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DESIGN OF AUTOMATIC STREETLIGHT AND USING ENERGY FROM WIND TO OPERATE

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ABSTRACT

Automation, Power consumption and Cost Effectiveness are the important considerations in the present field of electronics and electrical related technologies. Industry of street lighting systems are growing rapidly and going to complex with rapid growth of industry and cities.

Main goal of the proposed work is to control switching of street light automatically according to light intensity and the power consumptions at the streets, thereby eliminating manpower. This includes controlling a circuit of street lights with specific Sensors, LDR and Microcontrollers during day and night. Also our paper is one attempt to generate the electrical energy using a non-conventional energy source to operate the sensors[1].

Keyword: Dynamo, IR sensor, Keil software, LDR sensor, Propeller and Proteus.

I. INTRODUCTION

Street lights are the major requirement in today's life of transportation for safety purposes and avoiding accidents during night. Despite that ,in today's busy life no one bothers to switch it off/on when not required. The project introduced here gives solution to this by eliminating manpower and reducing power consumption. Also, in today's scenario, the demand for energy has been increasing at an alarming rate and there has been a decrease in the availability of energy resources. For sustainable development, the need of the hour is to develop more efficient, pollution fee and renewable energy resources to meet the unending demands. Thus valuable voltage, required to operate various sensors, is generated with the help of the moving wind i.e. by converting wind energy into electrical energy. For this purpose, an assembly is made in which a propeller is connected to a dynamo[2]. When the propeller rotates, it automatically rotates the dynamo. The output of this dynamo is connected to the DC battery. The battery gets charged and thus is used to operate the sensors. Here street lights are represented by LEDs which are controlled by programming a microcontroller AT89S52[3].

II. PROPOSED METHOD

2.1 Background

For the first time, Michael Faraday built an electromagnetic generator, using a small copper disc. It produced small DC voltage but it was not a dynamo as it did not use commutator. The modern dynamo, fit for use in

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industrial applications, was invented independently by Sir Charles Wheatstone, Werner von Siemens and Samuel Alfred Varley which is shown in figure 1.

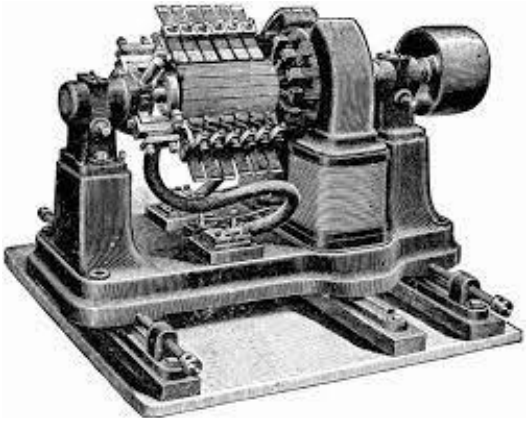

Fig 1 First dynamo to be used in industries

By 1827, Czech-Austrian inventor Josef Ressel had invented a screw propeller which had multiple blades fastened around a conical base. It was tested on a small ship and could achieve a speed of 11km/hr. So eventually their combination was used to generate electric power on small scale using a bicycle as shown in figure 2.

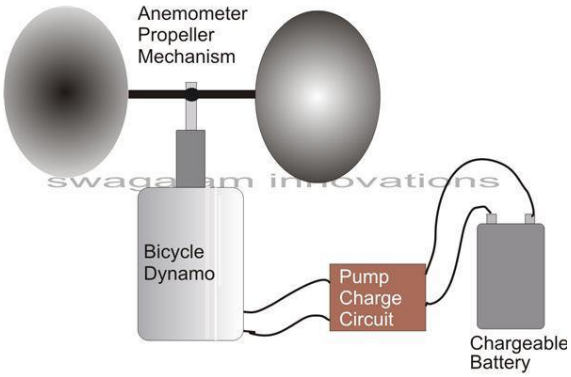

Fig 2 Charging battery using propeller and dynamo

2.2 Method

After detailed analysis of all the possible sources of generation of electric power, a propeller and dynamo are used as a supply source for operating sensors. Let there be a brief introduction about dynamo and propeller. A dynamo is an electrical generator that produces direct current with the use of a commutator[4]. The generation of electricity by a dynamo is based on a principle of magnetism called induction. When the lines of force that pass from the north to the south pole of a magnet are cut by a wire, current is produced. A propeller is a type of fan that transmits power by converting rotational motion into thrust[5]. An Infra-Red(IR) sensor is an electronic sensor that measures infrared light radiating from the objects in its field of view. All objects with a temperature

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above absolute zero emit heat energy in the form of radiation. Usually this radiation is invisible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices such as IR sensor[6]. Infrared transmitter and receiver are used here. Another important component used here is Light Dependent Resistors(LDR). They are generally used to detect day and night[7].

2.3 Implementation

The entire assembly of propeller and dynamo is made. It can easily be installed on the roadside. Whenever a strong wind blows, the propeller rotates as shown in figure 3. This propeller is connected to the dynamo and thus the dynamo rotates. This results in generation of electrical energy. This energy is stored in a battery, which is later used to operate the sensors. As discussed above, the two sensors used are LDR and IR[8].

