Automatic power generation using rain water harvesting and solar energy

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ABSTRACT

Over the years of the rising population, practices that increase demand for water supply and electricity have grown in industries as well as in the expansion of agriculture. Monsoon is still the main hope and the source of our agriculture. In this perception, water-saving has become a necessity for mankind. Rainwater harvesting is a way to capture rainwater at the time of the downpour, store the water above the ground or download the underground water and use it later. Presently, rainwater harvesting is being carried out by the method of using the pathway at rooftops. But, the accumulation of dry leaves and microbial contamination in the rainwater pathway blocks the outlet and degrades the quality of water. The above-mentioned problem will be addressed in the present investigation, which aims to design an automated rainwater pathway, thereby enabling the collection of pure water. This system will make use of a mechanism that will be actuated by a rain gutter which is actuated by a servo motor, controlled by a rain sensor.

Keywords— Rain gutter, Rain sensor, Level sensor, LCD, DC motor, Solar panel, Battery, ARM processor

1. INTRODUCTION

Electricity and Water are basic needs in human life. Solar energy is radiant light and heat from the Sun Solar energy is important to a source of renewable energy. Solar power is the conversion of sunlight into electricity. Photovoltaic solar panels absorb sunlight as a source of energy to generate direct current electricity. Solar power is anticipated to become the world's largest source of electricity by 2050, with solar photovoltaics and concentrated solar power contributing 16 and 11 percent to the global overall consumption, respectively. In 2016, after another year of rapid growth, solar generated 1.3% of global power.

Capturing and storing rainwater for use is particularly important in the dry land, hilly, urban and coastal areas. The widely used technique for capturing rainwater is rooftop rainwater harvesting. It is simple way of storing water and has many advantages. Mainly it will meet the ever-increasing demand for water. Rainwater harvesting will avoid flooding of roads. Rainwater harvesting will augment groundwater storage and control decline of water levels. Rainwater harvesting will reduce groundwater pollution, Rainwater harvesting will improve the quality of groundwater. It will supply domestic water requirements during summer, drought, etc.

2. MOTIVATION

As demand for electricity has increased it has become necessary to generate electricity at home or agriculture. Rooftop Rain Water Harvesting is the technique through which rain water is captured from the roof catchments and stored in reservoirs. By using rain water we will generate electricity by using turbine. And also we will generate electricity by using solar energy. Harvested rain water can be stored in sub-surface ground water reservoir to meet the household needs through storage in tanks. The Main Objective of rooftop rain water harvesting is to make water available for future use.

3. LITERATURE REVIEW

Water harvesting can be defined as the "collection of runoff for its productive use". Overflow or Runoff may be harvested from roofs and ground surfaces. Water harvesting techniques which harvest the runoff from roofs or ground surfaces fall under the term: Rainwater Harvesting. The major source of electricity in India is the Hydro-Electric Power. Hydro Technologies are associated with zero air emissions with electricity production are considered to be „Green Energy" among solar, wind, geothermal and tidal energy, Hydro Power contributes 83% of the renewable energy source (RES). Support of each country for the use of RES for electricity based on the Kyoto Protocol and Bali Climate Change Conference should be encouraged. Small hydropower systems (SHPS) in many cases are suitable for a group of users or individual users independent of the electricity supply grid...The activation and utilization of the potential energy that is inherent in the drinking water stored in high-level tanks of RWH system installed in a multi-story building are of growing interest. The maximum electrical output power of 5 KW comes under Pico hydropower.

Rooftop harvesting is a system of catching rainwater where it falls. In rooftop harvesting, the roof becomes the catchments, and the rainwater is collected from the roof of the house/building. It can either be stored in a tank or diverted to an artificial recharge system. This method is less expensive and very effective and if implemented properly helps in augmenting the groundwater level of the area. The harvesting of rainwater simply involves the collection of water from surfaces on which rain falls, and subsequently storing this water for later use. Normally water is collected from the roofs of buildings and stored in rainwater tanks. This is very common in rural Australia. Water can also be collected in dams from rain falling on the ground and producing runoff.

Rivers are dying or declining and aquifers are getting over-pumped. Thus, people have to depend on limited municipal water supply. Consequently, they are forced to rely on their own resources. This scarcity has led to the birth of water markets with private entrepreneurs doing business in supplying water tankers. This, once again, is putting pressure on surface and groundwater sources which are fast depleting all over the country. Eighty-five percent of India's urban population has access to drinking water but only 20 percent of the available drinking water meets the health and safety standards.The water in rivers is wasted as it flows into the sea and is not properly harnessed. The debate on dams as a means of harnessing water continues to make this issue politically and environmentally sensitive. No clear ecologically stable and financially viable solution has emerged. The poor state of local and municipal authorities renders them unable to provide basic water to the cities. Strengthening of local bodies could lead to another means of addressing this issue.

