"AUTOMATIC HYBRID STREET LAMP"

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ABSTRACT

In the past few years there is a global transformation on technology and researches which aims to energy savings through the usage of renewable sources in many applications. Solar as well as wind energy can be used for street lighting usually in cases of low consumption applications. This research aims to illuminate a low traffic road according to CIE M5 Class requirements, using only solar and wind energy. The objective is to operate the lighting system with renewable energy and also to use the appropriate lamp for the lighting of low traffic roads. In this study, a specific methodology is developed, which calculates the annual solar energy and the annual wind energy that the whole system needs to be autonomous. The proposed lighting system is an integrated unit with a photovoltaic panel, a wind generator, lamp, battery, controller, sensor etc. After extended calculation the appropriate parts of the system are selected in order to be autonomous. A result of system design is that an amount of the produced energy remains. This energy production can use to other application.

Keyword: - *photovoltaic, wind generator, renewable energy sources, outdoor lighting, street lighting, energy saving.*

1. Introduction

With the increase in global energy demand and large industrial power requirements, there has been a worldwide need for the development in the field of renewable energy. The drastic consumption of oil, natural gas, fossil fuels and other exhaustible sources of energy at the current scenario, will lead to their depletion from the earth. The concept of "sustainable development" has motivated us to search for alternative sources of energy which are freely and abundantly available to us. But due to the seasonal and geographical restrictions of wind and weather specific usage of solar panels, the need for focussing on hybrid energy sources has received special attention.

The test of research in renewable energy micro generation technology is the lucky combination of efficiency and urban integration. Indeed, the application field with the biggest potential is within cities where the number of small consumers is concentrated. Obviously, in this context, the acceptance of people towards the installation of new power plants becomes essential for the success of projects. Wind and solar energy are free and clean sources, maybe the most promising alternative of fossil fuels power generation. This idea has been leading the energy market in recent years.

Such systems, especially powered by photovoltaic (PV) panels and batteries, are currently sold. Their main application is the lighting in remote areas, as stand-alone generation units. There are some commercial products provided with both PV and either vertical (VAWT) or horizontal (HAWT) axis wind turbines technology, HAWTs generally take advantage of a greater power factor.

With the rapid economic development, energy consumption has increased year by year. Conventional energy is faced with increasing exhausting. The urgent need for new clean renewable energy exists. In the current number of renewable energy and new energy technology development, wind and solar energy's potential is the largest, and has the most development value. They are an inexhaustible renewable energy. First, using a single solar or wind power, there is a problem that, when it is winter, the wind is rich but the solar energy is lacking; when it is summer, they are just the opposite. So, wind and solar energy can be very strong complementary for each other. This complementarity makes the wind-solar hybrid system the best match in terms of resources. Secondly, because the wind power system and solar power system's battery and the inverter can be generic, the wind-solar hybrid system can reduce the cost, the independent power system, and the reliability is much higher. Wind solar hybrid streetlights as a practical application can not only make full use of resources, beautify and protect the environment, but also reflect the city's modernization. So the promotion of wind-solar hybrid streetlight construction has quite positive significance

1. Social benefit:

Wind-solar hybrid streetlight is a high-tech environmentally friendly product. Installing the wind-solar hybrid streetlight is done, not only in conformity with the government's environmental protection concept, but also it reminds people to protect the environment

2. Economic benefit:

It uses and produces power by itself. After the construction of a one-time investment, we can get a long-lasting benefit. Changing the traditional streetlight system laid on the underground cable power supply way saves a lot of manpower and financial resources.

3) Environmental benefit: Each traditional streetlight spends 1825 kWh power in 10 years. According to the standard thermal coal consumption (400g / kWh) to calculating, the standard coal consumption will be 7.3 tons. So a city Centre will consume 876,000 tons of standard coal just in 10 years, It will let out 3 million tons of carbon dioxide, 17,500 tons of sulphur dioxide, 13,000 tons of nitrogen dioxide, and so much 10 powder and impurity. But when using the wind-solar hybrid streetlights, the pollution will be avoided.

1.2 Objectives

- The design of a wind-solar hybrid streetlight, introducing the function of batteries, controllers and other components,
- Analysis of the application of wind-solar hybrid streetlight, and explaining the configuration of wind-solar hybrid streetlight.

