

# STREET LIGHT GENERATION USING SOLAR PANEL

Prachi D. Asalekar<sup>1</sup>, Nisha N. Bathe<sup>2</sup>, Jyoti A. Kshirsagar<sup>3</sup>, Annu D. Landage<sup>4</sup>

*Electronic and Telecommunication Department*  
*Shri Chhatrapati Shivajiraje College of Engineering, Dhangwadi, Pune, India*  
[prachiasalekar@gmail.com](mailto:prachiasalekar@gmail.com)  
[nishabathe8@gmail.com](mailto:nishabathe8@gmail.com)  
[jyotikshirsagar239@gmail.com](mailto:jyotikshirsagar239@gmail.com)  
[annulandage@gmail.com](mailto:annulandage@gmail.com)

## ABSTRACT –

The constant supply of energy on earth is solar energy which is both directly and indirectly used. A part of sun rays can be changed in to applicable electricity by means of an entrusting technology Solar Photovoltaic (PV). This work emphasizes upon the idea of conforming Solar PV panels and sunlight to depict and operate solar system in different areas . The ultimate goal of the solar system will be to enlighten the solar LED street lights, energy savers and tube lights in streets and different schools. This type of solar system is very cost effective in a way that it needs little expenditure initially and less care.

Keywords— Solar Panel, LED Lighting System, Pole, Batteries, Charge Controller, Inverters and Cooling Box

## I. INTRODUCTION

solar energy is the most demanding energy source due to fact that it is the most abundant and most effective energy source on earth. Solar energy is derived from sun, and this energy is not only environment free but also costless. Latest technology allows the harnessing of solar energy through cells known as solar cells or photovoltaic cells. Photovoltaic cells are placed in direct sunlight, when the direct sunlight hits these cells chemical reaction takes place which produce electric currents [1]. These electric currents are later on converted into electricity which are used to power everyday items like street lights, schools and households.

For this purpose we use solar energy. LED based lightning system is used which received charge from lead batteries charged by solar panels [2]. Solar system and LED lightning combination enables its interest in governing authorities to lighten street lights and schools in remote areas without setting up any external infrastructure in a meager traditional way. Stand alone solar street lightning solutions are popular and usually built with customized PV panels and design [3]. Solar energy systems are also used in schools for lightning purpose, internet installing equipment and laptop charging. This system includes photovoltaic cell, batteries and other connectivity equipments [4]. Photovoltaic street lighting systems

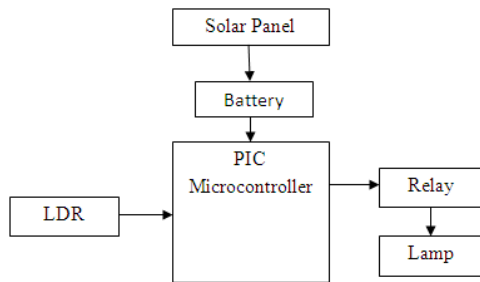
are in three different lamps namely low pressure sodium lamp, high pressure sodium lamp and fluorescent lamp to determine suitable system in rural areas of the country. The three different lamps are mounted in the same unit and wattage in different areas. The analysis of PV lightning systems with fluorescent lamp is suitable system for installation in rural areas [5]. An experiment is conducted using the PV panel o supply electricity in each building in the schools like classrooms, guard house etc.

## II. PROPOSED SYSTEM

In this section, we present the basic components used in the installation of our proposed solar system.

Description of some of the components like photovoltaic solar panels, batteries, LED lightning, poles, charge controller and inverters etc.

- Block diagram of street light system-



- Cadmium Telluride (Cd-Te)
- Copper Indium Gallium Selenide (CIGS)
- Dye-Sensitized Solar Cell (DSC)



### A :Batteries

Batteries are the most important component in the installation of solar system. Batteries store electricity from solar panels during day time and deliver this energy to the fixture during night. The life cycle of battery is very important to the lifetime of light and capacity of battery will affect the backup days of the lights. Two types of batteries are usually used which are Gel Cell Deep Cycle battery and Lead Acid Battery and many more. During charging time, electrical energy is converted into chemical energy and stored in the form of chemical energy and during discharging time the chemical energy is converted into electrical energy. The proper selection of batteries for PV systems depends upon the best knowledge of their design features, operational requirements and performance characteristics. Batteries are manufacture by the combination of different sequential and parallel processes. Conduction of charging and discharging cycles on batteries are done necessarily before bringing them to the market for distribution to consumers. Important components of batteries are cells, active element, electrolyte, grid plate, separator, terminal posts, cell events and case.