Today energy is the main inspiration for socio-economic development. But due to the incremental rate of environmental concern renewable energy provides a significant interest. This alternative power source is continuously achieving greater popularity due to continuous reduction in fossil fuels. It is the energy comes from sun, wind, rain, etc. Among the non-conventional, renewable energy sources, solar energy affords great potential for conversion into electric power. Maximizing power output from a solar system is desirable to increase efficiency. In order to maximize power output, needs to keep the panels aligned with the sun. This paper deals with the electricity generation using solar power. The proposed system ensures the optimization of the conversion of solar energy into electricity by properly orienting the panel in accordance with the position of the sun. The operation of the paper is based on a Stepper motor intelligently moves a panel according to the light intensity of the sun sensing by light sensor. Conserving and Simultaneously Generating Electricity Using Rainwater is designed to reap the rainwater for producing electrical electricity. The predominant objective of this work is to overcome the water and strength troubles in urban areas particularly in factories, multiplexes, flats and hospitals, and many others. The space between the 2 skyscrapers may be applied to install a trolley balanced via a counterweight, such that it's far first of all held on the top of the constructing. While there may be a rainfall the trolley receives filled up with the rainwater.

4. SYSTEM ARCHITECTURE
4.1 Solar panel
36W, 18V solar panel will be used on the house terrace to generate the electricity from Sunrays.

4.2 Battery
The battery will be used to store the charge, for this charge. The circuit will be built which charges the 12v, 1A battery
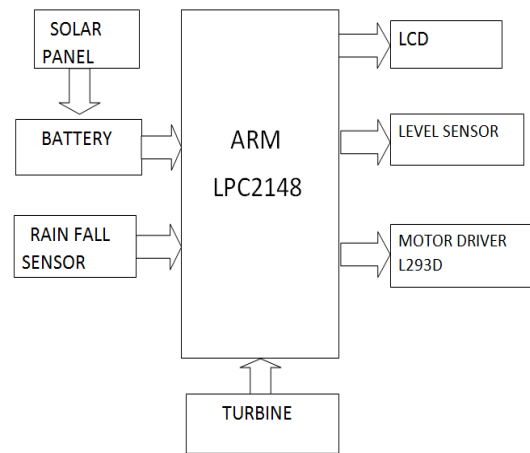

Fig. 1: Block diagram of the system

4.3 ARM controller
LPC2148 series for the control process will be used for whole system, it is one of the advance Controller for fast process.

4.4 Water level sensor
It will show water capacity on the rain gutter when rain gutter will get full at fixed level then sensor sends signal to controller.

4.5 Rain fall sensor
Rain fall sensor will be used to sense the rain, which will indicate to control system that rain now starts.

4.6 DC generator
This will be used to generate 12v DC output voltage when fan will start rotating by high-pressure water coming from rain gutter.

4.7 L293D motor driver IC
L293D is a typical motor driver IC which allows DC motor to drive on either direction

4.8 LCD
On LCD we will display the sensor output i.e. rainy season condition, level sensor condition to show the water rain gutter full capacity.
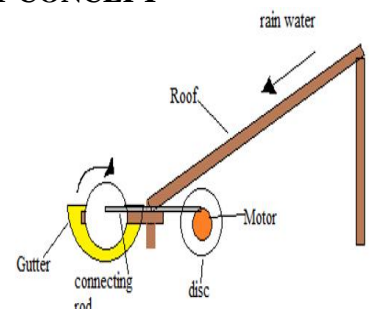
5. PROJECT CONCEPT

Fig. 2: Auto-mechanism of system

In this project we will use the solar panel as a Rooftop when there is no raining, solar panels will generate electricity and store energy (electricity) in battery. We will use charge circuit between solar and battery to store electricity in battery. And supply from this battery is given to controller circuit, to operate the system.

We will use a rain sensor on our project. When there is raining at that time this rain sensor will send signal to controller circuit and then controller sends signal and rotates rain gutter in

opposite direction, the rain gutter will be ready to capture rainwater from rooftop. When the rain gutter will full at fixed level, level sensor sends signal to controller and controller gives signal to electronic valve, then electronic valve will open and water will pass from valve. Water will fall on turbine in high pressure hence turbine will rotate according to the water pressure falls on it. As the turbine rotates, the electricity will be generated, this electricity we can use for normal home appliances or we can store it in battery. The generated electricity will be approximately up to 12V, this depends on the water pressure falling on it. The turbine is consists of movable magnet and fixed coil or fixed magnet and movable coil, as magnet or coil rotates electricity will generate.

6. CONCLUSION

Rainwater harvesting is a viable option to supplement water for non-portable human uses such as irrigation. The overall efficiency of a rainwater harvesting system to supplement water increases as area increase. Using this method, we will generate electric power. The whole concept of project will be design on Protel, Proteus and Keil software.

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