WATER QUALITY TESTING AND WATER MANAGEMENT SYSTEM

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ABSTRACT

We need water in our daily life. Water can be used for many purposes. Generally, we find many impurities in water like Salt or acidic materials. Due to these impurities water becomes hard and this hardness causes that water is not good to use or require filtration. This paper presents the model which is used to test the water with some parameters like pH level, salinity, turbidity, conductivity etc. All these parameters are measured by real time sensors that can send data to the control room (can be used for remote areas). Such water quality testing and water management system can be used to reduce the cost, easy handling and maintenance and will also help to reduce the labor cost and will also provide flexibility in terms of distance and location. In this paper the fundamental design and the implementation of WSN using Zigbee based technology as a compatible transreceiver. After testing the water, impurities (if present) can be removed by filtration process like chemical process, UV treatment etc. This paper presents a suitable model for water quality testing and water management system by testing the above described parameters.

KEYWORDS: *Quality standards, sensor, turbidity, pH.*

1. INTRODUCTION:

Water is important and a limited resource which is essential to survive. Water quality testing and management is must to prevent the waterborne diseases and to provide pure water for drinking and other purposes. This model mainly deals with the routine purity check of the water tanks in the provided specific area. The Network of sensors such as the PH, conductivity, TDS, Turbidity and salinity which define the purity of water is placed at every location of the tank or waste water lake. This will be connected with microcontroller. The network will be Zigbee. The Zigbee is a wireless protocol 802.11 before the Wi-Fi. Zigbee has low cost and low power consumption with many applications. The main purpose to use Zigbee is to make this system cost effective with easy operation. The values recorded by the sensors will be continuously monitored by the server PC which will be located at the main location. The values which are the standard will be stored in the program and will be continuously compared with the obtained values. The Front end for this project we are using software Visual Basic (or MATLAB can be used). This will give a simple user interface will show the monitoring and the values and recording these values. The variations if happens will be seen by the operator and also be sensed by the microcontroller. Now if the result of water testing is good then water will allow to flow through the pipes or blocked in case of the bad result of calculations. When this happens then the supply to the pump will be immediately stopped and a Buzzer will be ring. So with this model water quality testing and management will be very easy. Hence the main objective of the system will be achieved with ease and neat.

2. PROBLEM DEFINATION:

The difficulties that people undergo are:
There is no source system to understand quality of water. To check the water quality; continuous human surveillance is required. The exact parameter of water like temperature is not available**.** No one can control the complete water supply system from one station.
The above mentioned difficulties can overcome to some extent using our project as: Due to wireless network, continuous checking of water can be done. There is secure system due to use of sensors and communication network. Exact parameter like temperature, PH are available due to wireless network.

Complete water system can be controlled from one station

3. PROPOSED SYSTEM:

The parameters in the water quality determination such as the pH level, TDS, temperature, turbidity and conductivity is measured in the by the sensors that send the data to the base station or control/monitoring room. The parameter pH is a measure of the level of activity of hydrogen ions in a solution, resulting in the acidic or basic quality of the solution. The scale ranges from 0-14 pH units, if pH value is 7 the water being neutral if the pH value is less than 7 the water being acidic and if the pH value is more then 7 the water being basic. Most natural streams range from 6.5 to 8 pH units. To measure the ph value we are using sensor.
The TDS i.e. Total Dissolved Solids will be determined using conductivity sensor.
The Level sensor is used to measure the level of the tank. If Water level goes under certain limit; then Relay will be operated to turn on Water Pump.

