rechargeable battery

The most commonly used for batteries type was in the past, the lead- acid battery. For its use of low price per storable energy quantity, the achievable maintenance, the low self-discharge and the relatively high efficiency of about 80% spoke. The losses in lead-acid batteries can be explained in part by the out gassing of hydrogen –oxygen during charging. With maintenance-free lead-acid batteries the gas emissions are reduced. They are optimized for a particularly long service life, cycle stability and behavior at low discharge. Typical are numbers of cycles of 1200 {with a depth of discharge of about 80%} residual

capacity of 80%, since then a battery is considered defective from, maintenance-free lead acid batteries have the advantage that there are no or only forms a minimum stratification she sure but allow only a much smaller number of cycles from 400 to 600. An additional circulation of acid prevents completely stratification and the lead-acid batteries. This is especially important in



stationary operation.

battery bank

Lithium-ion batteries are also used recently as a solar battery, which is due to sharp fall in prices of lithium-ion batteries in addition, lithium-ion batteries have some very high cycle stability of more than 10,000 charge and discharge cycles and a long service life of up to 20 years. In particular, lithium iron phosphate batteries are used which, and by a high cycle stability, high security small price excel and come as traction batteries for use. Partly also used batteries are used, which no longer have enough capacity for other applications for example, peddle or electric cars, as solar battery, but still suffice.

D.C Motor:

The DC motor has two basic parts: the rotating part called the armature and the stationary part that includes the wire coils. Thestationarypartisalsocalledthestator.Figureshowsapictureofa typicalDC Motor,24V,250W DC Motor is used.

A brushless DC motor (known as BLDC) is a permanent magnet synchronous electric motor which is driven by direct current (DC) electricity and it accomplishes electronically controlled commutation system (commutation is the process of producing rotational torque in the motor by changing phase currents through it at appropriate times) instead of a mechanically commutation system. BLDC motors are also referred as trapezoidal permanent magnet motors.

Unlike conventional brushed type DC motor, wherein the brushes make the mechanical contact with commutator on the

rotor so as to form an electric path between a DC electric source and rotor armature windings, BLDC motor employs electrical commutation with permanent magnet rotor and a stator with a sequence of coils. In this motor, permanent magnet (or field poles) rotates and current carrying conductors are fixed

Final results

Energy Generation: Solar panels on the vehicle's surface capture sunlight and convert it into electricity, which can be used to charge the battery or power auxiliary systems. Wind turbines, if integrated, harness airflow during vehicle movement to generate electricity. Regenerative braking captures kinetic energy during braking and converts it into electrical energy.

Range Extension: Solar power and regenerative braking help extend the vehicle's range by continuously generating electricity during operation. Solar panels can charge the battery while the vehicle is parked or in motion, while regenerative braking recovers energy that would otherwise be lost during braking.

Efficiency: integrating renewable energy source and regenerative braking enhances the overall efficiency of the vehicle. It reduces energy consumption and reliance on external charging infrastructure, making electric vehicles more self-sufficient and sustainable.

Environmental impact: By utilizing renewable energy sources and reducing energy waste through regenerative braking, electric vehicles with these technologies have a lower carbon footprint compared to conventional vehicles. They help mitigate air and noise pollution, contributing to a cleaner and healthier environment.

Cost Considerations: While the initial investment in integrating these technologies may be higher, they offer long-term cost savings through reduced fuel or electricity consumption and lower maintenance requirements. Over the vehicle's lifetime, the cost of ownership may be lower compared to conventional vehicles.

Practicality and Implementation: The practicality of integrating solar power, wind power and regenerative braking depends in various factors such as vehicle design, efficiency or energy conversion, available space for installation, and technological advancements. Manufacturers need to balance these considerations to ensure safety, performance and feasibility.

Infrastructure and Support: Adoption of these technologies may require supporting infrastructure such as charging stations equipped with renewable energy sources.

Government incentives, policies and infrastructure development play a crucial role in promoting the adoption of electric vehicles with integrated renewable energy systems.

Conclusion

In conclusion, integrating solar, wind and regenerative braking technologies into Electric Vehicles (EVs) offers a compelling solution to enhance efficiency, sustainability and overall performance. By harnessing renewable energy sources and optimizing energy usage, these advanced systems contribute to reducing greenhouse gas emissions, minimizing reliance on non-renewable resources and lowering operational costs.

Solar panels mounted on the vehicle's surface, coupled with wind turbines strategically positioned to capture airflow, provide supplementary power generation, extending the vehicle's range and reducing the need for external charging. Additionally, regenerative braking systems enable the recovery of kinetic energy during deceleration, further improving energy efficiency and enhancing driving dynamics.

This innovative approach not only aligns with global efforts to mitigate climate change but also delivers tangible benefits to consumers, including reduced fuel expenses, increased autonomy, and a reduced environmental footprint. However, challenges such as cost-effectiveness, limited scalability and variability in renewable energy availability remain to be addressed to realize the full potential of these technologies.

Overall, the integration of solar, wind and regenerative braking systems represents a significant step forward in advancing the sustainability and performance of Electric Vehicles, driving us towards a cleaner, greener transportation future. Continued research, development and adoption of these technologies are essential to unlock their full potential and accelerate the transition to a more sustainable ecosystem.

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