

# Mobile Vehicles/Train Based On Automated Solar System

Dr. D.K.Shedge<sup>1</sup>, Ashvin Jatale<sup>2</sup>, Suraj Bansode<sup>3</sup>, Vijay Nanaware<sup>4</sup>, Kumar Gaurav<sup>5</sup>

<sup>1,2,3,4,5</sup>Dept of Electronics

<sup>1,2,3,4,5</sup> AISSMS's Institute of Information Technology

PUNE-411001

**Abstract-** In Today's world where the Non-renewable energy resources are exhausting very rapidly there is need to find an alternative which could be as efficient as today's power resources. Also we need to keep the cost of production of the power in check to meet the value added demand. In our project we have to come up with an idea to use solar power for efficient energy generation. Previously solar panels were being used for energy generation which produce less efficient energy generation due to dust accumulation over solar panels density of solar radiation, improper tilt angle, and the shadowing effect

To overcome all these problems we come with an idea to use a wiper which can move along the panel to remove the dust accumulated on the panels to solve the problems of scattering due to dust, and to overcome the problem of improper tilt angle we will add actuator so that the panels could be adjusted according to incident angle of sun rays. Using our idea we can generate efficient power from solar panels and drive the coaches of trains and vehicles effectively.

## I. INTRODUCTION

In today's era where the need of locomotives and other vehicles for the transportation is increasing, this also leads to increase demand of power resources to provide power to these vehicles. A great emphasis is being given on the use of solar energy for the power generation. Solar energy can help us to reduce our reliance on fossil fuels, which is very much needed to do as our net emission of 37 gigatonnes of CO<sub>2</sub> per year are weakening havoc on the planet causing weather changes, global warming and a number of respiratory diseases causing million of deaths.

However despite the scope to generate power from solar energy is vast, the idea of using it for vehicles and locomotives can be very energy and cost efficient. To make use of solar energy more efficiently we need to overcome many critical problems due to which the efficiency of power generation by solar cell decreases. The major problems which affect the power generation by solar cells are 1) dust accumulation on solar cells 2) Improper tilt angle of solar

panel 3) Shadowing effect. Power generation from solar panels can be very cost efficient and energy efficient if it generate power continuously without much accountable losses thus we need a system which can effectively reduce scattering effect, due to dust accumulation and automatically adjust the tilt angle of solar panels to produce maximum power from the solar radiation in particular area. Hence we are proposing a system with an idea to overcome all the mentioned problems to effectively increases the power generation and also improves cost effect and reliability on solar energy to a large extent.

## II. HARDWARE DESCRIPTION

Proposed system

1. Solar panel unit
2. Control and display unit

Solar panel unit:-

1. Solar panels
2. Wiper
3. Actuator

**Solar panels** – solar panel produce a 300-325w power per panel. Now if we consider a coach of locomotive 20 such panels are installed to produce 20\*300W =6kW power which can be used for lighting system and fans. Also for vehicles such as cars, trams and public buses we can install solar panels to produce required power. The power generated from these solar panels are given to the battery which are there for the storage of generated power.

**Wiper** - In our system a wiper is added to wipe out the dust accumulated on surface of solar cells to reduce the scattering effect. This can be done manually as well as automatically as per user's requirements.

**Actuator** – Actuator has also been provided to adjust the tilt angle of the solar panels to minimize the shadowing effect.

Control unit - There is a PIC microcontroller to do the important function i.e. of sensing the battery level, switching between main supplies and solar powered supply, controlling the wiper and actuators.

Display unit – All the element from the control unit are transmitted to display unit for observation and maintenance.

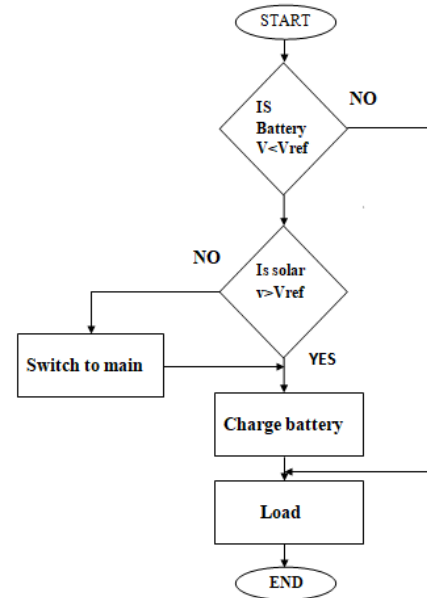
### III. WORKING

Every vehicle need power to be operated. In our system we have provided the alternate power resource as solar energy with existing main supply .We can switch between the main supply and the power generated from the solar panels .

