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Wireless Pump Control with Water Level Monitoring System

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ABSTRACT

Water and energy are the two main pivotal reason of concern in today's world. With the rise in population the demand for both energy and water is increasing day by day. To reduce the wastage of these two essential resources and to save time an automated water pump has been designed, involving cheap electronic devices like RF module, relay, PV cell etc. The pump works on renewable power source i.e. solar energy and includes an automated water level indicator which indicates the water level at various stages, being full, empty and middle. Thus in the processes switching on the pump when the tank is empty and switching the pump off when the tank gets full so that no water is wasted and the hole system will wireless.

Keywords: Encoder & Decoder ICs, Relay, Radio Frequency Module, PV Cell.

1. INTRODUCTION

Our world and community is facing excessive water usage either for domestic or commercial purposes and it is a serious issue, which affects the sustainability of our environment. As water is one of the scarce natural resources, it is important to properly use and manage our usage in different sectors. . Especially in those places which are known for low-drinking water supplies like Middle East and North African countries, there is a need to monitor the water usage across the different sectors such as the residential, agricultural, commercial and industrial areas. Now a day's, there is a lot of study to conserve our natural resources such as energy and water.

Water and energy conservation techniques and technological interventions are important to attain sustainable solutions to our environment that is currently at risk due to excessive use of such natural resources as a result of increase in population, human demand and economic growth. According to United Nations (UN) report, almost half of the world's workers work in water-related sectors showing most of the jobs dependent on water.

According to United Nations report, almost half of the world's workers work in water-related sectors showing most of the jobs dependent on water. Therefore, investments that enable proper water usage mechanisms or technologies will have significant impact on sustainable development. One of the factors that diminish the accessibility of enough water is climate change that also arises due to the excessive use of non-renewable energy sources such as fossil fuels. As water is needed for energy production, energy is also needed for production, transportation and distribution of water. An electronic system was designed for automatic controlling of water pumps that are used for agricultural fields or plant waters and light intensity controller for energy saving.

Water is a limited resource and it is very essential for agriculture, industry and also for creatures' existence on earth including human beings. Every living thing on earth needs water to survive. Human bodies are made up of more than 70 percent water. The main use of clean water is to drink, grow crops for food, operate factories, and for swimming, surfing, fishing and sailing. Mainly water is wasted by human beings by many uncontrolled way. So we

have to control the pumping system with a perfect way to prevent the wastage of water. By using automatic pump controlling system, we can avoid the wastage of water, power consumption and easily prevent the water for our future generation.

The wireless automatic pump controlling system is used to avoid overflowing and controlling the level of water in the tank. This pump controlling system implementation makes potential significance in home applications as well as big industries. The method of pump control for home is simply to start the feed pump at a low level and allow it to run until a higher water level is reached in the water tank. And when the water level will reach the predetermined point, the pump will stop and no water will overflow. This control system is widely used for monitoring of liquid levels, reservoirs etc.

In this system, we use the non-conventional energy like PV cell. Also here we use the wide range of wireless system by the radio frequency module 433MHz. In the transmitter module we use a battery backup, which can able to give the backup of the module 24 hours.

The main interesting thing which we implement here is that transformer less power supply. So, in the receiver circuit we will not use a bulky transformer that's why the entire system is very light weight and also low cost. The main advantage of the system is that, we can able to remove this system and it is very easy to re-install.