1.3 Problem statement

First, using a single solar or wind power, there is a problem that, when it is winter, the wind is rich but the solar energy is lacking. When it is summer, they are just the opposite. So, wind and solar energy can be very strong complementary for each other.

2. LITERATURE SURVEY

- Bouroussis, iason georgaris, frangiskos v. Topalis, "hybrid wind-solar system for street lighting" In the past few years there is a global transformation on technology and researches which aims to energy savings through the usage of renewable sources in many applications. Solar as well as wind energy can be used for street lighting usually in cases of low consumption applications. This research aims to illuminate a low traffic road according to CIE M5 Class requirements, using only solar and wind energy. The objective is to operate the lighting system with renewable energy and also to use the appropriate lamp for the lighting of low traffic roads. According to recent studies in the mesopic region, the ideal lamp for this application is a metal halide lamp. In this study, a specific methodology is developed, which calculates the annual solar energy and the annual wind energy that the whole system needs to be autonomous. The proposed lighting system is an integrated unit with a photovoltaic panel, a wind generator, lamp, battery, inverter, charger etc. After extended calculation the appropriate parts of the system are selected in order to be autonomous. A result of system design is that an amount of the produced energy remains. This energy production can be sold, making the system a small energy producer in the connected power grid.

- Renato Ricci, Daniele Vitali and Sergio Montelpare "An innovative wind–solar hybrid street light: development and early testing of a prototype" An innovative renewable hybrid micro generation unit has been designed to be fully embedded into a dedicated LED street lighting system. The key feature of this new concept is the arrangement of a multiple Savonius vertical axis wind turbine into the structure itself of the post. A photovoltaic panel is integrated to contribute to power generation. The energy is collected by a power conversion equipment along with a storage device which ensures the lighting also during windless nights. The main application of this project is the standalone street lighting, but also a grid connected option is feasible, making the system compatible with microgrid concepts. Different Savonius rotors have been designed and characterized by wind tunnel tests. The adopted cylindrical geometry has shown a maximum power factor of 0.21. A dedicated safety equipment has been designed to prevent turbine over-speed by automatic stop in extreme wind condition. A full-scale prototype of the generator/lighting system has been installed. The experimental data acquisition is currently in progress to analysis on site performance and to allow energy simulations.
- Badri Narayan Mohapatra, Aishwarya Dash, Bipin Prasad Jarika, "Power Saving Solar Street lights" This project is based on the idea of maintaining maximum utilization and minimum loss of available energy. The plenty of solar energy available during the day time is stored in a solar cell and the stored energy is used to glow the street lights during the whole night. Also the system provides a power saving mode of operation by adapting the method of automation. A dark sensor and a light sensor provides the automatic "ON"/"OFF" facility to the street lights, so that it will glow automatically when it is required(i.e. when the surrounding will be dark) and it will be turned "OFF" automatically if sufficient light is available in the surrounding. Again the auto intensity control mechanism has been applied by the help of a microcontroller to control the light intensity of the luminaries as per the requirement. Hence the loss of energy due to unnecessary glow of the street lights can be avoided.

