



“Naturally operated multipurpose vehicle”

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ABSTRACT :-

*In the today's world, pollution control is one of the tensest subject for all nation. Measure of minimizing the pollutants, leads to kindness of human towards environment. This kindness can be shown by the humans to great extent at domestic or commercial level. This project not only take cares of nature but also look after the human's health and wealth. We are able to decrease the pollutions caused by vehicles at domestic level. Research says that its almost not possible to minimize the harmful gases which is secreted by large scale factories but it also says that domestic automobile causes pollution upto 81.50 % as compare to industries. On the consideration, we made some efforts to manufacture a vehicle which is eco-friendly towards environment and even most cost efficient automobile, named **NATURALLY OPERATED MULTIPROPOSE VEHICLE (NOMV)**. The term "Naturally operated" itself has the meaning that the vehicles is operated by all natural factors, ie. Solar rays(main source), Pressure of Raindrops, Wind energy resulting to convert mechanical rotational energy into chemical through dynamo and kinetic energy of on-road running wheels into chemical energy through dynamo, in order to charge the batteries to drive the hub motor which acts as the engine of NOMV, ultimately driving the rear wheels by chain mechanism. The second term of our project "Multipurpose vehicle". This includes involvement of grass cutter which is responsible for grass levelling at different level, passengers and goods transport, charging small electronic devices.*

KEYWORDS :- Eco-friendly vehicle; Multipurpose; Used in domestic or commercial sites; Solar Energy; Wind Energy; kinetic Energy; Grass Cutter.



1. INTRODUCTION

Nature are the human's best friend. If Nature cares for human even we are suppose to take care of natural environment with no limits. Today at the age of modernisation, we are facing long periodical environmental issue of global warming, and research says that this occurrence of issue majority-ly is due the automobile emitting high amount of hydrocarbons , carbonmono oxide ,nitrogen,sulphuroxide,etc. Respected scientist ,engineers,etc. had made or are making efforts to minimise the harm to surrounding by reducing the emission of harmful gases from automobile. They are even succeeded in controlling the varieties of negative effects on public health and natural environment but we all know that every story has adverse effect too. In order to make sure that the health of public and surrounding should be healthy, man has to pay for it greatly financially. In market, already launcedyobike,yo car or electrical vehicle are the remarkable success of manufacturing eco-friendly vehicle but these vehicles which runs on batteries has to be get charged and charging these batteries take much time and more money directly or indirectly.

Is there any ways of any formula to tackle this problem too ?yes, nothing is impossible for enginners. The idea to develop 100% eco-friendly vehicle arised on the basis of a very small question.

We are manufacturing a vehicle which works on chargeable batteries. This is common and widely used in every automobile sector. But our thinking is different.The vehicle runs by batteries as vidualpowerplant of it but the question arises that how to charge these batteries without paying financial ie.no money? This made us in the state of thinking. When a person rides a motorbike, he has to face various environmental and mechanical factors directly imposed on him. The factors are solar radiation, raindrops, wind , and rotation of wheels. Solar radiation acts as the great source of energy of human if used mannerly. When the sun

raise gets incident on the solar panel,the solar energy is converted into electrical energy and ultimately stored in battery. Though the intensity of sun raise are low,the batteries get up charged. Raindrops when falls down to earth the great gravitational force,it exerts pressure on ground. Can we utilize this pressure of raindrops to charged vehicle batteries? Yes its possible. Like solar panel,rain panel are help to convert this pressure of raindrops into electrical energy, which is finally stored as chemical energy.(unfortunately, due to low budget,it is not being interpreted). During riding motorbike,biker is pushed in opposite direction to the direction he is riding. The push force victim is wind which acts against the direction of velocity of motorbike.This naturally occurred wind can be utilised to charged our vehicle's source of power. And this make the dawn of designing concept. The wind exert maximum force at the top of the vehicle. The two rotating vanes are attached to above portion of our vehicle so that wind comes in contact with it to rotate it. The rotational velocity or angulR velocity can be increased by designing it aerodynamically. Rotation of the vane will charge up the batteries by converting the mechanical energy of vane into chemical energy through dynamo. We can make use of the dynamo,to convert kinetic energy of on-road running wheels into electrical,to refill source of our vehicle.

