



# INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

## SOLAR POWERED CARS.

T.S.Dankhade<sup>1</sup>, K.S.Dankhade<sup>2</sup>, T.A.Kazi<sup>3</sup>, A.A.Gophane<sup>4</sup>

<sup>1</sup>UG Student, Civil Department, JDIET Yavatmal, Maharashtra, India, [kajaldankhade2000@gmail.com](mailto:kajaldankhade2000@gmail.com)

<sup>2</sup>UG Student, Electrical Department, JDIET Yavatmal, Maharashtra, India, [tejaldankhade1998@gmail.com](mailto:tejaldankhade1998@gmail.com)

<sup>3</sup>UG Student, Chemical Department, JDIET Yavatmal, Maharashtra, India, [kazitarique121@gmail.com](mailto:kazitarique121@gmail.com)

<sup>4</sup>Asst Professor, Electrical Department, JDIET Yavatmal, Maharashtra, India, [akashgophane@gmail.com](mailto:akashgophane@gmail.com)

### Abstract

Solar car can be categorized as a green vehicle which is powered by renewable energy with zero carbon emission. Huge numbers of solar race events conducted around the world has propelled the rapid development of solar cars by various research teams. Such events have become the platform for private companies to showcase their latest technologies and findings in utilising solar energy to drive vehicles. Solar car development cost has been observed to increase significantly over the years with most teams having the sole aim of winning the race at all costs, instead of producing a practical solar car suitable for everyday use.

The name itself suggests in this the energy of sun will be utilized to charge the batteries and run the car, with this we have tried to marvel the engineering in electrical and automobile sector by using the energy of sun in a beautiful technical manner. Using this technique, we have somehow tried to overcome the demerits of the conventional electric cars in the market and make the car consumer friendly. Electric cars are one of the most effective alternate for the conservation of energy which make our environment greener and also to reduce the load of pollution from earth. The only thing which we have to do is to make our cars more user and environment friendly.

**Index Terms:** Energy, Conventional, Non-Conventional, Solar energy, car, etc.

\*\*\*

## 1. Introduction

An electric car is a plug-in electric automobile which is propelled by numbers of electric motors using energy typically stored in the form of rechargeable batteries.

Electric cars run at least partially on electricity. In case of conventional vehicles there is use of gasoline or diesel-powered engine where as, electric cars and trucks use an electric motor powered by electricity from batteries or a fuel cell. Looking towards air pollution and greenhouse gas emissions, electric cars and trucks are often cleaner than the most efficient conventional vehicles. A solar car characteristic depends on the type of vehicle and the source of the electricity. When battery electric EVs are powered by the cleanest electricity grids then greenhouse gas emissions from EVs are comparable with a car getting over 100 miles per gallon. When it is charged exclusively with renewable electricity like solar or wind charging and operating an EV can be almost emission free.

### 1.1 Solar powered electric cars

Solar Powered Electric Vehicle is significantly designed for reducing our dependence on fossil fuels and is the natural evolution of our energy infrastructure. Powering plug-in electric vehicle (PEV) or plug-in hybrid electric vehicle (PHEV) provides much substantial savings over purchasing gas. Consumer incentives are also making the purchase of an electric vehicle and home fast-charging station which is more affordable and attractive.

The solar-powered electric vehicles which utilises the sun's energy to run the automobile. A solar car is just like any other 4-wheeler apart from the powertrain of the former uses sunlight to power the electric motor, In the case of latter, which is fully dependent upon liquid fuel. As such vehicles make use of sun's energy; these are much more clean and mild in terms of emission and are safer to the environment. Such eco-friendly cars are being designed and put into production by various auto giants of the world. Almost all the major auto brands have recognised the need to produce a green car, which not only provides zero emissions but also scores high on mileage scale. However, most of the general public is still unaware about how a solar car works and what all are the procedures involved in it.

## 2. Forms of Energy

Energy is the ability or capacity to perform any type of work. Unit of Energy is Joules. As energy is defined via work, the SI unit for energy is the same as the unit of work – the joule (J), named in honour of James Prescott Joule and his experiments on the mechanical equivalent of heat. In more fundamental terms, 1 joule is equal to 1 newton-metre and, in terms of SI units,

$$1 \text{ J} = 1 \text{ kg(m/s)}^2 = 1 \text{ kg.m}^2/\text{s}^2$$

On the basis of exhaustibility, resources are classified as Renewable and Non-renewable. These forms of energy resources are explained as below:

### 2.1 Renewable Energy

Renewable energy is any natural resource that can replace itself dependably and quickly. These energy sources are plentiful, sustainable and environmentally-friendly – making them a superior choice for us humans and our globe!