3. Block diagram

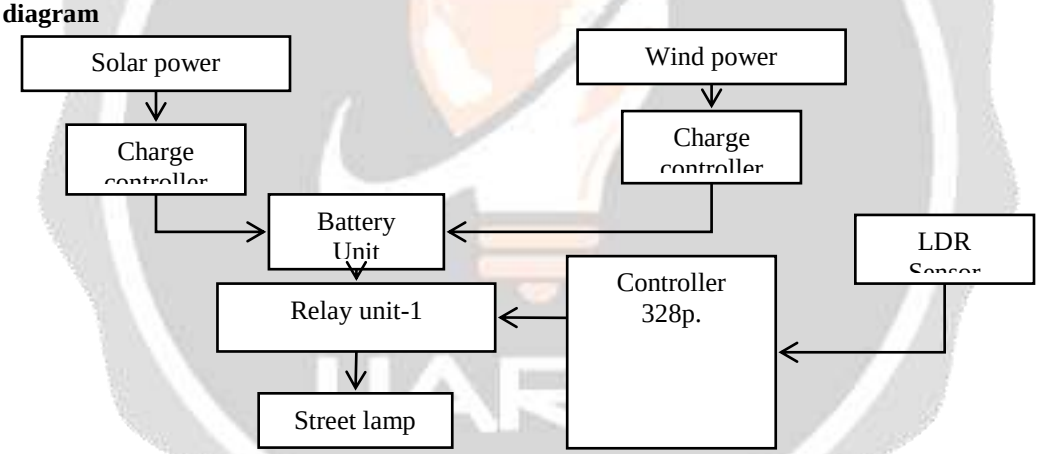


Fig -3.1 Block Diagram: Automatic Hybrid Street Lamp

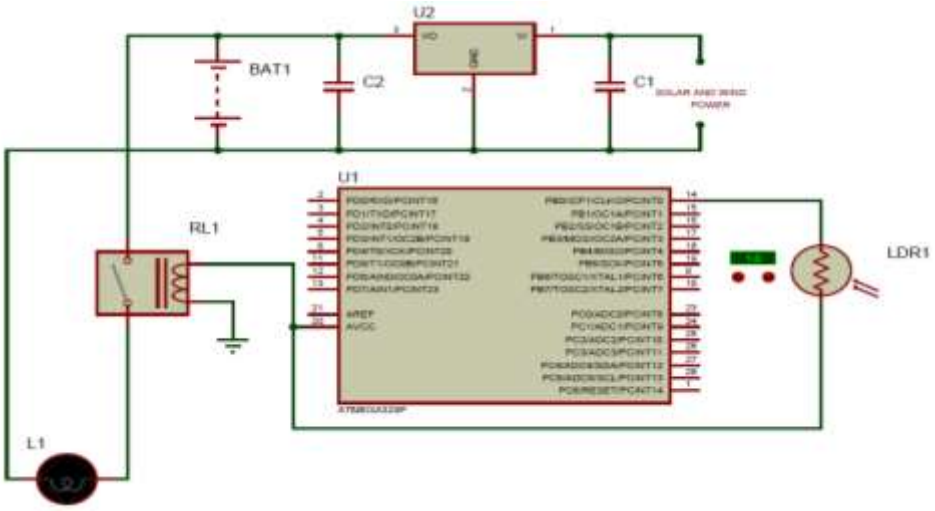


Fig -3.2 Circuit Diagram: Automatic Hybrid Street Lamp

3.1 METHODOLOGY

In our system there are two energy sources solar and wind. First, using a single solar or wind power, there is a problem that, when it is winter, the wind is rich but the solar energy is lacking. when it is summer, they are just the opposite. So, wind and solar energy can be very strong complementary for each other. In absence of wind solar energy is utilize and in absence of solar energy wind is energy utilize by street lamp.

Solar and wind energy store into the battery unit both sources are continuously in working condition. Street lamp energies when darkness occur in the surrounding place, and street lamp is off when

LDR sense the light in surrounding place. This whole process control by the arduino controller.

Light dependent resister sense the surrounding condition (light/dark).LDR sense connected to the arduino as a input sensor, controller control the street lamp supply as per LDR output signal.