As shown in block diagram power generated from solar panels is stored in a battery. The main supply is already present with the vehicles. There is a switching element in the form of relay which is used to switch between the power supplies depending on the power requirement of load .

Apart from the switching element there is also sensing element to sense the output power of the panels and the level of power stored in the battery .Here we apply condition for the switching calculation of the battery power and the solar power in percentage for better understanding.

and battery levels goes down so controller take a decision of switching to main line, although output power efficiency of panel is 50 % or greater there is no need to switching to main supply.



Flow chart of switching condition

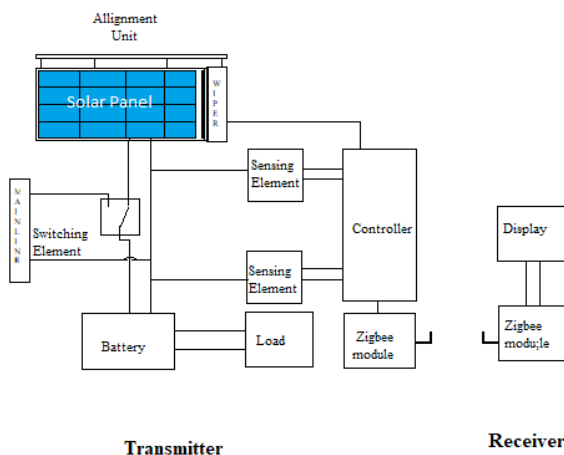


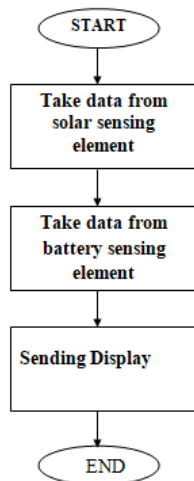
Fig- Block diagram

Switching is done according to our flow chart for switching condition. As per flow chart solar power is generated and battery gets charged continuously and sensors are used to sense the output power of panels and battery. When the output power decreases below the reference voltage (for train it is 6 KW and for other vehicles it varies according to load) or the power generation by solar cells decreases by 50% and battery level also decreases, at that time controller wait for some time and if this condition repeatedly happens

However if efficiency of power generation reduces heavily due to dust accumulation and improper tilt angle, we have provide the wiper remove the dust from solar panel time to time automatically after every 6 hours or it could be done manually as per requirement .

To solve problem of tilt angle we have provided actuator which can move the solar panel in step size equivalent to set degrees of rotation.

(In flow chart of Data acquisition) For the real time observation and maintenance of all the devices and proper functioning we have provided a display unit for vehicles operator. In small vehicles the information from controller to display unit can be transmitted through wires, whereas for the locomotive and trains we have used a zigbee module, thus all the basic information can easily displayed and real time observation is made.



Flow chart of signal conditioning

#### IV. APPLICATIONS AND ADVANTAGES

1. This system can be used with cars, buses, trains, trucks etc.
2. Power generated can be used very effectively without any wastage
3. Dependency on non-renewable sources will reduce heavily.
4. One time installation cost with very less or no maintenance cost.
5. Can be easily used with existing vehicles as well as new models
6. Problem of scattering and improper tilt angle is minimized at largest extent
7. shadowing effect is also minimized with use of actuators

#### V. CONCLUSION

In today's era when there is very much need to reduce reliance on non renewable resource of energy we have proposed a system which is solar powered and which can be very much useful and energy efficient in long run and solve the scarcity of resources for power generation. In our system we have also solved the problems such as scattering due to dust particles, improper tilt angle, shadowing effect which affects the efficiency of power generation from solar panels to a large extent.

Thus our proposed system is reliable, energy efficient, having one time installation cost with low maintenance expenses and it also has durability.

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