Wireless Water Level Controller Using Zigbee

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Abstract: **Water is the most important Nature's gift to the mankind. Without Water there is no life. Now man understood its importance, especially where water is not easily available. Now this is being managed by the proper manner in city areas where the use of water is more than its availability. This is one of the motivations for this research, to deploy computing techniques in creating a barrier to wastage in order to not only provide more financial gains and energy saving, but also help the environment and water cycle which in turn ensures that we save water for our future.**

In this paper we have discussed about design and implementation of water level control system which is wireless, automatic, cost effective and reliable. It uses two zigbee transceivers along with a controller each installed at the tank and in the household. Zigbee transceivers are used for wireless communication. It is completely automated with the help of a microcontroller. Installation cost is reduced since the system is wireless. It is reliable because it has no problems arising after installation such as breakage of wire.

***Keywords*: microcontroller, water pump, conductivity, computer simulation, zigbee, tranceivers**

I. INTRODUCTION

Decreasing water level is one of the key concerns now a days. Due to increasing population many water related problems like water pollution, wastage of water, water scarcity, etc. is arising day by day. So there is a need of sustainable utilisation of water resources in order to use them efficiently by present generation as well as conserving it for the future generation. Monitoring and controlling water level in the reservoir is an important task in homes and offices in order to reduce wastage of water. To avoid one such problem of reducing water level inside the earth we have developed an automatic water level controller circuit using zigbee.

In this paper we discuss about automatic water level sensing and controlling with wireless communication between devices placed at the tank and the sump. So the system basically operated with two controllers and zigbee transceivermodules.

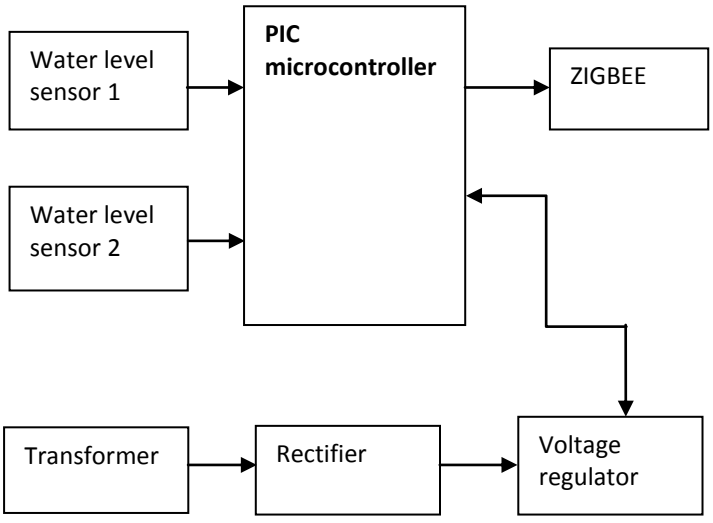
There are several literatures available that survey the water level controllers and their automation. Also there are several paper available that overview and compare the available water level controllers. Most of these papers are based on the electrical conducting property of the water and presents the microcontroller based water level monitoring and control in the wired environment. This will help to reduce the household power consumption as well as to reduce the wastage of water [1].

In [2] authors have discussed about design and implementation of water level control system which is wireless,automatic, cost effective and reliable. It uses two Radio Frequency transceivers along with a controller each installed at the tank and sump. Radio Frequency transceivers are used for wireless communication. It is completely automated with the help of a micro controller. The system doesn't need any attention of the user unless the sump is empty. It is reliable because it has no problems arising after installation such as breakage of wire.

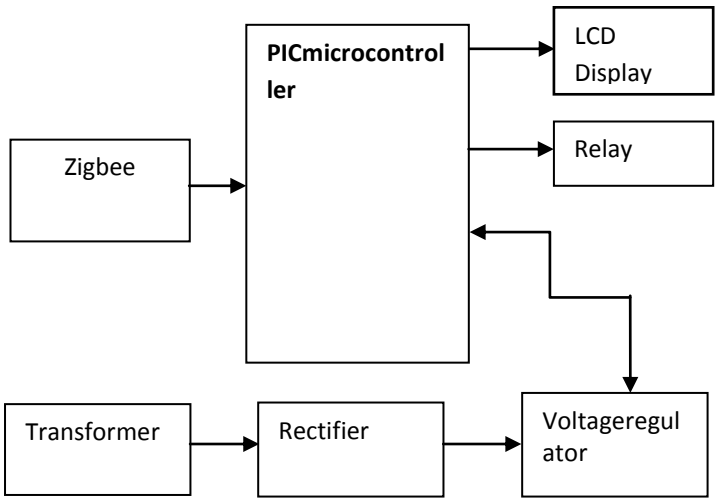
In this paper [3] Wireless Sensor Technology was discussed to avoid the huge amount of water to be wasted by uncontrolled use of large apartments/offices. The microcontroller(PIC) based Water level monitoring is used to indicate the level of water in the tank to agent. Its monitoring system uses daily life device like laptop or mobile phone.

II. BLOCK DIAGRAM AND DESCRIPTION

A. Transmitter :



B. Receiver:



In this section, we have discussed the design of our proposed "Automatic Water Level Control Using Zigbee". It consists of the following major units: *sensor, microcontroller, display unit and zigbee transceiver modules.*

Taking the advantage of the electrical conducting properties of water we have used the connecting wires as the water level sensors. The level is sensed with a conducting metal strip. When a signal is sensed by the level detector, it is fed to the microcontroller through a driver for further action.