4. HARDWARE AND SOFTWARE USED

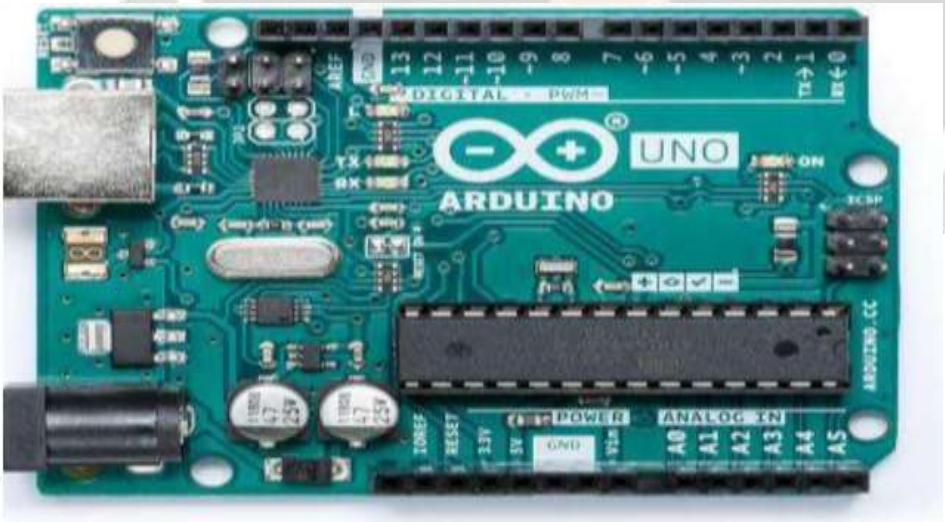


Fig. 4.1 arduino uno

4.1. How to use Arduino Board

Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

- **Serial Pins 0 (Rx) and 1 (TX):** Rx and TX pins are used to receive and transmit TTL serial data. They are connected with the corresponding ATmega328P USB to TTL serial chip.
- **External Interrupt Pins 2 and 3:** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM Pins 3, 5, 6, 9 and 11:** These pins provide an 8-bit PWM output by using analogWrite () function.
- **SPI Pins 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK):** These pins are used for SPI communication.
- **In-built LED Pin 13:** This pin is connected with a built-in LED, when pin 13 is HIGH – LED is on and when 13 pin is LOW, it's off.

Along with 14 Digital pins, there are 6 analog input pins, each of which provide 10 bits of resolution, i.e. 1024 different values. They measure from 0 to 5 volts but this limit can be increased by using AREF pin with analog Reference () function.

- Analog pin 4 (SDA) and pin 5 (SCA) also used for TWI communication using Wire library.

Arduino Uno has a couple of other pins as explained below:

- **AREF:** Used to provide reference voltage for analog inputs with analog Reference () function.
- **Reset Pin:** Making this pin LOW, resets the microcontroller.

4.2. Communication

Arduino can be used to communicate with a computer, another Arduino board or other microcontrollers. The ATmega328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The ATmega16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. There are two RX and TX LEDs on the arduino board which will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328P also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

4.3. Arduino Uno to ATmega328 Pin Mapping

When ATmega328 chip is used in place of Arduino Uno, or vice versa, the image below shows the pin mapping between the two.

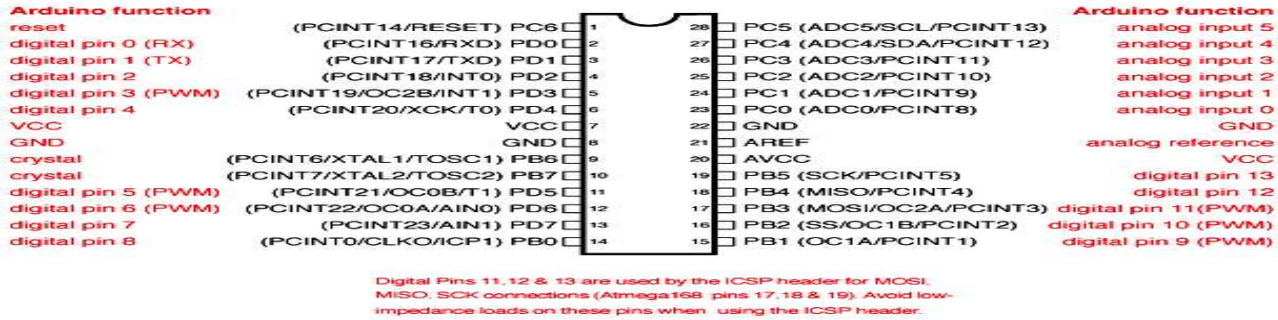


Fig 4.1.3. ATmega328 Pin Mapping

4.2 LDR

4.2 LDR

A photoresistor (also known as a light-dependent resistor, LDR, or photo-conductive cell) is a passive component that decreases resistance with respect to receiving luminosity (light) on the component's sensitive surface. The resistance of a photoresistor decreases with increase in incident light intensity; in other words, it exhibits photoconductivity.

A photoresistor can be applied in light-sensitive detector circuits and light-activated and dark-activated switching circuits acting as a resistance semiconductor. In the dark, a photoresistor can have a resistance as high as several mega ohms (MΩ), while in the light, a photoresistor can have a resistance as low as a few hundred ohms. If incident light on a photoresistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their whole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photoresistor can substantially differ among dissimilar devices. Moreover, unique photoresistors may react substantially differently to photons within certain wavelength bands.

