Solar Power, HOG Used In Train And Automatic System on Station

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Abstract- *In this project we can show how solar power used in train and head on generation used in train and also used automatic system using PIR sensor or motion sensor. Now a days End on generation system used in train in this system generator car is connected behind the train. In the generator car generator works on the diesel, for ac coach 65 to 70liter diesel is used to generate electricity and one liter diesel only generate 3 units of electricity. So a non ac coach uses around 120units of electricity in one hour.*

The main aim of our project is save electricity in train. For this aim we will used renewable energy i.e. solar energy and automatic system. Solar energy is used for only the electrification of coaches and automatic system is used on station. Now a days we are experiencing a lead shortage in a electrical energy. The nonrenewable sources that are we going to used get exhausted and the renewable energy is vital for future. We are also experiencing shortage of batteries in marked and hike in fuel price. The train is the main source of public transportation. Train requires maximum electric energy but sometimes all requirements of train are not get fulfilled by accessible electrical energy. Hence we are propose use of solar energy in the train to modify the application of normal train. The solar train technology is in developing stage. The principle of the solar train is used to store energy in the battery during and after charging it from solar panel. This idea will help to protect fuel extenuation.

Keywords- Solar Train, Head on generation system, automatic on off system.

I. INTRODUCTION

Head on generation system: As opposed to the older EOG system, the Head on Generation (HOG) system runs the hotel load drawing electricity from the overhead electric lines through the pantograph (an apparatus which mounted on the roof of electric train to collect power through with an overhead tension wire).

The power supply from the overhead cable is 750 volts at single-phase, and a transformer with a winding of 945 kVA converts it to a 750 Volts 50 Hz output at 3-phase. This energy is then provided to the compartments. The HOG system is free of air and noise pollution. The system would bring down yearly CO2 and NOx emissions, which according to the press release are currently at 1724.6 tonnes/annum and 7.48 tonnes/annum respectively, to zero. As per report, the Delhi division of the Northern Railways (NR) zone has cut down 80 per cent on its energy bills. The feat was achieved as a result of successfully converting the 39 pairs of Premium and Express trains to the head-on-generation (HOG) system.

Solar energy in train: For the huge amount of power needs to the railwayns to run also be made possible with the solar rather than using the existing diesel. The time has arrived there is a lot of scarcity of the fuel and in 5 to 10 decades more there would be no fuel. So one of most fuel being consumed are in arailwys in india and thus considering it the idea of making the trains to be equipped with the solar power would perfectly help to reduce the scarcity of the fuel and even the use of no exhaustible and eco-friendly energy. Considering the train equiped with the solar energy isn't a simple task yet we think of make up. Though there are few existing solar powered trains but they seem be limited and not completely specialized. The safety feature will be best implementation for this idea that the track detection.

Automatic On off system:

The main aim of this system is how save electric energy. In this system we can use pir motion sensor for to detect motion of public and then fans lights will on and off.

Eg. If any person stand below fan and light then that light will glow otherwise that equipment will be in off condition.

II. HARDWARE DESCRIPTION

The hardware part used in this project are mentioned below.

A. Solar Panel:

Fig.1: Solar Panel

A solar panel is a set of solar photovoltaic module which are electrically connected. A photovoltaic module is a packaged, connected assembly of solar cells. The solar panel can be used as component of larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by dc output power under standard test conditions and typically ranges from 10 to 320 watts. The efficiency of a module determines the area of module.

A single solar module can produces only limited amount of power, most installation contains multiple modules. A photovoltaic system typically includes panel or an array of solar modules, an inverter, and sometimes a battery or solar track and interconnection wiring.

B. IC L 7812:

Fig 2 : Ic L7812

7812 is 12V Voltage Regulator that restricts the voltage output to 12V anddraws 12V regulated power supply. The 7812 is the most common, as its regulated 12-voltsupply provides a convenient power source most

TTL components. 7812 is a series of78XX voltageregulators. Voltage regulator 7812 is available most commonly in TO-220 packages well as and surface mount Packages.

The IC 7812 Voltage regulators do operate their optimal capability, if the input voltage is at least 2.5 volt greater than the output voltage (i.e. 14.5 V min.) the current is 1 or 1.5 Amperes more. Though voltage and current difference is different for other IC Packages.

C. 12V relay:

Fig 3: Relay

Relay is remote control electronic switch normally controlled by another switch, control module. Functioning as standard 12 volt replacement or addition for full voltage, these relays are great option for equipment existing in vehicles today. The mounting bracket included with the relays allows for the relay to be mounted directly to vehicle or other electrical application. These relays are optimal solution for full voltage applications on variety of vehicle equipment including head lamps, auxiliary lamps, fog horns, and motors for fans, window lifters, air conditioners, heated rear windows, and more. Choose from 12V DC relay without a resistor. Both are designed to deliver superior, long lasting performance.

D. Diode:

Fig 4: Diode

1N4007 is rectifier diode, designed specifically for circuits those need to convert ac to dc. It can pass currents of up to 1 A, have peak inverse voltage (PIV) rating of 500 V. Note: This product has minimum quantity restriction (20nos) for order.

The 1N4007 belongs to sort of 1 A general-purpose silicon rectifier diode, commonly used in Alternating current adapters for common household appliances. It is fairly low-speed rectifier diode, being inefficient for square waves of more than 15 kHZ. The 1N4007 diode is standard recovery rectifier with molded plastic case.

A diode is semiconductor device that essentially acts as one-way switch for current. It allows current flow easily in one direction, but severely restricts current from flowing in the opposite direction. Diodes are also known as rectifiers because they change ac into pulsating direct current Diode is rated according to their type, voltage, and current capacity.

