

**ADVANCED STREET LIGHTING SYSTEM USING RENEWABLE ENERGY**Dhanasharisagar¹, Sandesh Mane² and SuhasDoke³¹Electronics & Telecommunication Engg., Solapur University
Fabtech Technical Campus, College of Engineering and Research, Sangola, India²Electronics & Telecommunication Engg., Solapur University,
Fabtech Technical Campus, College of Engineering and Research, Sangola, India³Electronics & Telecommunication Engg., Solapur University,
Fabtech Technical Campus, College of Engineering and Research, Sangola, India

Abstract: Solar Photovoltaic panel based street light systems are becoming more common these days. But the limitation with these ordinary street light systems is that it lacks intelligent performance. It is very essential to automate the system so that we can conserve energy as well as to maximize the efficiency of the system. In this paper a new method is suggested so as to maximize the efficiency of the street lighting system and to conserve the energy usage the LED lights. Here automation of street lights is done by LDR sensor. Intensity of led street lights can be controlled by IR sensor. The main aim of this paper is to generate the energy through the pressure generated by footsteps and vehicles. The micro controller setup is placed on road when a person or vehicle pass over then it generates some pressure and that pressure generated by the person or vehicle is noted down by the pressure transducer connected to the micro controller the pressure generated at the transducer is converted into the electrical energy and that energy will trigger the controller. This energy can be used to the street light to turn it on during night times the street light can be switch on automatically without any human effort by simply setting on and off time in RTC.

Keywords: Solar panel, LED, micro controller, lithium ion battery, LDR and PR sensors

I. Introduction

It is very common these days to see solar PV based street lights. People became aware about the importance of moving from conventional resources based energy production to renewable energy based power production. We all know that fossil fuel resources are going to feed us for only 40-50 years from now. So it is high time for us to shift to renewable energy based power production and usage as it is the only alternative available. It is sure that we can't leave in a society without power. So we need to maximize the usage of renewable energy so that we can preserve conventional resources. Normal solar PV based street lighting system lacks automation. The problem is that it will be in on state even though there is no need of light and hence it causes loss of power. Yet another problem is power is wasted during late night when there.

In this report a new technique is suggested to automate the entire system. Here when there is no necessity of light the system will go into a power down mode and the lamps won't glow. Sensors sense the intensity of light and presence sensor is used to detect the presence of human. In recent years, environmental issues have gained widespread international attention, resulting in the development of energy-efficient technologies aimed at reducing energy consumption. One aspect of this evolving situation is an increasing demand for a reduction in the amount of electricity used for illumination. In particular, energy conservation for large scale illumination tasks such as street lighting is gaining considerable importance. Most outdoor illumination sources, such as street lights, use HID Lamps as light sources. Global concerns have been raised regarding the amount of power consumed by HID lamps and by extension, the amount of atmospheric CO₂ released due to such power consumption. Because of this LED array illumination has received attention recently as an energy reducing light source. LED road illumination requires about one third to one half of the electric power needed for HID lighting. The lifecycle of an LED can be more than three times as long as an HID light. LED illumination could reduce the amount of time needed to exchange defective fixtures, and it is expected that an LED system would be comparatively maintenance free. This in turn, means that LED system could be considered suitable for use on isolated islands or in high mountainous regions. In such a background, and as a result of the significant improvements to luminescent efficiency in recent years, LED lighting can be expected to fully replace previously used light sources within our lifetimes. The anticipated development of LED illumination of Lighting systems, particularly within the public sector, are still designed per the previous standards of reliability and that they don't usually profit of latest technological developments. Recently, however, the increasing pressure associated with the raw material prices and also the increasing social sensitivity to CO₂ emissions are leading to develop new techniques and technologies which permit significant cost savings and larger respect for the environment. In the literature we will notice

three solutions to those issues. The second one is, if any human or vehicle movement detected, the motion sensor triggers the microcontroller to turn the LEDs to their full brightness and it gets restored back to the dimming brightness. The third resolution is the survey mode. Turn on / Turn off can be controlled also manually from EB station through the same wireless medium.

II. COMPONENT SELECTION:

2.1 SOLAR PANEL:

For this system we use panels made from Monocrystline solar material i.e. Monocrystline solar cell. Because of it has highest efficiency compared to other solar cells like Poly-silicon and thin film, the efficiency is approx.15-18%. Also it is highly standard and it is easily available in market as per requirement.

2.2 BATTERY(LITHIUM ION):

In this modern technology Li-ion (Lithium ion) batteries plays important role especially in batteries used in smart phones, tablet PC's, and all electronics gadgets Li-ion battery is used. The reason for being selected this is following. Fast charging capacity, internal impedance is very low i.e. $\leq 70\text{ohm}$, temperature range is high for charging 0-45degree centigrade and for discharging -20-60degree centigrade. Which are very helpful for this system rather than lead acid and many other.

2.3 CONTROL UNIT (MICROCONTROLLER):

For the controlling purpose we use PIC 16F877 is a 40-pin 8-Bit CMOS FLASH Microcontroller. Because among PIC family this is very famous so it can available easily and at lower cost. Also anyone who knows little about can do the maintenance easily without breaking or disturbing the system, these are general parameters when we consider costumer point of you.

PIC is also meet all the requirements of this system, later version are also useable but the general parameter may effect. So 16F877 is used in this system.

2.4. LED (LIGHT EMITTING DIODE):

Since from last half decade use of LED is grows at extreme level, due to people now aware that the importance of saving energy.

For this system we are going to use 40Watt LED as an output source so that human or vehicle or animal can see the road easily and clearly.