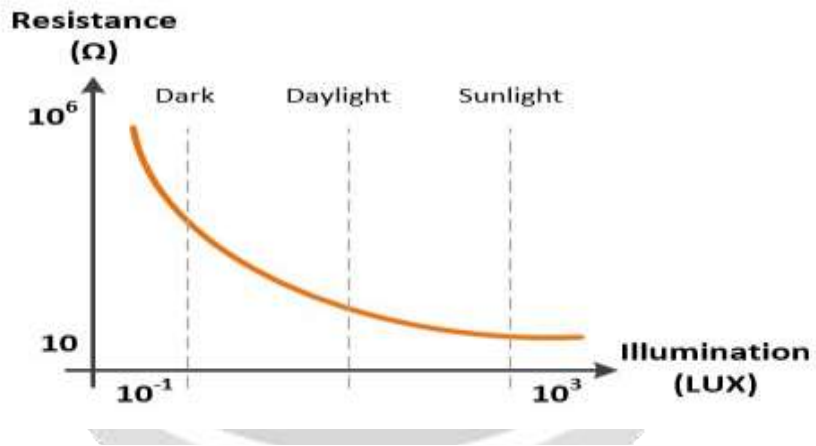
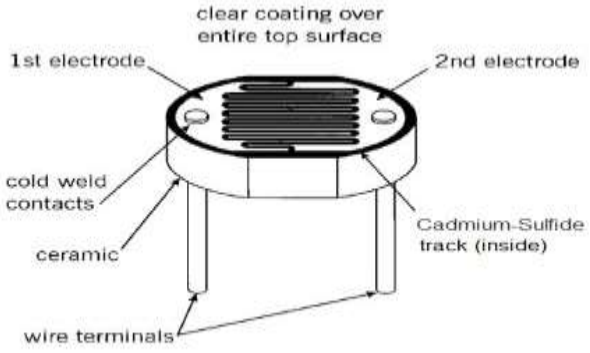


Fig.4.2.1 Resistance vs Illumination

A photoelectric device can be either intrinsic or extrinsic. An intrinsic semiconductor has its own charge carriers and is not an efficient semiconductor, for example, silicon.

In intrinsic devices, the only available electrons are in the valence band, and hence the photon must have enough energy to excite the electron across the entire band gap.

Extrinsic devices have impurities, also called dopants, and added whose ground state energy is closer to the conduction band; since the electrons do not have as far to jump, lower energy photons (that is, longer wavelengths and lower frequencies) are sufficient to trigger the device. If a sample of silicon has some of its atoms replaced by phosphorus atoms (impurities), there will be extra electrons available for conduction. This is an example of an extrinsic semiconductor.



Typical Construction of a Plastic Coated Photocell

A photoresistor is less light-sensitive than a photodiode or a phototransistor. The latter two components are true semiconductor devices, while a photoresistor is an active component that does not have a PN-junction. The photoresistivity of any photoresistor may vary widely depending on ambient temperature, making them unsuitable for applications requiring precise measurement of or sensitivity to light photons.

Photoresistors also exhibit a certain degree of latency between exposure to light and the subsequent decrease in resistance, usually around 10 milliseconds. The lag time when going from lit to dark environments is even greater than, often as long as one second. This property makes them unsuitable for sensing rapidly flashing lights, but is sometimes used to smooth the response of audio signal compression.

4.3 IC 7812 Voltage regulator

7812 Voltage regulator is a type of self-contained fixed linear voltage regulator integrated circuit. The IC belongs to IC 78xx voltage regulator family.

The 7812 voltage regulator IC is ease-of-use and available in very low cost. The last two digits of 7812 indicates the output voltage that is 12 V

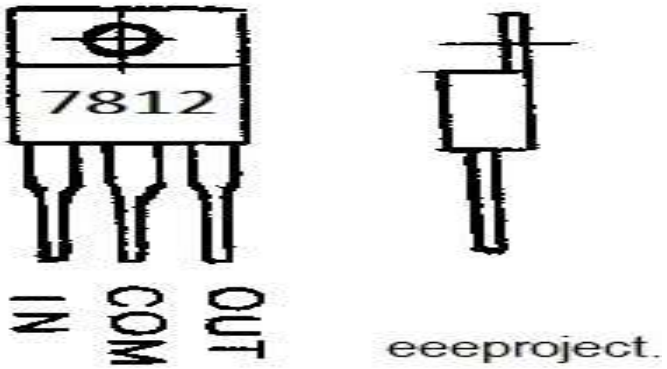


Fig.4.3 7812 voltage regulator

The IC 7812 is a positive voltage regulator which means that it generates the positive voltage with respect to the common ground.

In case if both the positive and negative voltage supply is needed in the same circuit. The voltage regulator IC 7812 is combined with its corresponding 79XX family IC that is 7912 IC.

