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Full Length Article

SMART BOREWELL OPTIMIZER AND MONITORING SYSTEM TO ENHANCE BOREWELL LIFE

P.KARTHICK[1],R.MURALIDHARAN[2],M.PAVITHRA[3],P.PAVITHRA[4],B.YUVARANI

[a]*Department of Electrical and Electronics Engineering,K.S.R. College of Engineering,Tiruchengode -637215 Tamilnadu, India*

[a]*Assistant Professor, Department of Electrical and Electronics Engineering,K.S.R. College of Engineering,Tiruchengode -637215 , Tamilnadu, India*

[a]*Department of Electrical and Electronics Engineering, K.S.R. College of Engineering Tiruchengode -637215, Tamilnadu, India*

[a]*Department of Electrical and Electronics Engineering K.S.R. College of Engineering, Tiruchengode -637215 Tamilnadu, India*

***Corresponding Author**
muralincc1997@gmail.com
(R.MURALIDHARAN)
Tel.: +91 8682967523

ABSTRACT: Inefficient utilization of water in bore wells is leading to the drying of bore wells. When the overhead tank gets emptied, the motor of any of the bore wells is automatically switched ON regardless of the status of the bore well. So, if there is multiple borewell in an apartment, all the borewell will not have same yielding capacity. But as per the current situation, all 2 borewell are operated same time and same quantity of water will be taken out from borewell. So Lesser yield borewell will lose its yielding capacity easily and possible that borewell will shut down earlier. Our proposed project will provide the solution for this project. We will monitor the yielding capacity of all bore wells and based on the yielding capacity borewell can operated. If borewell has high yielding capacity then we can operate it for more time and if borewell has lesser yielding capacity then we can operate it for less time. So that we can able to increase the borewell life and also water conservation can be done.

1 Introduction

Water is one of the most essential natural resource that has been gifted to the mankind. India is a land of villages where wells and bore wells are an important source of water for the villagers. However, the problem of water scarcity and water pollution is a matter of concern for the rural community of India and hence proper utilization of well water is necessary. Due to the vast increase in industrial output, pollution and the high use of chemical fertilizers, the quality of available in wells and bore wells to the villagers has deteriorated.

We need to measure the quality of the water by ensuring the appropriate pH, transparency level, salinity levels. The system involves inspection of the quality of the well water by measuring important parameters.

LITERATURE REVIEW

Various authors had proposed solution on assessment of water quality of water reservoirs which have been presented at research level. Following are the papers referred: A.N. Prasad, K. A. Mamun, F. R. Islam, H. Haqva has published a paper „Smart Water Quality Monitoring System‟. This paper presents a smart water quality monitoring system using IoT and remote sensing technology, for Fiji. Fiji Islands, located in the Pacific Ocean, requires a data-collecting network for the water quality monitoring. The system has proved its worth by delivering accurate and consistent data throughout the testing period using IoT for real time water monitoring.

Yang Xu and Fugui Liu have presented a wireless sensor system for water testing. The system through the monitoring of the installation of sensor nodes in the waters, timely collection of information, to the water quality monitoring and management center to upload data, and according to the uploaded data to determine whether the pollution of water quality, and then make the alarm processing, real-time and efficient management of water resources.

Brinda Das, P.C. Jain published paper 'Real-time water quality monitoring system using Internet of Things' for monitoring the water quality. The system has a ZigBee module that transfers data collected by the sensors. The module transfers the data to the microcontroller wirelessly, and this data is further transferred from microcontroller to the smart phone/pc via a GSM module.
If somebody attempts to foul the water body, the system will alert the officials by sending a message to them via the GSM module and proximity sensors thing Speak is an open source (OS) IoT application which can store and recover data from sensors or things using Local Area Network (LAN) or HTTP over the Internet. Thing Speak channel supports 8 data fields, elevation, latitude, longitude, and status. thing Speak can send sensor data to cloud to store data in a channel using sensors and websites.