2.5 PIEZO-ELECTRIC SENSOR:

Piezo sensors are used to convert mechanical energy into equivalent electrical energy and this is principle of it. Piezo-electric sensors are used for triggering the mechanism as the night 8pm-6am, as explained in working table no.1.

2.6 LDR SENSOR:

The long form of LDR is Light Dependent Resister.in this system it is used as switch for solar panel. When intensity of sun will reach to minimum level then it will switched off solar and trigger the system to glow with full intensity.

III. HARDWARE IMPLEMENTATION:

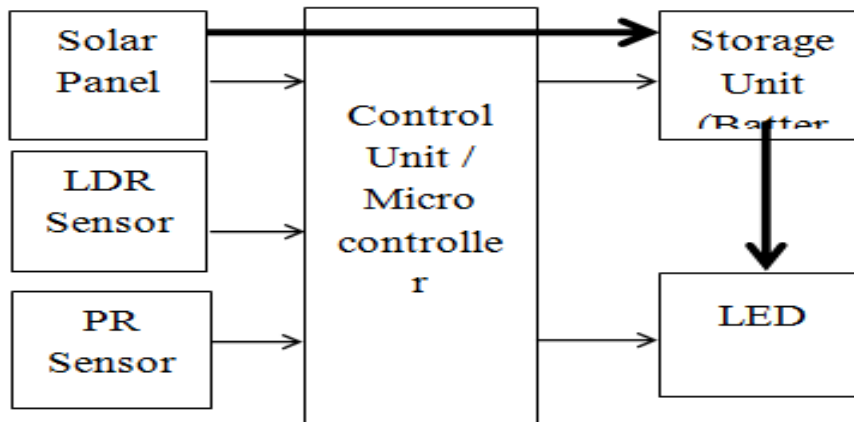


Fig 1.General block diagram of system.

Working:

The working is explained as below,

3.1. solar panel:

The main energy source of this system Solar panel. This will convert the solar energy into equivalent DC voltage. For this project we choose **Monocrystline solar cell**, because of efficiency of these cell is compare to other cells like Polycrystalline and Thin film

3.2: storage unit (battery):

Presently in the market several types if storage units are available but when we talk about best performance then **Li-ion** battery is greater than all and also life time of this battery is also high compare to other types of batteries are lead acid, zinc carbonate, nickel cadmium etc.

3.3: Control device:

For any automatic system control device or controller is like heart of that system , so to control our system we choose PIC controller due to these reason, simple understanding of working, easy to update, cost is comparatively high with respect to micro-controller but we can manage, easy availability in the market etc.

3.4: LED lamp (output device):

This project is based on street light so we use LED as a light output. Because of benefits of LED over all traditional lamps LED is far better than all. For this project we think about 40 W LED will enough to work for any road in between lane and rural areas.

3.5: Sensors:

In this project two types of sensors we are going to use i.e. Piezoelectric sensor and LDR sensor.

Table no.1: working of LED w.r.t.time.

	Night			Day
	6pm-8pm	8pm-6am(without interfere)	8pm-6am(when interfere)	6am-6pm
Solar panel	OFF	OFF	OFF	ON
LED	FULL	MID	FULL	OFF

As shown in table no.1 above, the working of system is dividing into 4 modes of operation and with respective to the solar panel and LED.

At the evening of 6pm solar panel stop charging battery and same time LED will glow with full intensity, and it will remain for next two hours i.e. up to 8pm. This is because 6-8pm is crowded time and most of people or vehicle uses road at this time, so there is no need to trigger the system.

But after the 8pm especially in rural areas very less amount of people or vehicle actually used road. So that time we will use only trigger mechanism to turn lights.

So in table above when there is no interfere of any human or vehicle or any kind of thing on road, the system will still remain OFF. And if there is movement on Pressure Sensor, it will trigger the system and immediately LED will fully glow for the thing which is present on road.

IV. ADVANTAGES:

It is independent on electricity hence no need to pay after installation for electricity. System is fully automated hence no need to human interface. System remains working in any season conditions. System is so compact that we can even carry with us. One's system is installed then system becomes maintenance free for next 3 years, only we have to clean the plate face area to maximum use of solar energy.

V. APPLICATIONS:

This system is most useful in rural areas in India where electricity still not available. Also in the areas where people rarely visited but light is key element. And most of those places where electricity is used unnecessary i.e. government poles. Because these bulbs are continuously glows without use.

VI. CONCLUSION:

As this system is totally depends on renewable energy and less maintenance system, we can use this as floating points in sea where sailors can't see the national and international boundaries by making it water proof but at that time piezo sensors are useless. Also now we consider for single use but we can use piezo as an second way to charge batteries. Also we can use electricity as an backup medium for this system.

VI. REFERENCES:

1. Archana M., Mahalahshmi R., "E-street: LED powered intelligent street lighting system with automatic brightness adjustment based on climate conditions and vehicle movements", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3 Special Issue, April 2014. ISSN(print): 2320_3765, ISSN(online): 2278_8875.
2. Ahmed Sharique Anees, Ayushy Chowdhary, Shalini Dubey, Shewta Warma. "Solar Powered LED Street Light with Automatic Intensity Control", International Journal Of Innovative Research In Electrical, Electronics, Instrumentation and Control Engineering, Vol.3, Issue 6, June 2015. ISSN(online): 23212004, ISSN(print): 2321-5526
3. Sharath Patil G.S, Rudresh S.M, Kallendrachari. K, M Kiran Kumar, Vani H.V, "Design and Implementation Of Automatic Street Light Using Sensors and Solar Panel", Sharath Patil G.S et al. Int. Journal of Engineering Research and Applications. Vol.5, Issue 6, June 2015, ISSN: 2248-9622.