The voltage regulator 7812 is available most commonly in TO-220 packages well as TO-3, TO-92 and surface mount Packages.

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

4.3.1How to use IC 7812

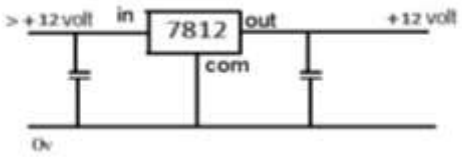


Fig 4.2.1. 7812 voltage regulator circuit

The 7812 IC have 3 pins.

- The positive input is at pin 1.
- The Pin 2 is common between both input as well as output voltage.
- Pin 3 is a positive output.

When using the voltage regulator setup, you need to take care of the current through the voltage regulator ic do not exceed beyond the capacity which is mentioned in the datasheet or else it may blow off. You also have to be careful with the connection you are making with the voltage supply. Reverse polarity does get the ic heat up really quickly, you can also use a pn junction diode in order to prevent such a condition.

Also read jk flip flop.

You can use the capacitors in order to minimize the voltage fluctuations in the circuit and maintains the constant voltage across the input as well as output of the circuit.

Also see difference between microprocessor and microcontroller.

4.3.2 Advantages of IC 7812

- 7812 voltage regulator IC does not require any component to balance or saturate their output voltage.
- The 7812 IC has a built-in protection from the high current. It has a heat-sink with the common ground connected with it. The heat sink prevents our regulator IC from overheating and short-circuits.

4.4 Relay

Electromagnetic relays are those relay which operates on the principle of electromagnetic attraction. It is a type of a magnetic switch which uses the magnet for creating a magnetic field. The magnetic field then uses for opening and closing the switch and for performing the mechanical operation.

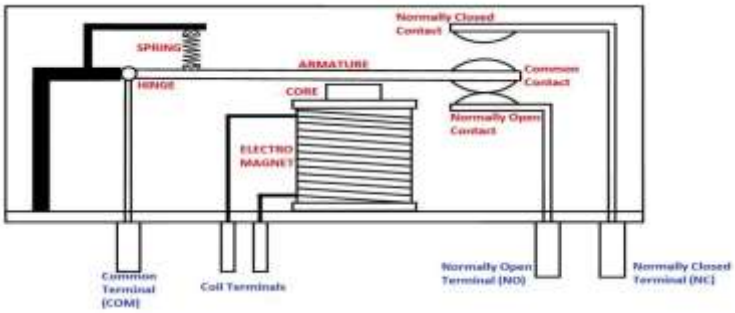


Fig.4.4 Electromagnetic relay

The construction and working of a relay can be understood from the above diagram. The main part of a relay is the electromagnet. The electromagnet is made by a coil of wire wrapped around a soft iron core which provides low reluctance path for magnetic flux. It also consists of a movable iron armature and one or more set of contacts. These are held in a position by a spring as shown in the above diagram. Normally a spdt relay has 5 terminals. Two them are used to energies the electromagnet and other three are com, No, NC. Com stands for common, no stands for normally open and NC stands for normally closed. When the electromagnet is not energized, the armature will be connected to NC contact. Thus com and NC will be connected. When the electromagnet is energized, the electromagnet attracts the iron armature and it will be connected to no contact. Thus com and no will be connected.

- **Specifications of relay**
  - Coil ratings
  - Contact ratings
  - Change over time
  - Enclosure and mounting
- **Coil ratings**
  For dc operated relays electromagnet excitation voltage and coil resistance are specified while for ac operated relays a c voltage and VA ratings are specified.
- **Contact ratings**
  The commonly used contact ratings are the maximum voltage and current it can handle continuously.

- **Change over time**
  It is also known as operation time. Turn – on (switch – on) time is the time required for the relay to make on contact after energizing the electromagnet and turn – off (switch – off) time is the time required to make off contact after de-energizing the relay. In some applications such as ups these times are critical.
- **Enclosure and mounting**
  Relays are available in enclosure and in open execution. If the relays are used in cabinet of a device, then you may use open execution type. However if there is a possibility of dust gathering in to electrical contacts, it is better to use enclosed type relays. There is also a possibility of sparks in contacts, thus in hazardous environments properly enclosed relay must be selected.