E. Transistor:

Fig 5: Transistor

A BC547 transistor is negative-positive-negative (NPN) transistor that is used for many purpose. Together with other electronic components, such as resistor, coil, and others. it can be used as the active component for switch and amplifier. Like all other NPN transistor, this type has an emitter terminal, a base or control terminal, and a collector terminal. In typical configuration, the current flowing from the base to the emitter controls the collector current.
A short vertical line, which is the base, that indicate the transistor schematic for an NPN transistor, the emitter, which is a diagonal line connecting to the base, is an arrowhead pointing away from the base.

F. Battery:

Fig 6. Battery

The lead acid battery is type of recharging battery. This is made first time by French Physicist Gaston planet in 1859. It is first type of recharging battery ever created. Comparing to rechargeable batteries. Lead acid batteries have relatively low density.

G. PIR Sensor:

Fig 7. PIR Sensor

A passive infrared sensor i.e. PIR sensor is electronic type sensor that measured infrared IR from objects in its view of field. This sensor is used in various application like automatic on off lighting, Security alarm and other application. Pir detect only general movement they do not idea who or what go that case infrared radiating sensor i.e. ir sensor used.

IV. BLOCK DIGRAM

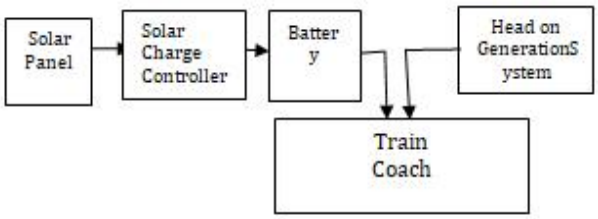

Fig 8: Block Diagram

Working:

Solar panels convert solar energy into electricity. They use the concept photoelectric effect, emission and electrons when light falls on solar panel. Solar panels are made up of silicon cells, silicon cell has an atomic number 14. When light falls on solar panel, the outer most electrons of silicon i.e. two electrons are set into motion. This initiates the flow of electricity. Silicon has two different cell structures: Solar energy converted into electrical form and saved to the lead acid battery. This battery power supplied to the lights and fans of train coach

In this block diagram, we can show the overview of project. Solar panel connected to solar charge controller and also solar charge controller connected to battery and battery connected to train coach. Also head on generation system is connected to Locomotive and locomotive Step the voltage and supplying to train coach.

Circuit used in this system:

1. Solar Charge Controller:

The charge controller regulates the ampere and voltage that is delivered to the load and any excess power can delivered to the battery system. So the batteries maintain their state of charge without getting overcharged. During the evening when there is no sunlight, battery power is used to run the load and other

A Solar Charge Controller works by regulating the voltage or current flow from solar panels to a battery. It detect and monitor the battery voltage, reducing the current when the battery fully charged. The controller maintains float charge to keep the battery ready for use.

2. Phase Change over circuit:

An automatic phase change over switch is designed primarily to disconnect load from its power source and transfer to a standby source say generator, in case there is a power outage. The switching process is done in controlled manner so as to prevent the false starting of generator at very short power outages. Its operation like home inverter.

3. PIR Sensor circuit:

The PIR sensor internally is split into two halves, one half is positive and the other is considered negative. Thus, one half generates one signal by detecting the motion of hot body and other half generates another signal. The difference between this two signals is generated as output signal.

V. RESULT

The result shows how solar energy and head on generation system used in train. This two system is connected to train coach. If solar energy is reduced then phase changer circuit load transfer on head on generation system and main motto of automatic system is to save energy.

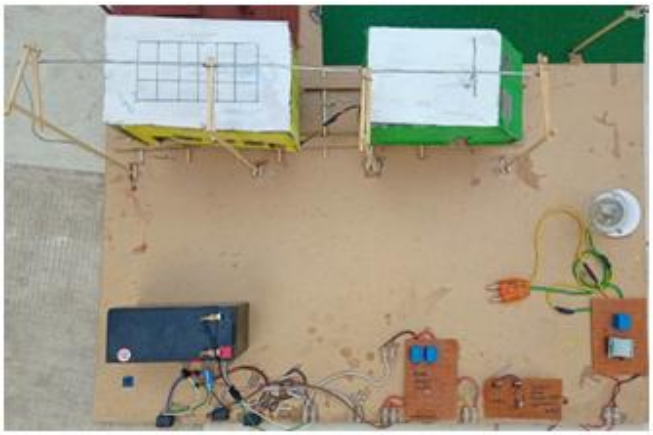

Fig 9: Final Project Model

VI. FUTURE SCOPE

The purpose behind this project is that we should be used renewable energy in railways because we see that the coal required to generate electricity in getting less and if it is reduce then the railways will suffer from huge losses and the electricity will be cut off you need to use the solar energy in the railway.

In the future solar system will be a powerful for getting electric power and if you use this system from now on it will be of great benefit today the railways we use 18.5 billion unit of electric power every year if we can save a lot of electric power if you use solar for loading at least in coaches form today.

In HOG scheme power is fed from the electric locomotive to the train to cater for the hotel load of train in electric locomotive power is taken from the overhead line through pantograph traction transformer of the locomotive which is provided with a hotel load winding of 945 KVA at nominal voltage of 750 volt single phase which varies with the OHE voltage variations. This 750 volts single phase supply fed to hotel load converter, which gives 750 volts 3 phase 50HZ supply as output for feeding the hotel load of the train.

VII. CONCLUSION

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