Disparate fossil fuels, renewable energy sources won't ever run out, as they are constantly replenished no matter how much we use. So while deliveries of fossil fuels like coal and oil will eventually be depleted, renewable energy sources will always be there.

Examples: wind energy, solar energy, geothermal energy, biomass, hydro energy, etc.

### 2.2 Non Renewable Energy

Non-renewable energy is a source of energy which will eventually come to an end. Most sources of non-renewable energy are fossil fuels, such as gas, coal and oil.

These natural resources are a chief source of power for a vast amount of industries – but, there are numerous downsides to non-renewable energy, including their negative environmental influence and the fact they are in inadequate supply. Non-renewable energy sources can be used for all categories of things. Over 70% of the energy used in industrial practices arises from non-renewable sources, whereas fossil fuels are also used for several household purposes.

## 3. Comparison Chart

Sr. no	Renewable	Non renewable
1.	A renewable source of energy refers to the sources that are identified few decades ago.	Non-renewable sources of energy are the sources that are commonly in use since long time.
2.	They cannot be exhausted.	They can be exhausted due to over consumption
3.	They are environment friendly sources, which does not cause pollution.	They pollute environment, on a large scale and adds to global warming.
4.	Comparatively less expensive.	Costly.

Table-1: Comparison chart

## 4. Designing Approach

These eco-friendly cars have solar panels mounted on their roof or peripheral which helps in gathering of the sunlight. The rudimentary solar panel is made up of several Photovoltaic Cells (PVC) which efficiently alter the solar energy into electric energy.

The elements used in the manufacturing of PVC are most frequently Silicon, alloys of Nitrogen, Gallium and Indium. Altogether of these elements have the capacity to recollect light and then release it in the form of rapidly moving electrons, which helps in generating flow of electricity.

This electricity is then put in storage in the batteries of a green car which are made up of exceptional materials such as, lithium-ion, nickel-cadmium and nickel-metal hydride. All of these elements support the battery in storing more amount of charge than the other conventional battery types.

When these eco-friendly cars are accelerated, the battery propels energy to drive the electric motor and in return help the vehicle to move. A solar car has the ability to generally work in voltage range of 80 – 170 V and can have a driving range of about 50-100 km.



Fig 1: Panel arrangement.

## 5. Working

At its core, a solar car is an electric car, one with an limitless, free and wireless power source which it takes wherever it goes. Basically, a solar car involves a solar panel, a battery and one or more electric motors. All these parts are linked in parallel, like this:

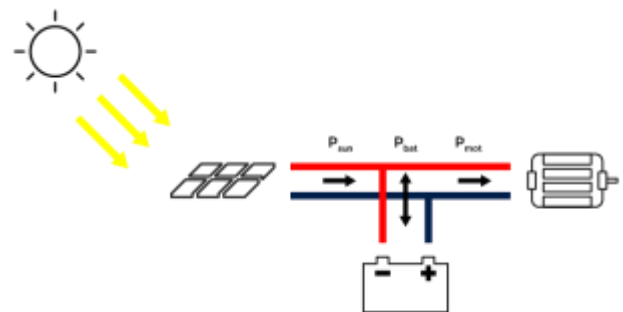


Fig 2: Simple representation of a Solar Car.

At any given time, the quantity of sunshine defines the power output of solar panels,  $P_{sun}$ . Also, we have the power of the battery  $P_{bat}$  and the power demanded by the

motors,  $P_{mot}$ . The power into or out of the battery is determined by the difference between the power from the sun and to the motors as:  $P_{bat} = P_{sun} - P_{mot}$ . Thus, if more power is coming from the sun than is needed for the motor, the battery is charged. For example, when the car is parked or driving leisurely, the excess energy will be stored in the battery and can be used at a future time. When the motor requires more power than is coming from the sun, the battery is discharged. For example when driving at high speed. The efficient working of solar car is as mentioned in the flowchart given below:

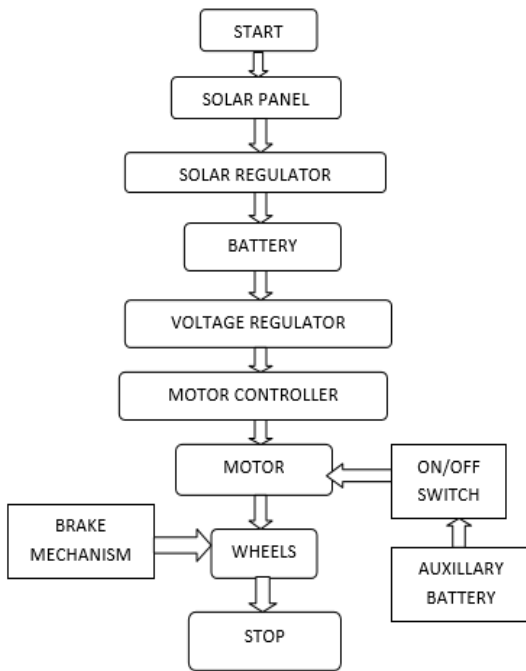


Fig 3: flowchart

## 6. Advantages

There are excessive benefits of electric vehicles (EVs) over conventional petrol/diesel cars. Those are as follows:

**Cheaper to run:** Owners of an EV have the gain of much lower running costs. The electricity to charge an EV works out around a third as much per kilometre as purchasing petrol for the same vehicle.

**Cheaper to maintain:** A battery electric vehicle (BEV) has a lot less moving parts than a conventional petrol/diesel car. There are relatively little servicing and no expensive exhaust systems, starter motors, fuel injection systems, radiators and many other parts that are not needed in an EV.

**Less pollution:** By selecting to drive an EV it is helping to minimize harmful air pollution from exhaust emissions. An EV has zero exhaust emissions.

**Eco-friendly materials:** There is also a trend towards more eco-friendly production and materials for EVs. The Ford Focus Electric is made up of recycled materials and the padding is made out of bio based materials. The Nissan Leaf's interior and bodywork are partly made out of green materials such as recycled water bottles, plastic bags, old car parts and even second hand home utilisations.

**Health benefits:** Reduced harmful exhaust emissions is good news for our health. Healthier air quality will lead to less health problems and costs caused by air pollution. EVs are much quieter than petrol/diesel a vehicle, which indicates less noise pollution.

**Safety improvements:** Recent outcomes have shown that numerous EV features can improve safety. EVs are likely to have a lower centre of gravity that makes them less likely to roll over. They can also have a minor risk for major fires or explosions and the body construction and durability of EVs may find safer in a collision.

## 7. CONCLUSION

The development process of a solar car is not an easy tasks specially it needs a lot of efforts and time from the team members and most significantly the investment is high. On the other hand, those factors will not stop the CPDM solar car team from continuing their efforts to design and build more solar cars in order to achieve the aim of finishing the race in the coming WSC events. There are number of challenges and obstacles before the dream solar car can be fabricated but with the experiences and knowledge obtained from the previous WSC events, the dream will come true.

## ACKNOWLEDGEMENT

We sincerely acknowledge our indebtedness to our guide **Prof. A. A. Gophane** for his guidance and immense support on every step towards the completion of the paper and dissertation work and his keen and active interest in our efforts and their contribution for the solution of every problem at each stage is helpful for us. We express our sincere thanks to members of Electrical Engineering department for their kind co-operation.

We also express our gratitude to all teaching & non-teaching staff of our college who helps us in one or the other way to Complete this paper. Our special thanks go to our friends and colleagues to complete this paper in attractive and influential manner. We can never forget our parents & our family members whose blessing and best wishes inspired.

## REFERENCES

- [1]. <https://m.cartrade.com/blog/2015/greens/solar-cars-pros-and-cons-1181.html?amp=1>
- [2]. <https://m.cartrade.com/blog/2014/greens/what-is-a-solar-car-and-how-does-it-work-750.html?amp=1>
- [3]. Source - Environmental Benefits of Electric Vehicles on website <http://www.gumtree.com.au/scam-security-centre/buying-on-gumtree/the-ultimate-electric-cars-buying-guide>.
- [4]. Wekepedia.

