

Design and Analysis of Hybrid Solar Vehicle

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Abstract:

Conventional combustion engine vehicles are very much responsible for various kinds of pollutions in current decade due to emission of Green-house gases. To control the problem of pollution occur by Combustion engines and also reduce the effect of Global warming, renewable energy sources are come in picture. Various kind of renewable energy sources are used for domestic as well as industrial applications. In Asian Countries Solar energy is accomplished in very large amount. To overcome the disadvantages of Conventional combustion engine vehicles this research introduced Hybrid Solar Vehicle. Hybrid Solar Vehicle is performs on the principle of Photovoltaic Solar Cells. Sunlight or Solar energy is directly converted into Electrical energy by using Photovoltaic cells for displacement of vehicle. Lithium-ion batteries are used in this future designed Hybrid vehicle for storing the Electric Power which is generated from Photovoltaic Cells. This future designed vehicle is more efficient in the manner of Green-house gases emission.

Keywords: *Electrical Energy, Hybrid Vehicles, Less Emission Vehicles, Photovoltaic Principle, Solar Energy.*

Introduction

Internal Combustion Engines produced maximum Power Output and also they give good number in fuel efficiency, but Internal Combustion Engines fails to overcome the emission control of Green-house gases due to use of Crude Oils as fuel. This research is introduced Hybrid Solar Vehicle for overcome the disadvantage of Internal Combustion Engines. In this newly future designed Hybrid Solar Vehicle Concentrator Photovoltaic System is used with the assist of Lithium Ion Batteries for using Solar Energy in the form of Electrical Energy (Conversion of Solar Energy into Electrical Energy).

Concentrator Photovoltaic System

Hybrid Solar Vehicles performs on the basis of Concentrator Photovoltaic Principle. Concentrator Photovoltaic System uses Lenses or

Curved Mirrors and Solar Tracker to focus large area of Sunlight onto Small Multi Junction Solar Cells. Small Multi Junction Solar Cells converts maximum amount of Solar Energy into required Electrical Energy.

Advantages of Concentrator Photovoltaic System or Hybrid Solar Vehicle are:

1. The Green-house gas emissions of Solar Power (Hybrid Solar Vehicles) are in range of 22 to 46 grams per Kilowatt-hour depending on Solar Energy System analyzed.
2. Time required to generate amount of energy, which was consumed during Production and Operation of system is minimum for Hybrid Solar Vehicle.
3. Concentrator Photovoltaic System optimized maximum amount of solar energy to convert it into required electrical energy.

Lithium Ion Battery

Lithium ion batteries or Lithium ion battery packs are used in this future designed Hybrid Solar Vehicle because of their tendency of:

1. Higher Power Density.
2. Longer Life Span.
3. Higher Energy Density.
4. Better Safety, Durability, Thermal Breakdown and Cost.

Instead of single large battery using Pack of Lithium ion batteries in this future designed Hybrid Solar Vehicle reduce mass of vehicle because Lithium ion batteries are very light weight as compared to conventional Lead Acid batteries, and that reduction of mass gives better result in overall Vehicle Efficiency.

Note: For safety and efficiency Lithium ion batteries should be used within safe temperature and safe voltage ranges.

Literature Survey

1. **Video Documentary on Mega Kitchen India (Shirdi, Maharashtra, India) posted by National Geography on Social Networking site YouTube**

This video documentary is describes the Concentrator Photovoltaic Kitchen. Thermal Concentrator Photovoltaic System is introduced by Shirdi Kitchen for preparation of *Mahaprasada* . Curved Mirrors are used for focusing Solar Energy on Boilers and by using steam which is generated inside the boilers Shirdi Kitchen prepare their *Mahaprasada*.

