

ENERGY EFFICIENT STREET LIGHTING SYSTEM USING SOLAR

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ABSTRACT:

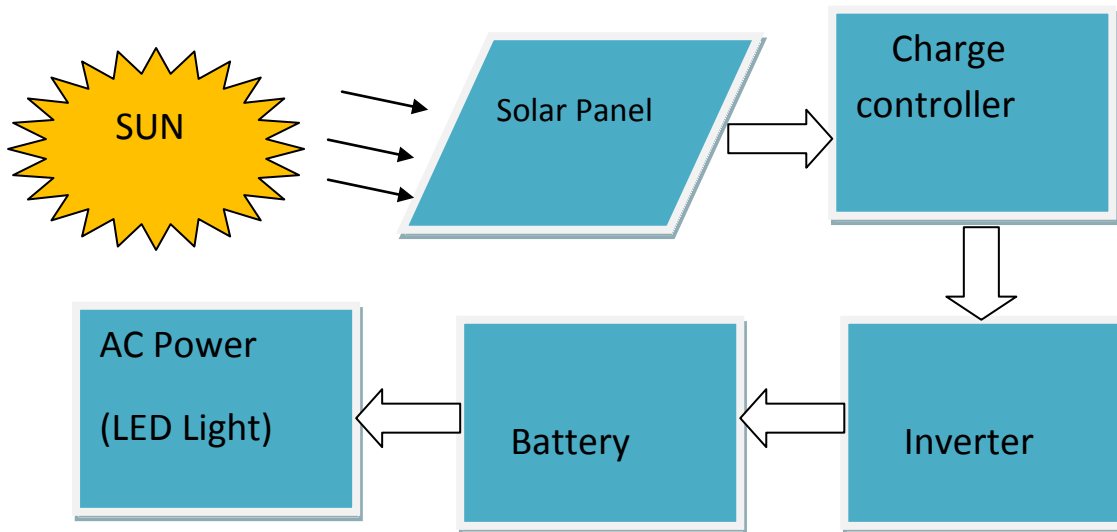
Now-a-days most of the street lighting system is based on solar panels only. This is preferred so to reduce the huge power consumption which is allotted especially for street lighting systems. After introducing solar panels also, much losses are being present in the system due to the lack of intelligence and automation in the system. At night, the street light is ON and its full brightness. Whenever at morning time, street light is automatically OFF condition.

Index Terms - Street light system, Solar panel, Battery, Inverter, Charge Controller.

INTRODUCTION:

Currently the LED lamp is popular due to its efficiency and many believe it is 'new' technology. The LED as we know it has been around for over 50 years. The recent development of white LEDs is what has brought it into the public eye as a replacement for other white light sources our work aim is creating an intelligent lamp post managed by a remote-controlled system which uses LED-based light sources and is powered by renewable energy. The advantage of LEDs is that they have extremely long lives -- they don't have filaments that can quickly burn out -- and they don't contain toxic chemicals like mercury, unlike traditional high-pressure sodium lamps or mercury-vapor lamps. An LED light can last 100,000 hours. These lights also have reduced maintenance costs because of their long lives, and they give off less heat than other bulbs. Because they last so long, LEDs are suitable for places where replacing light bulbs is expensive, inconvenient or otherwise difficult. In general CFL bulbs are used for street lighting system. Here we are replacing them with light emitting diodes(LEDs). The main reason to replace CFL is they will conserve more energy when compared to LEDs. By using LED's we are going to save the power of 15% when compared to CFL's. Here LED's produce 80 lumens per watt which is sufficient for street lighting.

BLOCK DIAGRAM:



BASIC COMPONENTS:

The system consists of:

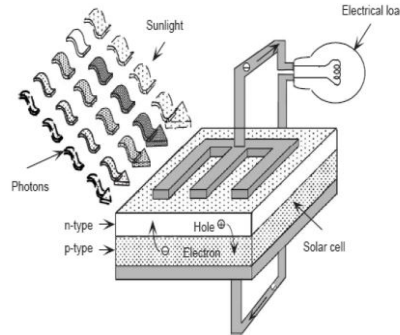
- (1) Solar cell
- (2) LED lamps
- (3) Light pole
- (4) Control box (charger, controller, battery)



OPERATING PRINCIPLE AND WORKING:

According to principle of photovoltaic effect, the solar panels receive solar radiation during the day time and then convert it into electrical energy through the charge and discharge controller, which is finally stored in the battery. When the light intensity reduced to about 10 lx during night and open circuit voltage of the solar panels reaches at a certain value, the controller has detected voltage value and then act, the Battery offer the energy to the LED light to drive the LED emits visible light at a certain direction. Battery discharges after certain time passes, the charge and discharge controller will act again to end the discharging of the battery in order to prepare next charging or discharging again.