A reconfigurable water monitoring system in an IoT Environment was proposed by Cho Zin Myint, Lenin Gopalm and Yan Lin Aung. In the system, quality of water is remotely monitored by means of real-time data acquisition, transmission and processing. The system proposed a reconfigurable smart sensor interface device for monitoring of water quality in an IoT environment. The smart WQM system consists of Field Programmable Gate Array (FPGA) design board, sensors; Zigbee based wireless communication module and personal computer (PC). The FPGA board is the main component of the given system, but it is very expensive. Zigbee modules used are also very costly.

In the paper put forward by Yunze Li; Ying Wang; Min Cong; Haoxiang Lang, a powerful sensors node was proposed. It was prepared by applying a waterproof UAV and the sensor nodes were mobile. This paper proposed a system for water testing for real time acquisitions of water parameter and approximations. The UAV model used are not 100 percent water-proof and hence can damage the components and thus is not reliable.

A complementary experiment compares the proposed pub/sub architecture and MQTT, a lightweight protocol on which IoT mostly uses, to show better performance of the proposed architecture in case of network latency and throughput for diverse message payload size, thus suggesting the future IoT implementation of the system. However, the deployment and maintenance cost of the system is very high.

PROPOSED SYSTEM

This project is built on IoT based Smart Well Monitoring System. The hardware part of the project consists of sensors, which will sense the pH level of the water, turbidity, dissolve oxygen, water level in the well and other such parameters. Microcontroller is used in the system and all these sensors will be interfaced on the microcontroller. All the data collected will be stored on a cloud. The project involves building an android application for the villagers, which will show all the statistics of the parameters detected by sensors. The application will also provide guidelines for the utilization of the water and purification of the water. This will help the farmers to know which type of water can be used for the cultivation of the given crop and which water is fit for drinking, etc. thus water can be used to the best of their knowledge which will avoid the wastage of water and the pollution of water.

The application built will give the farmers and the villagers the idea about the type of water in the well and will enable them to put the water to correct use. The application will guide them which water could be put to use. Thus, wastage of water is avoided; people will get to drink the water that is fit for drinking and water that are suitable for a particular crop can be used for irrigation purpose. The project can be implemented on a large scale for water monitoring of wells of villages connected to each other. The same project when modified further with the help of technologies can be implemented for monitoring the dead organisms in water. The app could be made more advanced by integrating such systems and gathering a large data.

BLOCK DIAGRAM

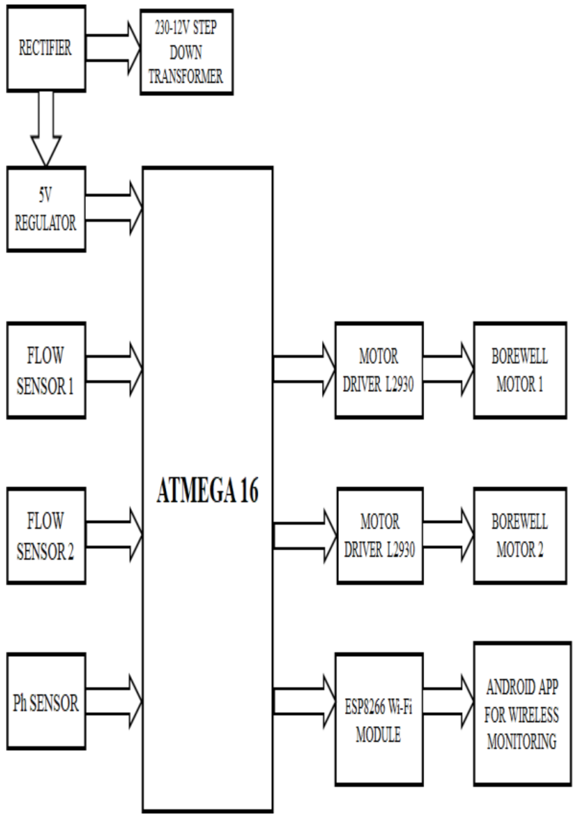

Fig.1. Block Diagram

BLOCK DIAGRAM EXPLANATION

Initially 230v supply is given to the rectifier and the rectifier converts AC to DC. Now the DC supply is given to the regulator which step downs 230v into 5v. The flow sensor determines the water flowing speed and gives to the microcontroller. Then the push button indicates the on and off condition. All the above-mentioned blocks are given as an input to the microcontroller. Microcontroller displays the yield capacity via LCD display. Output from microcontroller is also given to the motor driver which helps to drive the borewell motors. Mobile acts as a controller through the application developed in it.