2. WORKING PROCEDURE

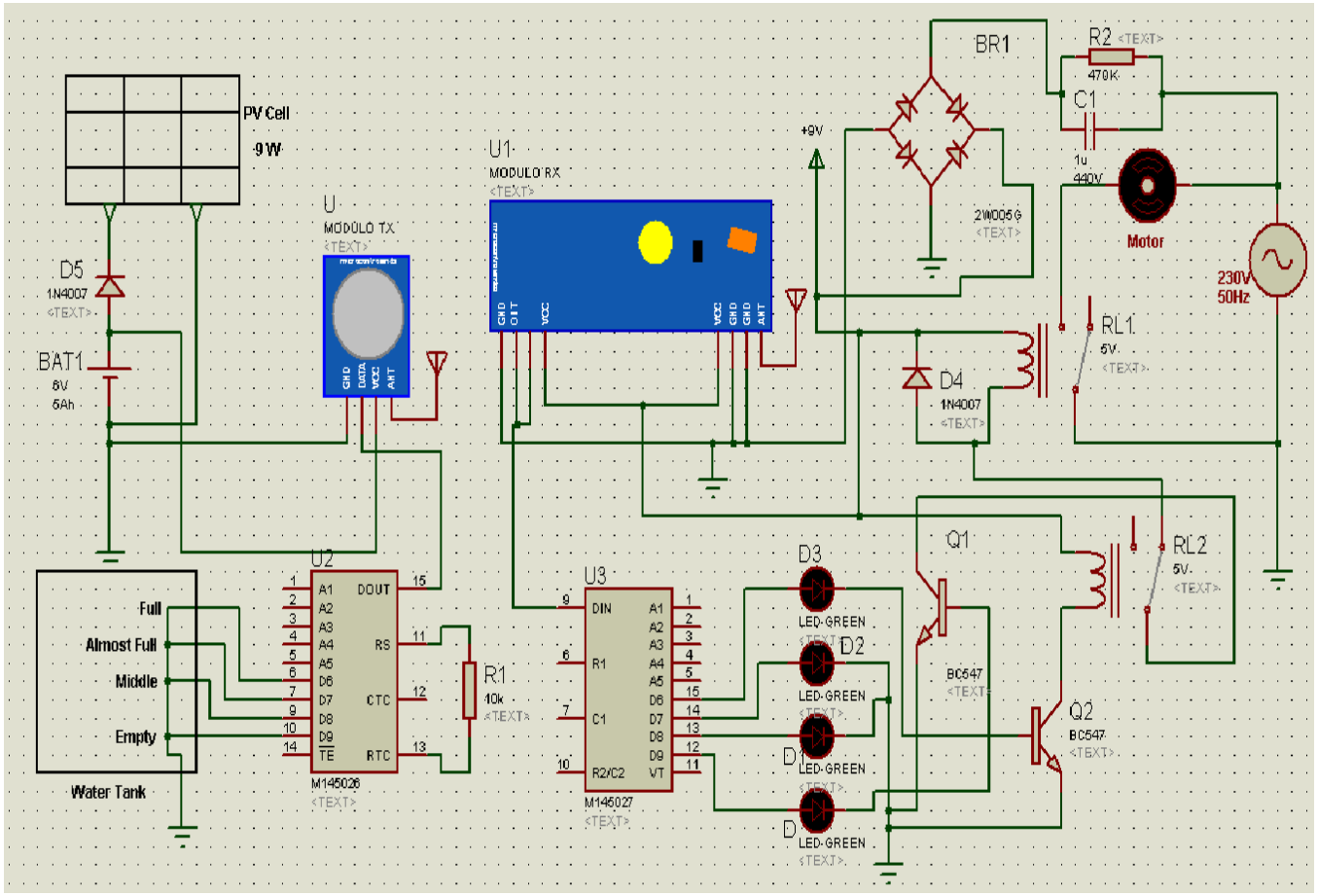
The working procedure of this system is very easy. According to the transmitter circuit configuration we know that, there are five wires. The first four wires are output wires and the last wire is the ground wire. Let assume that, the water tank is empty now, and it is untouched from the empty wire.

At this condition, the transmitter device will send a message to the receiver device and the empty light of the level monitoring system will glow and the receiver device will actuate the relay device to turn on the pump. Again, after some time when the water level of the tank will reach the predetermined middle portion the transmitter circuit will send a message to the receiver circuit and the middle indicating light of the monitoring system will glow.

Gradually the water level is increasing in the tank and when it will touch the predetermined position of almost full wire, the indicating light of the monitoring circuit will glow which will tell us the tank is almost full.

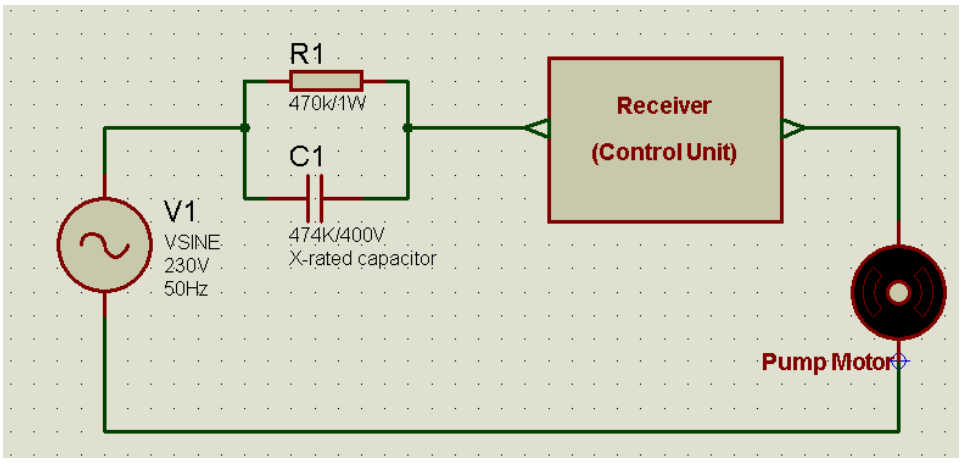
At the last condition of the system when the water level will touch the predetermined position of full wire the monitoring system will indicate that the tank will full now and indicator will glow, at this condition the receiver circuit will actuate a relay to turn the pump of. This is the entire working principle of this system.

