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DESIGNING OF AUTOMATIC STREET LIGHT SYSTEM USING SOLAR PANEL

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ABSTRACT

This project aims to develop an energy-saving Solar Street Light control system that automatically turns on and off lights based on the vehicle movement with day/night sensing in the environment. A Solar Street LED light system, consisting of a PV Panel, Battery, LED Lamp, Sensing device and control device aims to design energy-efficient streetlights for energy conservation. Using LDR we control the street light, when the LDR values falls above the threshold value the lights are switched off. Light sensors are like our eye which detect the presence of an object and relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. This system automatically turns off street lights during daylight hours, thus preventing waste and electricity shortage. Conventional lamps use more power than LEDs, but automatic control and self-powered LED Street lights can operate street lights at no cos

Keywords: - ,Solar Panel, LED, Smart Street Light, LDR

INTRODUCTION

Solar street lights convert solar energy into electricity stored in batteries, automatically starting at night. Street light controllers provide an automatic control facility, replacing mechanical or electronic timers for on-off operation. Street lights are crucial for community infrastructure development, identifying people, vehicles and objects at night to minimize accidents and theft. Street lights of traditional method are of switching on/off at fixed times is expensive and inefficient. Automated systems are more cost effective and reliable, as they operate independently of human input. Energy-efficient lighting is crucial for sustainable development and energy strategies, as it consumes about 20 % of nation's electricity. High power LEDs offer energy savings up to 75% and reduce carbon emissions. LED street lights have a uniform rectangular beam pattern, allowing them to be spaced at wider intervals than sodium and CFL lights.

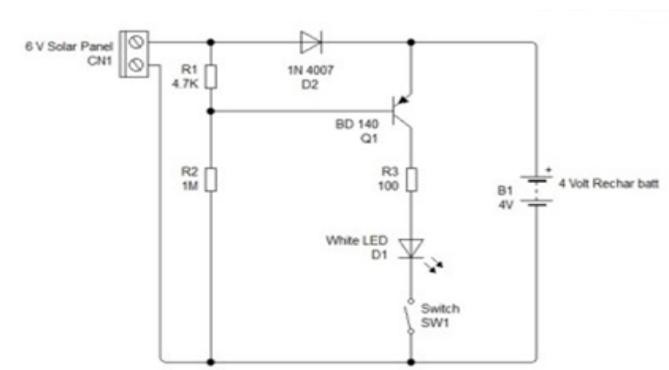
PRINCIPLE

The working principle of solar street light system is based on "Photovoltaic effect", where solar cells convert sunlight into electrical energy. This conversion is achieved through the use of the semiconductor material in the device. It is commonly referred to as the "Photovoltaic effect" or solar cells. The electrical energy generated is stored in batteries, and a charge and discharge

controller is employed to monitor the voltage levels. These controllers serve to safeguard the battery from any potential damage.

CIRCUIT DIAGRAM

The proposed circuit diagram for the design of automatic street light system is shown in fig:1.



1. COMPONENTS

The various components used for this circuit design are solar panels, rechargeable battery, LED's, BD 140 Transistor and IN4007 diode

1.1 Solar Panels

Solar panel is a device that are used to absorb the sun ray's and convert them into electricity . A solar panel with output are measured in watts or kilowatts. It uses multiple reflectors to collect thermal energy, and its performance depends on factors like climate, sky conditions, panel orientation, sunlight intensity and wiring connections.

1.2 Rechargeable Battery

A Rechargeable battery is an electrical device

that can be recharged multiple times, unlike a throwaway or primary battery, which is completely charged and discharged for later use. A rechargeable battery stores the electricity from solar panels during the day time and provided energy to the fixture during the night.

1.3 Light Emitting Diode

An LED is a two lead semiconductor light source that emits light when activated. Electro illumination occurs when electro holes, releasing photons with colour determined by semiconductor energy bandgap. A diode is a component that only allows electricity, they emit light. The LEDs are the primary lighting source in modern solar street lighting due to their higher lumens, lower energy consumption, longer lifespan, recycling capabilities, low maintenance and reduced heat generation.

1.4 BD 140 Transistor

The BD 140 is a popular PNP Bipolar Junction Transistor commonly used in audio amplifier circuits. This Bipolar Junction Transistor uses electrons and holes as charge carriers, allowing for amplification or switching by controlling a smaller current at one terminal. BJTs utilize two p-n junctions between n-type and p-type semiconductor types in a crystal.

1.5 1N4007 diode

The 1N4007 is the most commonly used rectifier diode. It enables the conversion of AC power to

DC by allowing only one direction of electrical current flow. It is commonly used in rectifier circuits, protection circuits and regular circuits.

WORKING

Upon receiving sunlight, the solar panel within the solar street light generates electrical power. The power is then used to charge the battery throughout the daytime. Once the sunsets, the solar street light automatically

illuminates. The LED light utilizes the power stored within the battery from the daytime. To detect any movement around the light, a motion sensors is employed. This system effectively conserves energy and provides reliable backup, particularly in cloudy or foggy weather conditions. Additionally, this system includes a battery for controlling the motion sensor's ON/OFF function. During night time, the street light automatically turns on, consuming the electricity previously stored in the battery. The battery is recharged during the daytime, and this cycle repeats daily .

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