2. **Review Paper of Solar Powered UAV by Gaurav Kumar, Shubham Sepat, Shubham Bansal**

Vivekanand Institute of Technology, Jaipur, Rajasthan

Gaurav Kumar, Shubham Sepat, Shubham Bansal present their review paper on the topic of Solar Powered UAV. They conclude that alternative source of energy

is needed for any kind of transportation system. They prefer solar energy for UAV (Unmanned Aircraft Vehicle) for internet facility.

working principle

The Concentrator Photovoltaic System concentrates Sunlight onto the Multi-Junction Solar Cells or simply Photovoltaic cells by using Energy Tracker or Solar Tracker.

Lenses or Curved Mirrors

Lenses or Curved Mirrors are used for focusing Sunlight onto the Multi-Junction Photovoltaic Cells Surface. This Lenses or Curved Mirrors which are used in Concentrator Photovoltaic System are worked on the basis of Reflection and Refraction theory of Light. Sunrays reflected from Lenses or Curved Mirrors are focusing onto the surface of Multi-Junction Solar Cells or Photovoltaic Cells for further conversion of Energy.

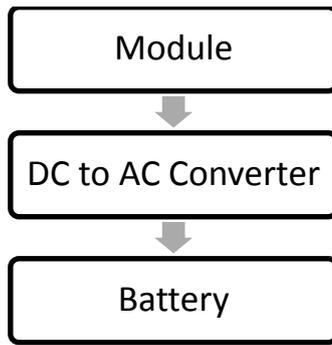
Solar Tracker

Solar Tracker is a device which track the direction of Sunlight as per location of Sun in sky and adjust the Lenses or Curved Mirror that used in Concentrated Photovoltaic System in the direction of Sunlight, so the large area of Sunlight concentrated onto Multi-Junction Photovoltaic Surface for converting more Solar Energy into Electrical Energy.

Multi-Junction Solar Cells

Multi-Junction Solar Cells are used in this future designed Hybrid Solar Car for utilized maximum amount of Solar Energy that concentrated on this Multi-Junction Solar Cells for converted into required amount of Electrical Energy on the theory of Photovoltaic Principle.

General Schematic Diagram for Concentrator Photovoltaic System



Module is nothing but Concentrator Photovoltaic System including:

1. Lenses or Curved Mirrors.
2. Solar Tracker.
3. Multi-Junction Solar Cells.

DC to AC Converter converts required conversions for operation of Hybrid Solar Vehicles.

Batteries are nothing but Pack of Lithium Ion Batteries.

Further required processes for performance of vehicle are done by various kinds of Electric Motors as per Requirement or Purpose of Vehicle.

Electric Motors are driven by Electrical Energy that comes from Pack of Lithium Ion Batteries.

For smooth operation while driving the vehicle Lithium Ion Batteries are also charged by using rotation of wheels of vehicles.

And there is charging slot is also provided for Lithium Ion Batteries for performance of vehicle.

Conclusion

Concentrator Photovoltaic System uses Solar Energy for operating this future designed Hybrid Solar Vehicle instead of conventional Internal Combustion Engine.

From various researches and practical studies it is conclude that:

1. Emission of Green-house gases is very low because of using Solar Energy as well as

Electrical Energy for performing Vehicle on roads.

2. Time for Energy Regeneration is comparatively reduced with conventional vehicles.
3. Cadmium emission is almost zero as thin layer of Cadmium is used as buffer in this newly designed Concentrator Photovoltaic System.
4. Neglecting Internal Combustion Engine, show better number in overall maintenance of vehicle.
5. Lithium ion batteries helps vehicle to enhance its own Life span.

References

1. Video Documentary on Thermal Concentrator Photovoltaic Kitchen of Shirdi, Maharashtra, India. Posted by National Geography Chanel under the section of Mega Kitchen, India on Social Networking site YouTube.
2. Review Paper on Solar Power UAV by Gaurav Kumar, Shubham Sepat, Shubham Bansal. International Journal of Scientific & Engineering Research, Volume 6, Issue 2, February 2015 ISSN 2229-5518