A. Sensor unit:

The sensor unit of the system consists of following sensors-

pH sensor: The pH sensor SEN0161 is used as the pH sensor with the BNC connector. The output voltage is in millivolts (mV) with respect to the hydrogen ion (H+) concentration in the solution, when dipped into the sample. The output voltage range is from -414mV to +414mV with the operating temperature range of 0-60 degree Celsius. It has the accuracy of 0.01ph.

The output voltage is positive for the acidic sample and negative for the alkaline sample. For neutral sample, it gives zero output. The output pH range for SEN0161 is from 0 to 14. The pH sensor v1.1 is used as the signal amplification circuit to boost the output from mV to volts.

Fig.2. PH Sensor

This sensor gives output in both the modes i.e. digital mode and analog mode. In digital signal mode, the threshold is adjustable.

Flow Sensor:

Water flow sensor consist of a plastic valve body, a water rotor, and a hall-effect sensor. when water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. This one is suitable to detect flow in water. Thus, the flow sensor also used in different types of application.

Fig.3. Flow Sensor

B.Motor drive

A motor driver IC is an integrated circuit which allows DC motor driven or either direction. Motor driver is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that can control a single motor driver IC.

Fig.4. Motor Drive

C..AVR ATMEGA16

AVR is a family of microcontrollers developed by Atmel beginning in 1996. These are modified Harvard architecture 8-bit RISC single-chip microcontrollers. AVR was one of the first microcontroller families to use on-chip flash memory for program storage, as opposed to one-time programmable ROM, EPROM, or EEPROM used by other microcontrollers at the time.