On the consideration,our project title consist of the word multi-propose. Naturally operated multiproposevehicle,is not only 100% naturally operated but also helpful in domestic propose. This includes grass cutting or grass levelling at commercial or domestic sites,passenger and goods transfer from one place to other, and even includes to charge small electronic devices (upto 5-6 V).

2. LITERATURE REVIEW

2.1 Investigation upon the Fuel Free Vehicle

Mostly petrol is using as a fuel to run the conventional vehicle and everyone knows, in



international market the cost of petroleum products are increasing day by day. Today the choice of people is CNG (Compressed Natural Gas) and LPG (Liquefied Petroleum Gas) as well as. CNG and LPG are cheaper than petrol. LPG is a no longer a very cheap fuel and due to the limited availability of CNG, these fuels are not permanent solution. This paper provides a solution for fuels problems with the help of Solar vehicle. A Solar Rickshaw is an electrical vehicle powered by solar panels as a fuel. In solar panels, Photovoltaic (PV) cells get radiations from the sun and convert into electrical energy. Batteries store that electrical energy and drive the Hub motor which serves as an engine.

2.2 BASIC CONCEPT OF OUR NATURALLY OPERATED VEHICLE (NOV)

The main source of energy for vehicle is solar energy. When sun light falls on the solar panels, they convert it into electrical energy. This electrical energy is stored in batteries. Batteries are connected to the motor. The motor is mechanically coupled with chain drive which derives the rear wheel axle. So, in this way the light energy is first converted to electrical energy which is stored in batteries in the form of chemical energy and then finally converted to mechanical energy. Hub motor will further attach with chain drive mechanism which ultimately drive rear wheels. A basic schematic diagram is given below.

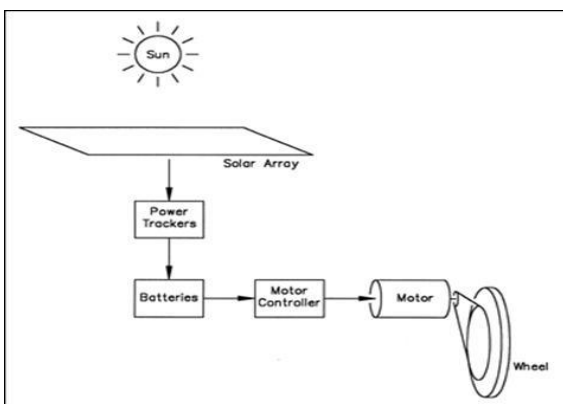


Fig.1 SOLAR SYSTEM DIAG.

2.3 CONTROL SCHEME

The control scheme of Naturally Operated Vehicle is consisting of mono crystalline solar panel, an efficient MPPT (maximum power point tracking) for charging system, charge controller for batteries, and Hub motor which is clearly shown in given figure of control scheme.

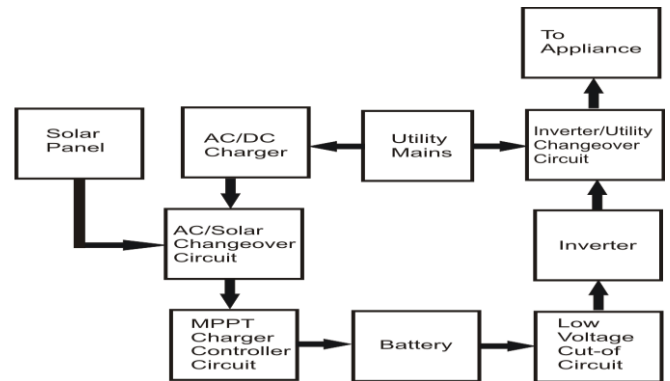


Fig. 2 FLOW DIAG

A. SOLAR PANEL

A solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. After study literature and market survey, it is known that mono-crystalline panel are more efficient then poly-crystalline panel. Although, it is expensive but gives accurate output voltage. Mono-crystalline panel is used to fulfil our requirements.