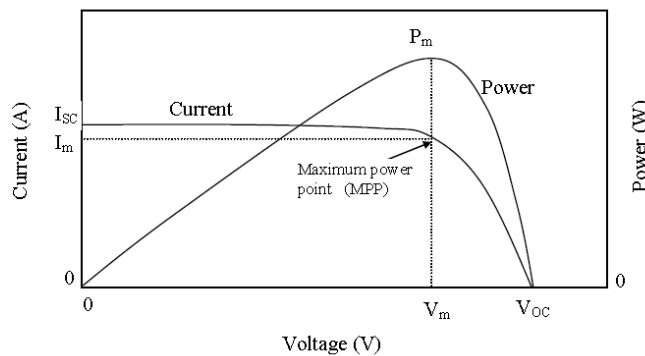
SOLAR PANEL (PV Cell):



The Photovoltaic (PV) cell is composed of at least two layers of the semiconductors which have been “doped” with different impurities. This makes an excess of free electrons (n-type) on one side of the junction, and a lack of free electrons (p-type) on another side. When the photovoltaic cells are irradiated with sunlight, some photons are reflected and the others are absorbed by the solar cell. When the photovoltaic cells keep enough photons, the negative electrons are released from the semiconductor material. Due to the manufacturing process of the positive layer, these free electrons naturally migrate to the positive layer which creates voltage differential. When the solar cell is connected with the external load, there will be a current circulation in the circuit. Each single solar energy cell produces only 1-2 watts. In order to increase output power, these cells (from one to several thousands) are connected in series or in parallel with others, what is called a solar array.

V-I CHARACTERISTICS OF SOLAR PANEL:

The V-I characteristic curve and output power of a solar panel. The curve has two parts, one indicates the trend of current with respect to increasing voltage. The other curve is the power-voltage curve and is obtained by the equation $P=V*I$. If no load is connected with the solar panel which is working in sun light, an open-circuit voltage V_{oc} will be produced but no current follows. If the terminals of the solar panel are shorted together, the short-circuit current I_{SC} will flow but the output voltage will be zero. In both cases, when a load is connected, we need to consider V-I curve of the panel and V-I curve of the load to find out how much power can be transmitted to the load. The maximum power point (MPP) is the spot near the knee of the V-I curve, and the voltage and current at the MPP are designated as V_m and I_m . For a particular load, the maximum point is varying following insolation, shading and temperature. It is important to operate panels at their maximum power conditions.



CONTROLLER:

The controller is the intelligent core of the whole solar streetlight system, it controls the entire system's normal operation and automatically prevents the battery's overcharge, or over discharge. Its basic functions must also have light control, time control and anti-reverse connection etc. The controller generally has a simple measurement function. We use the DC chopper as the main circuit and the single-chip or the low-power integrated circuits as the control circuit.

PROPOSED SYSTEM:

This proposed work focus on the necessity of the automated street light system and the peculiar way of implementation with embedded system. It is designed to detect the vehicle movement on the highways to switch ON only a block of the street light ahead of it and switch OFF the trailing light to save energy. The main idea behind the system is that the LED array will be in off position at day time. LEDs are controlled to glow only when it is needed. During night time sometimes roads will be empty and hence there is no use of illuminating all the lamps. At such instances the intensity of LEDs are controlled to conserve the energy. The power will be taken from solar power or external power supply based on the availability of renewable resource.

EXSISTING SYSTEM:

The conventional energy resource is going to difficult task because of availability of coal. The major disadvantages of solar energy system independent of unavailability of power. To overcome this problem by the solar energy system. In this proposed system we can use both sources combine, Another way is that we can use any one source and keep another source as a stand by unit. So that any one source of power fails other will take care of the generation.

FUTURE SCOPE:

From the current situation of the LED, there are still many problems which shall be further improved. For example, the quality of the LED chip, heating problem, package problem, power driver issue and the lifetime of the electronic components. LED lighting is a developing technology although its luminous efficiency is improving and cost is continuously reduced, but it still needs long time to completely replace the traditional high pressure sodium street lighting. Following progressing of the technology, the led lights can use more low-power products to achieve same effect as the traditional lighting, and the price will decreased significantly in the coming year. The significant progress of the LED must make it completely replace the traditional street lights. The LED has a bright future.

CONCLUSION:

Currently, the initial investment in solar LED street light system remains a major problem. However, the efficiency of the solar cells is increasing, while the price is decreasing. At same time, the efficiency of the LED light is in a rapid increase, but the prices are independent of unavailability of power. To overcome this problem by the solar energy system. In this proposed system we can use both sources combine, Another way is that we can use any one source and keep another source as a stand by unit. So that any one source of power is lower. So following development of the outdoor lighting technic, the solar LED street light system has shown us it will have promising application and infinite vitality.

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