4.5 Solar panel

4.5.1 History of solar panel

A solar panel, or photo-voltaic (PV) module, is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy and generate direct current electricity. A collection of PV modules is called a PV panel, and a system of panels is an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

Fig.4.5.1 solar panel

In 1839, the ability of some materials to create an electrical charge from light exposure was first observed by Alexandre-Edmond Becquerel.[1] Though the premiere solar panels were too inefficient for even simple electric devices they were used as an instrument to measure light.[2] The observation by Becquerel was not replicated again until 1873, when Willoughby Smith discovered that the charge could be caused by light hitting selenium. After this discovery, William Grylls Adams and Richard Evans Day published "The action of light on selenium" in 1876, describing the experiment they used to replicate Smith's results.

In 1881, Charles Fritts created the first commercial solar panel, which was reported by Fritts as "continuous, constant and of considerable force not only by exposure to sunlight but also to dim, diffused daylight."[4] However, these solar panels were very inefficient, especially compared to coal-fired power plants. In 1939, Russell Ohl created the solar cell design that is used in many modern solar panels. He patented his design in 1941.[5] In 1954, this design was first used by Bell Labs to create the first commercially viable silicon solar cell.[1] In 1957, Mohamed M. Atalla developed the process of silicon surface passivation by thermal oxidation at Bell Labs. The surface passivation process has since been critical to solar cell efficiency.

4.5.2 Construction and working

Photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. Most modules use wafer-based crystalline silicon cells or thin-film cells. The structural (load carrying) member of a module can be either the top layer or the back layer. Cells must be protected from mechanical damage and moisture. Most modules are rigid, but semi-flexible ones based on thin-film cells are also available. The cells are usually connected electrically in series, one to another to the desired voltage, and then in parallel to increase current. The power (watts) of the module is the mathematical product of the voltage (volts) and the current (amps) of the module. The manufacture specifications on solar panels are obtained under standard condition which is not the real operating condition the solar panels are exposed to on the installation site.

A PV junction box is attached to the back of the solar panel and functions as its output interface. External connections for most photovoltaic modules use MC4 connectors to facilitate easy weatherproof connections to the rest of the system. A USB power interface can also be used.

Module electrical connections are made in series to achieve a desired output voltage or in parallel to provide a desired current capability (amperes) of the solar panel or the PV system. The conducting wires that take the current off the modules are sized according to the current rating and may contain silver, copper or other non-magnetic conductive transition metals. Bypass diodes may be incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated. Some special solar PV modules include concentrators in which light is focused by lenses or mirrors onto smaller cells. This enables the use of cells with a high cost per unit area (such as gallium arsenide) in a cost-effective way. Solar panels also use metal frames consisting of racking components, brackets, reflector shapes, and troughs to better support the panel structure

4.4 DC generator

A generator is a machine that converts mechanical energy into electrical energy by using the principle of magnetic induction. This principle is explained as follows:

Whenever a conductor is moved within a magnetic field in such a way that the conductor cuts across magnetic lines of flux, voltage is generated in the conductor.1-2 The AMOUNT of voltage generated depends on

(1) The strength of the magnetic field,

(2) The angle at which the conductor cuts the magnetic field,

(3) The speed at which the conductor is moved, and
(4) The length of the conductor within the magnetic field.

The POLARITY of the voltage depends on the direction of the magnetic lines of flux and the direction of movement of the conductor. To determine the direction of current in a given situation, the LEFT-HAND RULE FOR GENERATORS is used. This rule is explained in the following manner.

4.6.1 LEFT-HAND RULE FOR GENERATORS

Extend the thumb, forefinger, and middle finger of your left hand at right angles to one another, as shown in figure Point your thumb in the direction the conductor is being moved. Point your fore finger in the direction of magnetic flux (from north to south). Your middle finger will then point in the direction of current flow in an external circuit to which the voltage is applied.

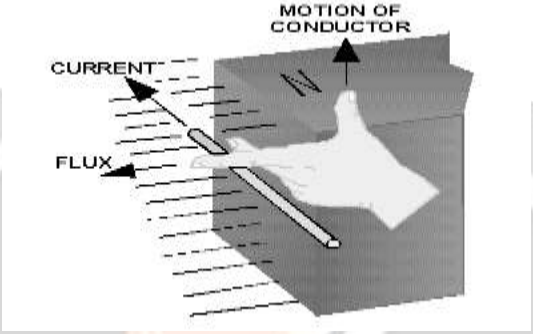


Figure 4.6.1.a Left-hand rule for generators

Fig.4.6.1.b Dc generator

This is 12V DC motor which has a gearbox of 45mm diameter. The planetary type gearbox of this motor has a metal gears and a Centre shaft. The Shaft of the motor is loaded with bearing for wear resistance and smooth operation. 300RPM 12V Johnson, high torque DC geared motors is used for robotics applications. It gives a massive torque of 9Kgcm. The motor comes with metal gearbox and off-centered shaft.