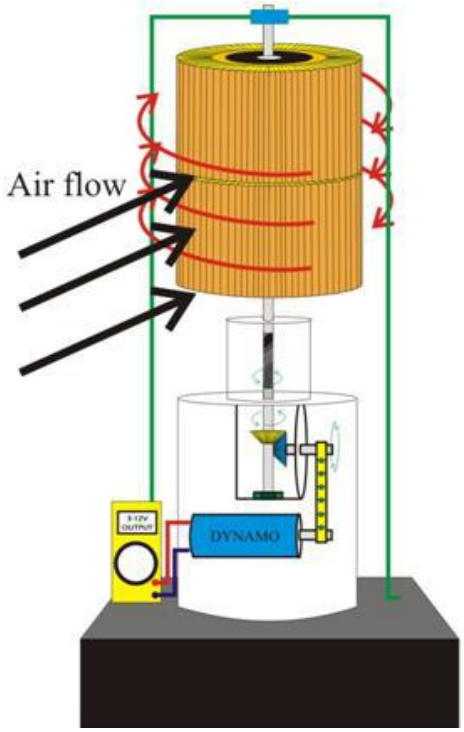

Fig 3 Rotation of blade with blowing of air

LDR is a device whose resistivity is a function of the incident electromagnetic radiation. It works on the principle of photo conductivity. When the falls i.e. when the photons fall on the device, the electrons in the valence bond of the semiconductor material are excited to the conduction band. These photons in the incident light should have energy greater than the band gap of the semiconductor material[9]. Hence when the light having enough energy is incident on the device, more and more electrons are excited to the conduction band which results in large number of charge carriers[10]. Hence more and more current starts flowing through it and its resistance is decreased. Similarly its resistance is increased during night i.e. absence of light. Therefore, it helps in detecting the time of the day.

IR sensors are used here to determine whether or not there is a vehicle on the road. An IR transmitter transmits IR signal and a signal is received at the IR receiver when the IR radiation bounces back from a surface of the object[11].

The LEDs representing street lights will be off during day-time. As soon as the light on LDR sensor

decreases, i.e. by the evening the LEDs will glow upto 50% of its total capacity[12]. Whenever a vehicle approaches, it will be detected by IR sensor and thus LED will glow to its maximum limit. The basic layout is shown in figure 4.

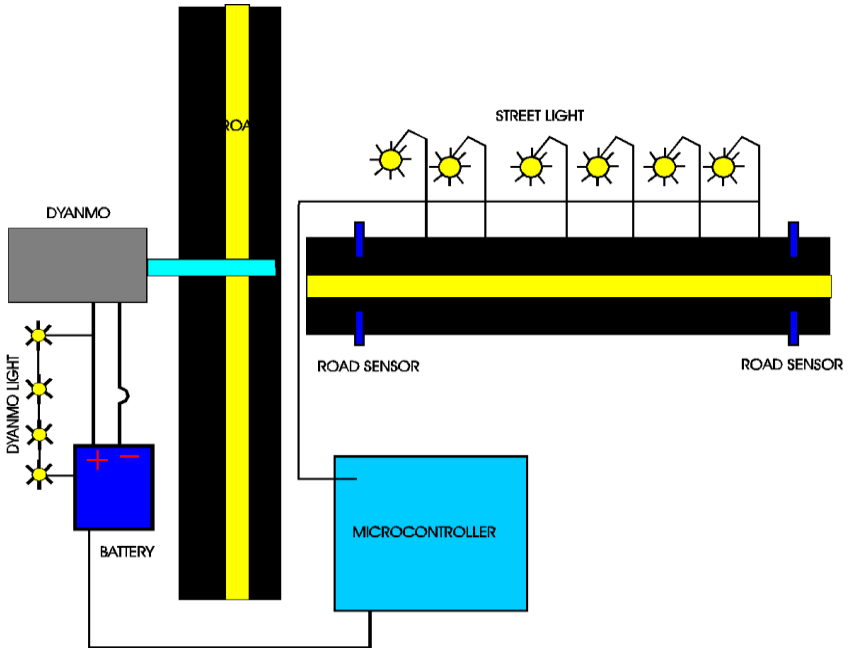

Fig 4 : Basic Layout

III. CONCLUSION

This idea of AUTOMATIC STREET LIGHTS is a cost effective, practical, eco-friendly and the safest way to save energy. It clearly tackles the two problems that world is facing today, saving of energy and also disposal of incandescent lamps, very efficiently. According to statistical data, more that 40 % of electrical energy can be saved that is now consumed by the highways. This idea presents far more advantages which can over shadow the present limitations like initial cost and maintenance. Keeping in view the long term benefits, the initial cost would never be a problem as the investment return time is very less. Also the supply used for the entire operation is non-conventional so it does not pollute the environment and does not require heavy expenditure.

IV. FUTURE SCOPE

The main aim of this idea is to conserve energy. So to do that, automatic street lights can be provided with the centralized intelligent systems. So, in future many more advanced technologies can be designed to save power. The idea has scope in various other applications like for providing lighting in industries, campuses and parking lots of huge shopping malls. This can also be used for surveillance in corporate campuses and industries.

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