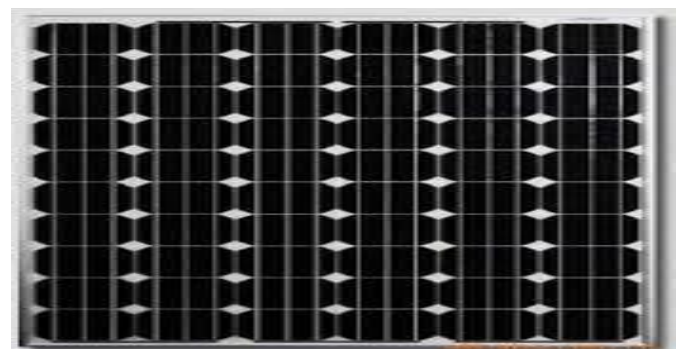


Fig. 3 Mono Crystalline Solar Panel

The solar cells used in this module are coated with blue antireflection silicon nitride to ensure their good appearance and high efficiency. It's a high quality product warranty for up to 25 years. Anodized aluminum frame improves resistance to heavy wind loads



B. MPPT (MAXIMUM POWER POINT TRACKING)

At a given temperature and isolation level, PV cells supply maximum power at one particular operation point called the maximum power point (MPP). MPPT is an important process for the PV system to deliver maximum power to the battery and also to increase the efficiency. In PV applications, the buck type converter is usually used for charging the battery. A buck converter can operate at the MPP under almost ideal conditions for PV cells, but it cannot do so well when the MPP goes below the battery charging voltage under a low irradiance and high temperature condition. The boost converter allows tracking the MPP also at a low irradiation level or at high temperatures since the low voltage of the PV module can still be boosted to the required battery voltage.

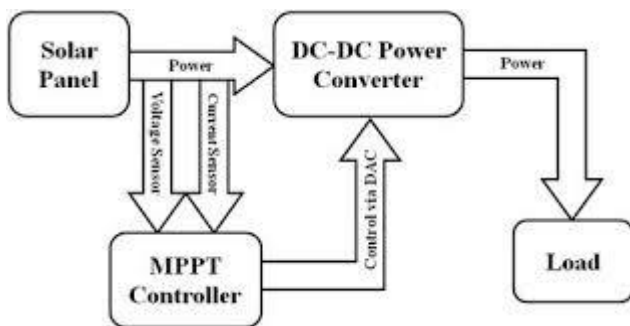


Fig. 4 Layout of MPPT

The use of charge controller is for to increase battery life because it prevents batteries to be over charged, and stops to charge when battery is fully charged and automatic disconnect battery if it is going to be empty. It also works as a battery level indicator with the help of LEDs. The physical picture of Solar Charge Controller is given below.

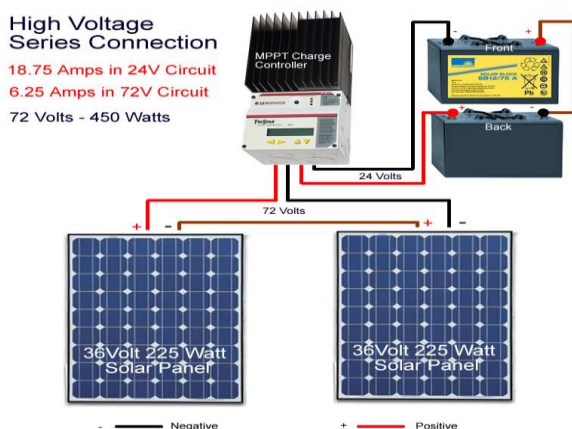


Fig. 5 Solar Charge Controller of Solar panel

C. BATTERIES

Lead Acid Batteries have been used in vehicle which has low cost, easily available, light weight as compared to dry batteries. The external charger connection from battery is required for the indicators, horns and lights. The charging and discharging time of battery is calculated by Peukert's Law according to that Law the charging time of batteries is calculated by the formula: Ah rating of battery / applied current Battery output is=30 Ah Solar panel output current is=8.3 Amp So the charging time is: 30.Ah/8.3A= 3.6hrs (3hrs and 36mins) And The discharging time of batteries is calculated by the formula: (Ah rating of battery * battery volts) / applied load Battery output= 30Ah Solar panel output=8.3 Amp Applied load=325watts Battery volts=24 volts So the discharging time of batteries is: (30Ah*24)/325= 2.3hrs (2hrs and 20mins)