4.5.2 Specifications

- 300RPM 12V DC motors with Metal Gearbox and Metal Gears.
- 6mm diameter shaft with M3 thread hole
- Gearbox diameter 40 mm.
- Diameter 28.5 mm.
- Length 63 mm without shaft.
- Shaft length 30mm.
- 180gm weight.
- No-load current = 800 mA, Load current = up to 7.5 A (Max).

4.7 SOFTWARE USED

4.7.1 ARDUINO IDE

The open-sourceArduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OSX, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board. Refer to the Getting Started page for Installation instructions.

[1]. The Arduino Integrated Development Environment (IDE) is a cross-platform Application (for Windows, mac OS, Linux) that is written infunctions from C and C++

[2]. It is used to write and up load programs to Arduino compatible boards, but also, with The help of 3rd party cores, other vendor development boards.

[3]. the source code for the IDE is released under the GNU General Public License, Version.

[4]. The Arduino IDE supports the languages Cand C++ using special rules of code Structuring.

[5]. The Arduino IDE supplies a software library from the Wiring project, which provides Many common input and output procedures. User-written code only requires two basic Functions, for starting the sketch and the main program loop, that are compiled and Linked with program stubmain () into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution.

[6]. The Arduino IDE employs the program avrdude to convert the executable code into Text file in hexadecimal encoding that is loaded into the Arduino board by a loader Program in the board's firmware.

[7]. By default, avrdude is used as the uploading tool to flash the user code on to official Arduino boards

[8]. Arduino Pro IDE:

- Developer(s) : Arduino Software
- Preview release: v 0.0.2/28 October 2019;4 months ago[9]
- Repository : github.com/arduino/Arduino
- Writtenin : C,C++
- Operating system :Windows, mac OS, Linux
- Platform : IA-32,x86-64, ARM
- Type : Integrate development environment
- License : LGP L or GP License
- Website: blog.arduino.cc/2019/10/18/arduino-pro-ide-alphapreview-with-advanced-features/
- In October2019 the Arduino organization began providing early
- Access to a new Arduino Pro IDE with debugging and other advanced features.

4.7.2 PROTEUS 8.1

The Proteus is an electronic circuit design software which includes as schematic capture, Simulation and PCB (Printed Circuit Board) Layout modules. But generally now a days Eagle CAD is highly preferred Dover Proteus for PCB designing because of its flexibility. Even though if u are not using for PCB designing u can view the PCB layout of the Component individually while selecting the component it helps during the soldering of Components in PCB.Proteus is a head insimulating the circuits containing the microcontrollers where we Can simulate the circuit by uploading the hex code to the Micro-controller whereas Multism can't do this.Net list file (WritteninVerilogCode).if needed for your usage can also be extracted from the tools option in this software.

5.1 ADVANTAGES

- Wind-solar hybrid streetlights have the advantages of high efficiency,
- long service life,
- maintenance free, light weight,
- easy installation,
- antistrong wind, low noise,
- Rust proof, anti-corrosion and waterproof.
- The solar energy resources throughout the world are inexhaustible.
- It is not depending on the laying of cables.

- It also has the advantages of zero carbon emissions, small investment, emission reduction and environmental protection.]

5.2 DISADVANTAGES

- When the wind turbine is running at night, it will cause some noise, affecting the people's normal life and sleep. But with the development of technology, the problem will be solved in the future.
- Weak lights: In the continuous rainy weather, it is difficult to get enough sunshine. Generating capacity cannot be guaranteed, so that the lamp light is faint.

5.3 FUTURE UP-GRADATION

- To increase the solar efficiency the four axis movable system is implement for to tracking maximum rays of sun.

6. CONCLUSIONS

As discussed above the hybrid street lamp successfully develop. The future work is to reduce the cost of the working model and to make it available to the needy. Scholars should work towards making India a nation with affordable and clean energy by tapping the renewable energy assets in an ideal way. The prototype of the proposed model is made and tested for optimum output. Based on the prototype design.

6. REFERENCES

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