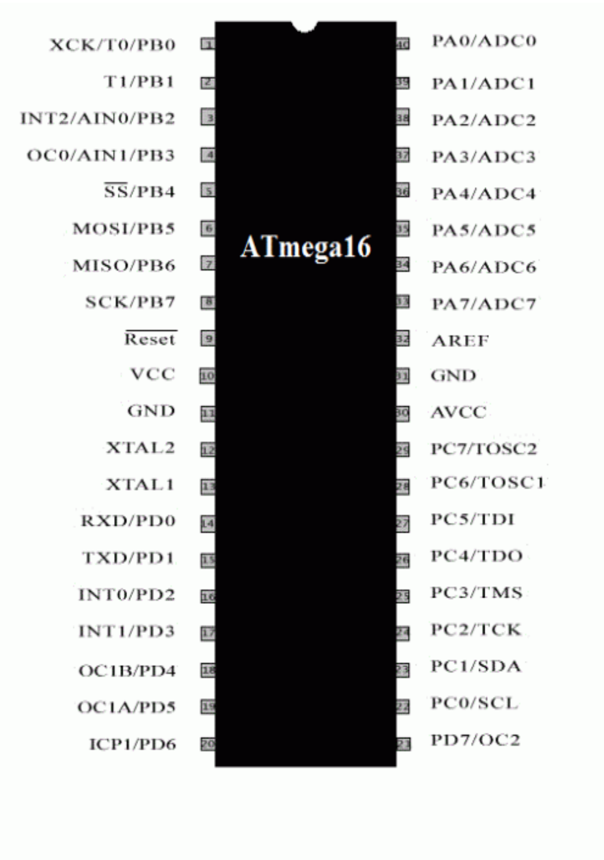

Fig.5. Pin Diagram

SIMULATION

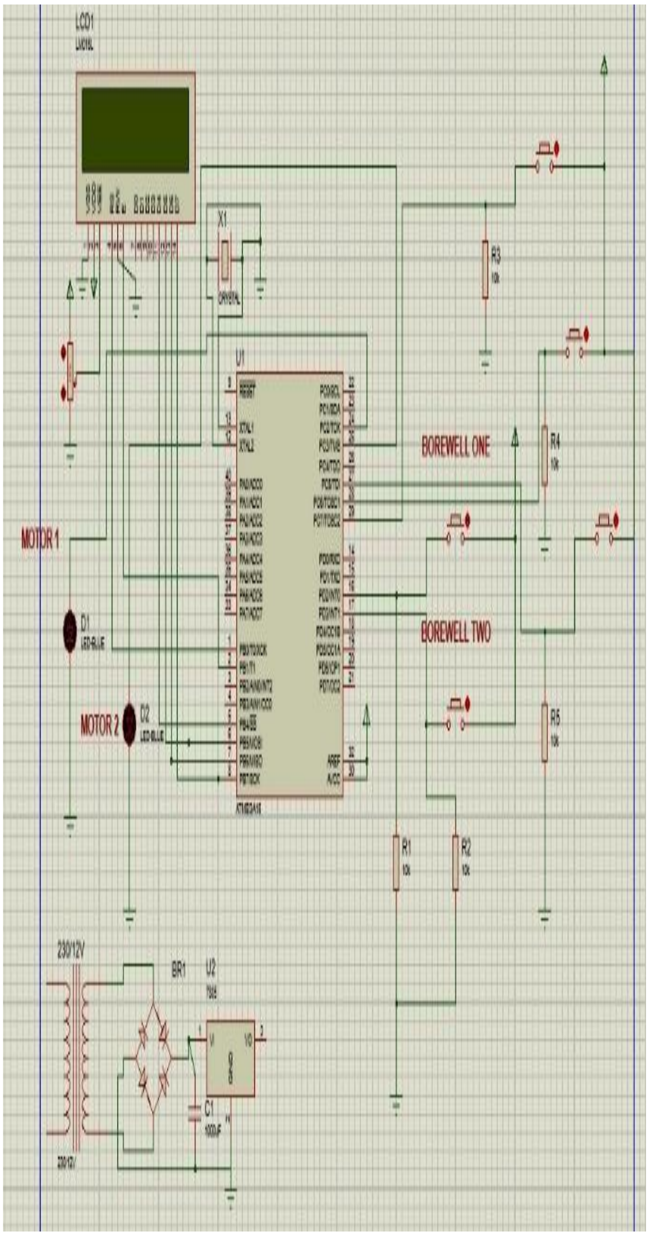

Fig.6. Simulation

RESULT AND DISCUSSIONS

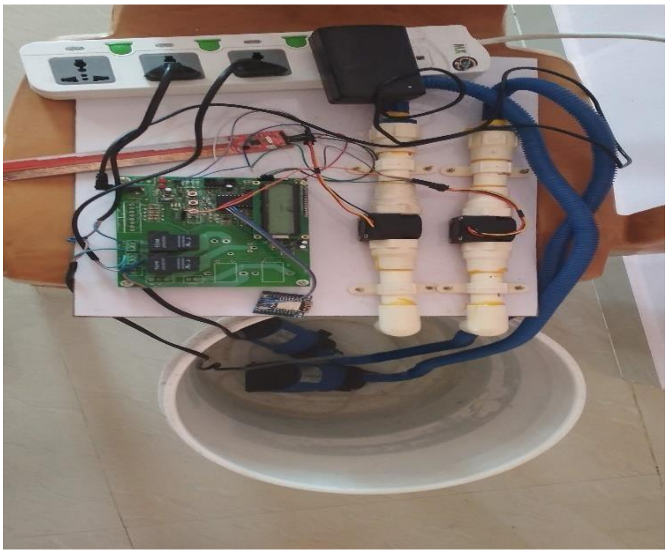

Fig.7. Final Model

Fig.8. Output of Flow Sensor

Fig.8, shows the output values of the flow sensors respectively are used for various quantity of water. The output varies as the samples varies

IV CONCLUSION AND FUTURE SCOPE

A low cost, efficient, reliable, real time and IoT based well water quality monitoring system has been put through, successfully implemented and proven. Through this system, the level of the well water and the quality is tested. The application built will give the farmers and the villagers the idea about the type of water in the well and will enable them to put the water to correct use. The application will guide them which water could be put to use where. Thus, wastage of water is avoided; people will get to drink the water that is fit for drinking and water that are suitable for a particular crop can be used for irrigation purpose. The project can be implemented on a large scale for water monitoring of wells of villages connected to each other. The same project when modified further with the help of technologies can be implemented for monitoring the dead organisms in water. The app could be made more advanced by integrating such systems and gathering a large data.

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