Fig.6 lead battery

D. Selection of hub Motor

The **wheel hub motor** (also called **wheel motor**, **wheel hub drive**, **hub motor** or **in-wheel motor**) is an electric motor that is incorporated into the hub of a wheel and drives it directly. A hub motor typically is designed in one of three configurations. Considered least practical is an axial-flux motor, where the stator windings are typically sandwiched between sets of magnets. The other two configurations are both radial designs with the motor magnets bonded to the rotor; in one, the inner rotation motor, the rotor sits inside the stator, as in a conventional motor. In the other, the outer-rotation motor, the rotor sits outside the stator and rotates around it. The application of hub motors in vehicular uses is still evolving, and neither configuration has become standard. [16]

Electric motors have their greatest torque at startup, making them ideal for vehicles as they need the most torque at startup too. The idea of "revving up" so common with internal



combustion engines is unnecessary with electric motors. Their greatest torque occurs as the rotor first begins to turn, which is why electric motors do not require a transmission. A gear-down arrangement may be needed, but unlike in a transmission normally paired with a combustion engine, no shifting is needed for electric motors



Fig.7. HUB MOTOR

Uses of Hub Motor in current and future :-

- They are commonly found on electric bicycles.
- Wheel motors are applied in industry, e.g. driving wheels that are part of assembly lines.
- They have not been used very often on cars, despite being invented for this purpose.
- Hub motors can also be found on buses

Comparative Study of Solar Rickshaw with Conventional Auto Rickshaw

A solar vehicle is an electric vehicle powered completely or significantly by direct solar energy. Usually, photovoltaic (PV) cells contained in solar panels convert the sun's energy directly into electric energy. The term "solar vehicle" usually implies that solar energy is used to power all or part of a vehicle's propulsion. Solar power may be also used to provide power for communications or controls or other auxiliary functions.

Wheel Track	1070 to 1160 mm	36"
Total Length	2150 to 2900 mm	50"

Total Width	1200 to 1350 mm	32"
Maximum Height	1650 to 1950 mm	66"
Engine	2 stroke,4 stroke , CNG kit	DC series motor
Brake	Hydraulic / Mechanical	Disk Brake
Piston displacement	Less than 100 cc	Not required
Fuels	Petrol, CNG, LPG	Solar panel
Capacity of Fuel Tank	minimum 4 litter	Two batteries of 12V 30Amp

Table:1 Comparison Table Of Solar and Auto Rickshaw

Solar Vehicle Changing the Future Lifestyle of Human

- Electric vehicle with more advantages of no noise, no pollution, saving energy and reduce carbon dioxide emissions is to power-driven vehicle with a motor drive wheels moving. Solar electric vehicle can make to reduce our greenhouse gas emissions and other pollution. All advantages of solar electric vehicle make research and application of solar electric vehicle as a "hot spot" of automotive industry and the trend of future cars. Solar electric vehicle is made of PV panels, battery, electric motor, vehicle controller and vehicle body. Solar electric vehicle drives using dual-mode of PV and battery hybrid. It can be achieved PV-driven and battery-driven independently.
- Solar electric vehicle project has been reported in which a Solar electric vehicle Kundi was developed by converting sunshine into electricity to realize green and clean transportation. Solar electric vehicle Kundi is driven using dual mode of PV and battery hybrid. It can be achieved PV-driven and battery-driven independently.