Microcontroller is the heart of any circuit design. Here we have used PIC16F877 microcontroller or simply PIC [4] which is a member of atmega family and an advanced version of at89c52. It has a set of serial transmission and receiver pins, I/O ports and timers, which are the basic requirements system proposed. It also has inbuilt analog to digital convertors and requires easier programming than other microcontrollers. Depending upon the water level in the tank, the sensors sends a signal to the microcontroller which produces an encoded signal to be sent over zigbee transceiver serially.

At the receivers end, the microcontroller receives a signal from the zigbee transceiver module and depending on the signal received it decides whether to turn motor OFF or ON depending upon the level of water in the tank.

The LCD is used as the display unit here, which serves as the output to show the status of the tank on the basis of the received signal.

A transceiver is basically a combination of transmitter and a receiver. Here we used a zigbee transceiver module [5] which works on the operating frequency of 868/915MHz, 2.4GHz. These operates in the range of 30m-75+m with a data rate of 20, 40 or 250 kbps. These are low cost, low data rate modules with a power consumption of 1mW.

III. PROCEDURE

As the block diagram indicates, there are two microcontrollers. One at the transmitter's sidei.e. the overhead tank, and other at thereceiver's side i.e. the household circuit. They perform the task of controlling and sequencing the communication.

At the tank two water levels are taken into account i.e. a "LOW" water level, when the tank is almost empty and a "HIGH" water level, when the tank is almost full. The two sensors are placed at these two levels. The sensors outputs are amplified and send to the controller as interrupts. So controller will send request when:

a) LOW level is detected

b) HIGH level is detected

As soon as the interrupt occurs, the controller at the transmitter's side has to send the signal through the zigbee module to the controller at the receiver's side and an effective communication should take place. At the receiver the zigbeetransceiver receives the signal and send it to the controller which in turn turns the motor ON or OFF depending upon the signal received.

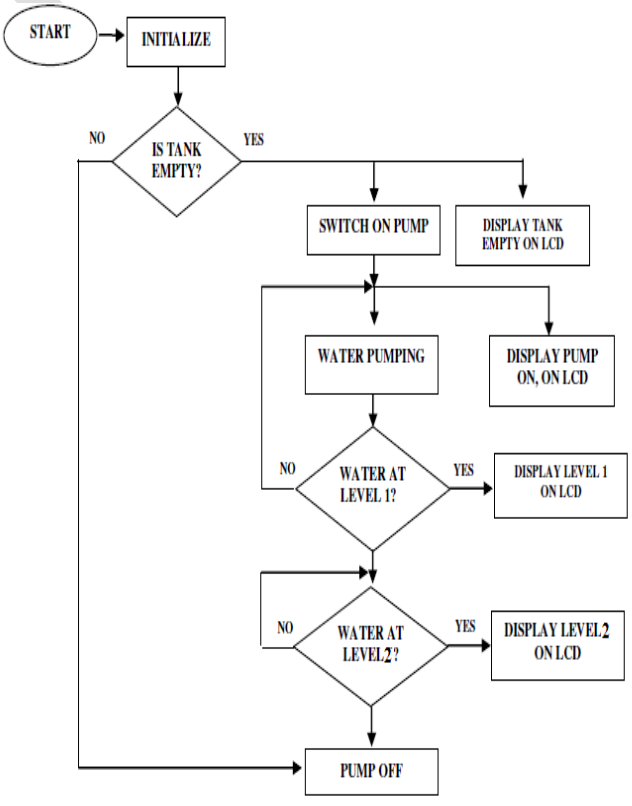


Fig.4. Flow Chart of the Automatic Water Level Monitor with Feedback

IV. RESULTS

With this implemented system, it is possible to monitor the water level in an over-head tank, switch on the water pump when the tank is empty and switch off the same pump when the tank is full without any need for human intervention. By so doing, the incidence of water wastage is eliminated and abrupt cut-off of water supply is equally also eliminated.

The microcontroller has passed various tests with various components being interfaced to it. As described in the previous sections of the paper the controller is the heart of this project work as all the control signals are passed and processed by the microcontroller. The LCD was interfaced to the microcontroller in order to display the status of the system as it operates. The LCD data port is connected to the port 2 of the microcontroller and through this port the microcontroller is able to send information or instruction codes to the LCD. The microcontroller processes the data received and used it tocontrol the pump based on the written flow or control algorithm stored in its ROM.

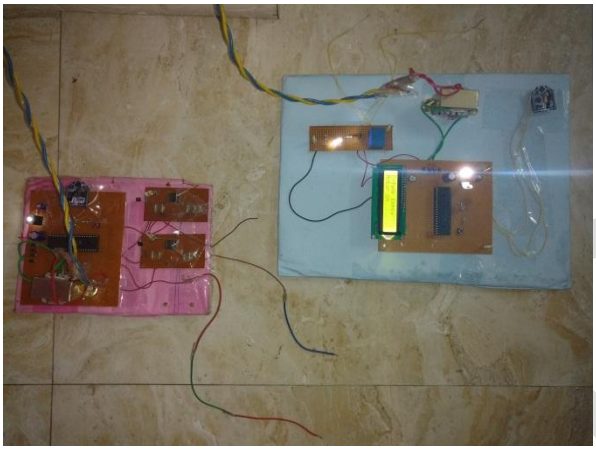


Fig. 1 Hardware prototype of the circuit

V. CONCLUSION

In this paper we have explained the design and implementation of a simple, reliable and cost effective automatic water level control circuit. This circuit can be mainly implemented in offices and buildings and can cover an area of 50-100m. For covering larger distances GSM based water level controller can be used but it can be expansive. RF based water level controllers are present in the market which cannot send serial data and are used for short distance purposes. It is observed that the offices and households are the main areas of water wastage. So, constant monitoring and control of water level in the overhead tank is required. It has no problem of wire breakage after the installation is complete. It can also be employed for water leakage detection.

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