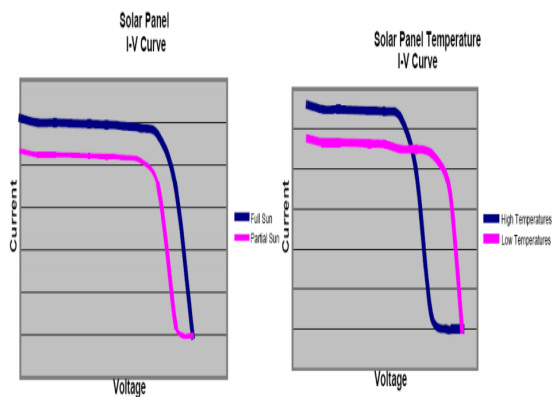
Solar Panel Characteristics Extracting the maximum amount of power from the solar panel is difficult due to the nonlinearity and variability of the Voltage-Current (V-I) characteristic.

### B :Solar panel

A Solar Panel is basically a module that converts light energy (photons) from the sun to generate electricity in direct current (DC) form. There are two types of solar panels, mainly crystalline and thin-film types. There are two types of crystalline solar panels :

- Poly-crystalline Solar Panel
- Mono-crystalline Solar Panel.

As for Thin-film types, there are : Amorphous Silicon (a-Si)



### C :LDR

The theoretical concept of the light sensor lies behind, which is used in this circuit as a darkness detector. The LDR is a resistor as shown in Fig. , and its resistance varies according to the amount of light falling on its surface. When the LDR detect light its

resistance will get decreased, thus if it detects darkness its resistance will increase.

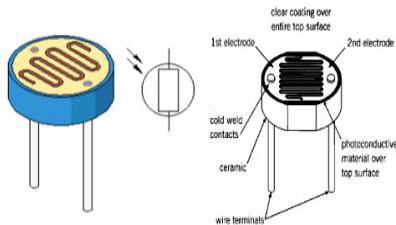


Fig. 2 LDR

#### D.:MICROCONTROLLER

A microcontroller is a computer control system on a single chip. It has many electronic circuits built into it, which can decode written instructions and convert them to electrical signals. The microcontroller will then step through these instructions and execute them one by one. As an example of this a microcontroller we can use it to controller the lighting of a street by using the exact procedures. Microcontrollers are now changing electronic designs. Instead of hard wiring a number of logic gates together to perform some function we now use instructions to wire the gates electronically. The list of these instructions given to the microcontroller is called a program. There are different types of microcontroller, this project focus only on the PIC16F877A Microcontroller where it's pins as shown in Fig. 6.

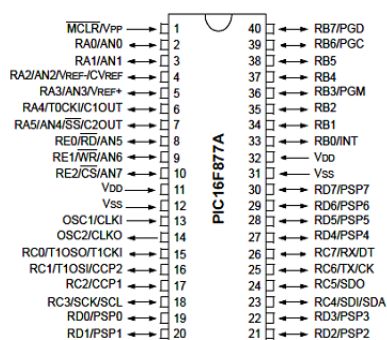


Fig. 6 Pin diagram of PIC16F877A microcontroller

#### E.:Street light

LED is usually used as lighting source of modern solar street light, as the LED will provide much higher Lumens with lower energy consumption. The

energy consumption of LED fixture is at least 50% lower than HPS fixture which is widely used as lighting source in Traditional street lights. LEDs lack of warm up time also allows for use of motion detectors for additional efficiency gains.

#### F:RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are remote control electrical switches that are controlled by another switch, such as a horn switch or a computer as in a power train control module. Relays allow a small current flow circuit to control a higher current circuit. Several designs of relays are in use today, 3-pin, 4-pin, 5-pin, and 6-pin, single switch or dual switches. Relays which come in various sizes, ratings, and applications, are used as remote control switches. Fig. 5 shows different types of relays. In this paper, the 4-pin relay will be used.

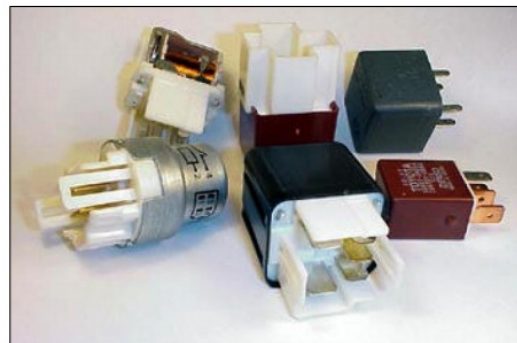


Fig. 5 Different types of relays

#### G:ADVANTAGES:

- Solar street lights are independent of the utility grid. Hence, the operation costs are minimized.
- Solar street lights require much less maintenance compared to conventional street lights.
- Since external wires are eliminated, risk of accidents are minimized.<sup>[21]</sup>
- This is a non polluting source of electricity
- Separate parts of solar system can be easily carried to the remote areas
- It allows the saving of energy and also cost.

*H: DISADVANTAGES*

- 1) Initial investment is very high.
- 2) Rechargeable batteries have to be replaced from time to time
- 3) Non-availability of sunlight during rainy and winter seasons is a problem.
- 4) Dust accumulation on the surface of panel create a problem.

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