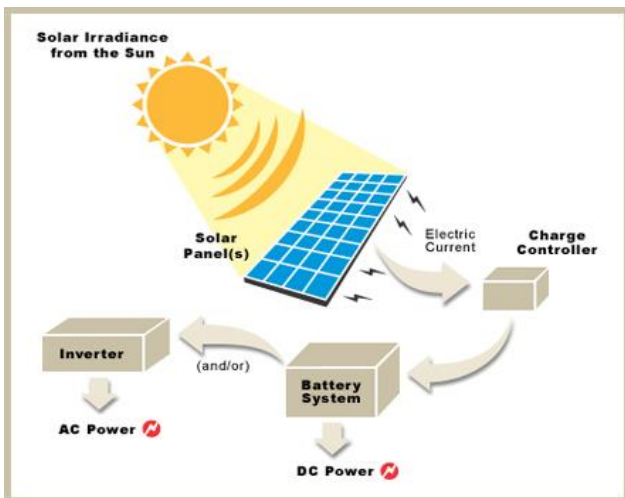


Fig. 8 Solar System

Cost Analysis :-

In this model the efficient components used to run the SR as long life product. Capital Cost of SR is about Rs. 86,000 but the capital cost of auto rickshaws are Rs. 1, 50,000 to 2, 00,000 which very expensive as compare to SR. The capital cost of SR is in detail in given table:

Sr. no.	ITEM	PRICE (RS)
1.	SOLAR PANEL	20000
2.	BATTERIES	5000
3.	BODY FRAME	15000
4.	MOTOR	15000
5.	MISCELLENIOUS	15000
	Total cost	70000

TABLE 2.COST ESTIMATION OF OUR NOMV MODEL

A new world of exploration of solar energy

Solaris DTU team of 16 members of Delhi Technological University started in 2006 when the first Solar car of India SAPPHIRE was launched in India which was first of its kind in India and after that Solaris never looked back and made world to look a new world of exploration in which vehicles ran using solar energy and till now Solaris has made 5 cars and presently working on 6th car. Following are the different cars made:

Sapphire'06

This was the first Solar Electric Vehicle of India and was presented at Auto Expo and also at the Akshay Urja Divas '08 organised by The Ministry of New and Renewable Energy (MNRE), Govt of India. The vehicle had a maximum speed of 90 kilometers per hour and ran successfully on the roads of India. This car had conventional solar panels with a comparatively low efficiency as compared to the latest monocrystalline panels available now a days.



Fig 9: Sapphire'06

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2.2 Solaris'08

This was a golf kart type solar model and can be used as a caddy in golf fields or as a rickshaw for travelling and transportation. This had a lesser surface area and a comparatively lesser panels. It had a maximum speed of 60 kilometers per hour but had a good stability and could easily move on difficult terrains. It was for the first time the concept of solar electric rickshaw came into existence in India.

Advantages:

- **Noise Free** – These electric rickshaws will be noise free and silent as compared to the normal auto rickshaws.
- **Pollution Free** – Since the electric rickshaws will use solar energy to run, they will be non polluting and will cut the carbon dioxide emissions in contrary to the normal auto rickshaws.



- **More Efficient** – The solar powered rickshaws will use 40% less energy than petrol auto rickshaw and hence will be more efficient.
- **Battery Life** – The solar powered rickshaw can run for ~60-70 kms after fully charged. According to a survey, auto rickshaws ply for 25-30 kms/ day in India.
- **Battery Charging** – The batteries of the solar powered rickshaws will need to be charged the whole night. Once charged it will meet the daily requirement of an average Indian rickshaw puller.
- **Battery Replacement Costs** – Will be reasonable, since the pricey petrol/ diesel, which is becoming increasingly unaffordable even by the rising middle classes in India.
- Capable of climbing up hill on an average inclination of 15deg to 30 deg.

Disadvantages:

- Solar vehicles don't have speed or power that regular vehicles have.
- Solar powered vehicles can operate only for limited distances is there is no sun.
- If it is dark out for many days, the vehicles battery will not charge and you this can seem as a problem to many problem. This is the main reason why people don't rely on solar vehicles.
- A good solar powered vehicles is expensive.
- Parts used in solar vehicles are not produced in large quantity so they are expensive.

CONCLUSIONS

Further research is needed in this regard to improve solar panels, reduce weight, to improve reliability and to reduce the cost. Research is being carried out on many semi-conductors and their alloys to develop more efficient solar cells. Thus this technology will definitely grow up in the future.

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