3. CIRCUIT DIAGRAMS



3.1. Transformerless Power Supply

We know that, transformer is a static electrical device which can able to step up or step down the voltage from one circuit to another. We can able to see it in many electrical devices. But, the cost of the transformer is very high and it is very bulky. So here we use a new technology which is transformer less power supply. Here we use a ceramic capacitor of 474K and 440v X-rated capacitor and a resistor of 470K; these two components are connected in parallel. And then in series we connect the receiver device and motor.



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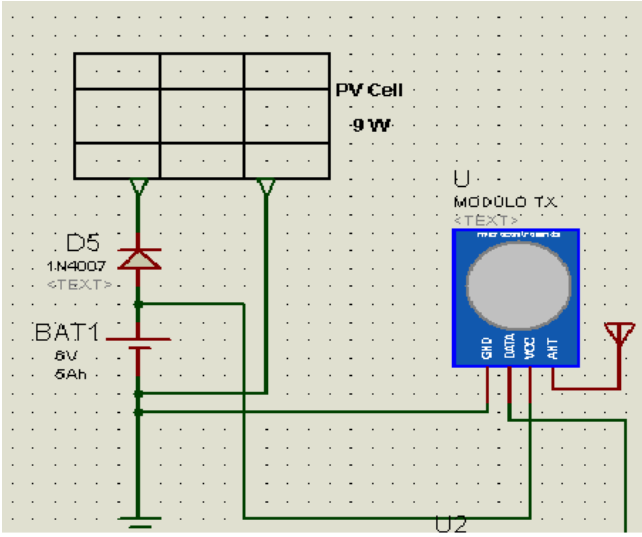
3.2. PV Cell with Battery Backup

In the transmitter circuit we use a PV cell and a 6v 5Ah battery for backup. So we use a configuration which can give power to the transmitter circuit through all day.



3.3. Transmitter

The entire system is automated and it is very helpful for any kind of liquid storage system to control the feed pump. At the preliminary condition of the system, let the storage tank is empty. And there is a predetermined empty point in the tank, which will tell the transmitter device that it is empty or not. According to this method there are five ports total in the tank. The higher one is the full wire, the second one is the almost full wire, the third one is the middle wire, and the fourth one is the empty wire. And the main wire which is ground wire is connected in the base part of the tank. This is the wiring configuration of the transmitter circuit. Now, in this circuit RF transmitting module, encoder IC and a PV cell and a lead-acid battery is connected for the backup of the transmitter circuit through 24×7.

3.4. Receiver

In this part we will discuss about the receiver device of the system. The receiver part consist the RF receiver module which is 433MHz, a decoder IC and etc. The feed pump is connected to this circuit by a high rated relay device. The level monitoring system is connected here. The main thing of this part is that, we create a transformer less power supply here. Now, according to the transmitter device this receiver circuit will turn on the feed pump and also turn it off.

4. CALCULATIONS

In this section we will show that the charging time of the battery and the discharging time of the battery. According to this small calculation we can sure that, is the battery can able to give the transmitter circuit backup through 24×7 or not.

4.1. Charging time of the battery

Here we use a 6 volt and 5Ah lead-acid battery. And a PV cell of 9 watt.

The output power of the PV cell is –

$P = V \times I$

Or, $P = 9 \times 1$

So, the output voltage V= 9volt

The output current I = 1A

The charging time of the battery is = (Ah of the battery / input current) [h= Hour or charging time]

= (5 Ah / 1A)

= 5 h

Therefore, the battery remains full charged in 5 hours.

4.2. Discharging time of the battery

Here we use a 6 volt and 5Ah lead-acid battery and the transmitter module which will act here like an output.

So, voltage of the battery = 6 volt

Capacity of the battery = 5Ah

Current drawn by the output circuit = 0.5 Amp

So, the discharging time of the battery is = (6v × 5Ah) /0.5A

= (30 / 0.5)

= 60×40% [40% is the loss of the battery]

= 24 H

So, by this calculation it is proved that the battery will give backup through 24 hours.

5. CONCLUSION

Water is one of the most important basic needs for all living beings. But unfortunately a huge amount of water is being wasted by uncontrolled use. The main issue that is being addressed in this project is about developing an efficient wireless network based water monitoring system. Finally the thesis water monitoring system of smart home or office, research concept will be completed by using wireless technology. By using the monitoring system we can easily prevent the water and the water will save to our generation.

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