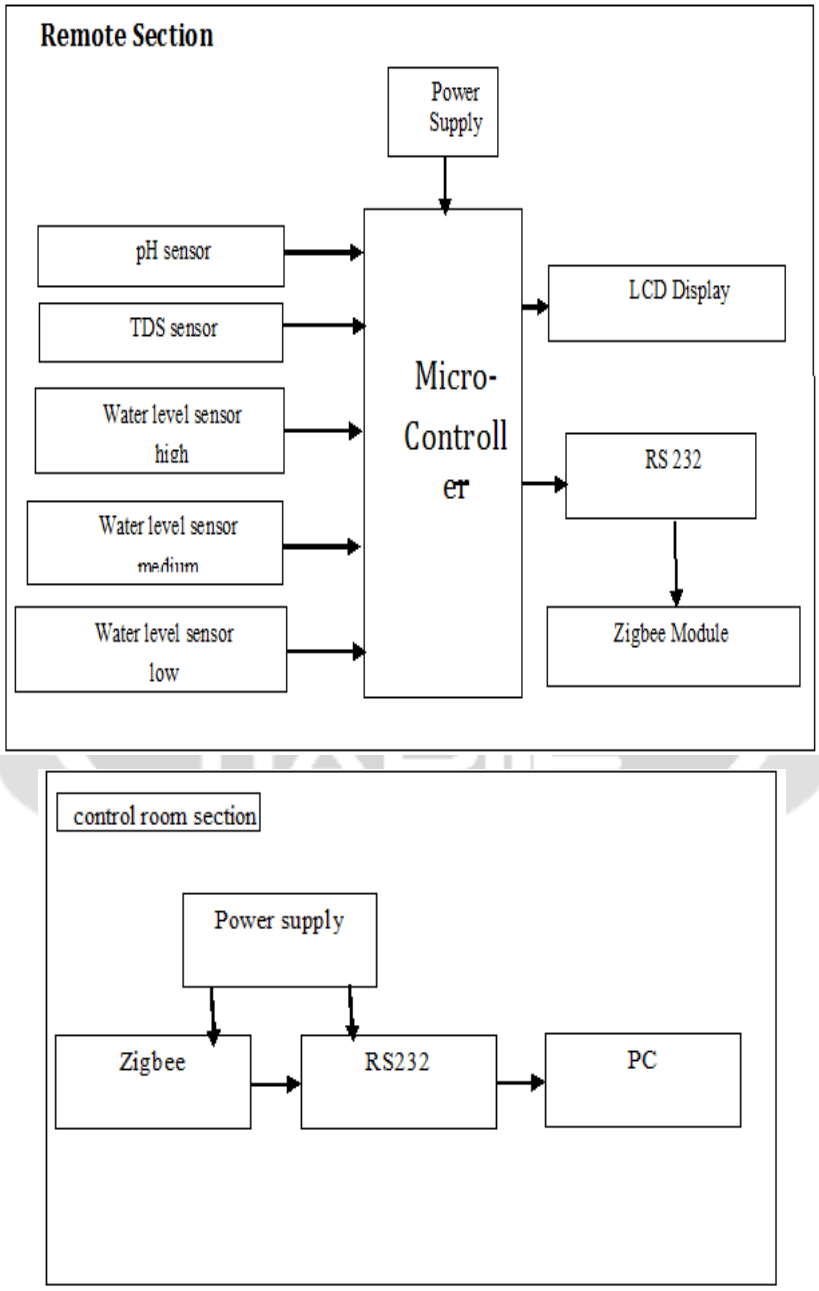

Figure3.1: System Architecture

The Above Figure shows the block diagram of water quality testing and water management system. As shown in the fig. there are different blocks are present. Each block has its own functionality. Some of these blocks are:

- **LCD Section:**

The microcontroller is interfaced with 16*2 LCD which used to display the readings of parameters which are being monitored

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- **pH sensor:**

pH Sensor can be used in any lab or demonstration that may be done USING a traditional pH meter. pH sensor offers the additional
advantage of automated data collection, graphing, and data analysis. Typical activities using pH sensor, we can include studies of household acids and bases, acid-base titrations, monitoring pH change during chemical reaction and in an aquarium as a result of
photosynthesis, investigation of acid rain and buffering, and investigation of water quality in streams or lakes.

- **RS232:**

RS 232 is used for serial communication in the system. Here, the RS 232 provides the serial and point to point communication between the microcontroller and components such as display, PC or Mobile etc. So it is a media used to communicate between microcontroller and the PC.

- **Zigbee:**

XBee wireless transceiver provides a quick and easy way to add wireless communication to any system. These modules are popular because they are FCC tested and Zigbee approved, so that saves some time and cost in product development. Additionally, these modules are readily available from distributor and relatively easy to interface with embedded designs.

- **TDS sensor:**

Total Dissolved Solids (TDS) are nothing but the total amount of mobile charged ions, including minerals, salts or metals dissolved in a given sample of water, expressed in units of mg per unit volume of water (mg/L) and can also be referred to as parts per million (ppm). TDS is directly related to the purity of water and the quality of water purification systems and affects everything that consumes, lives in, or uses water.

4. ALGORITHM:

1. Initialize all ports
2. Set µL=Lower threshold value
   µH=upper threshold value
3. Check condition
   a) If µL> µ then start buzzer and start inlet
   b) If µH> µ then start buzzer and start outlet
4. Switch control to sensors simultaneously
5. Initialize ADC, ports, sensors
6. Check the values.
7. If values are beyond threshold on buzzer
8. End process.

5. FLOWCHART:

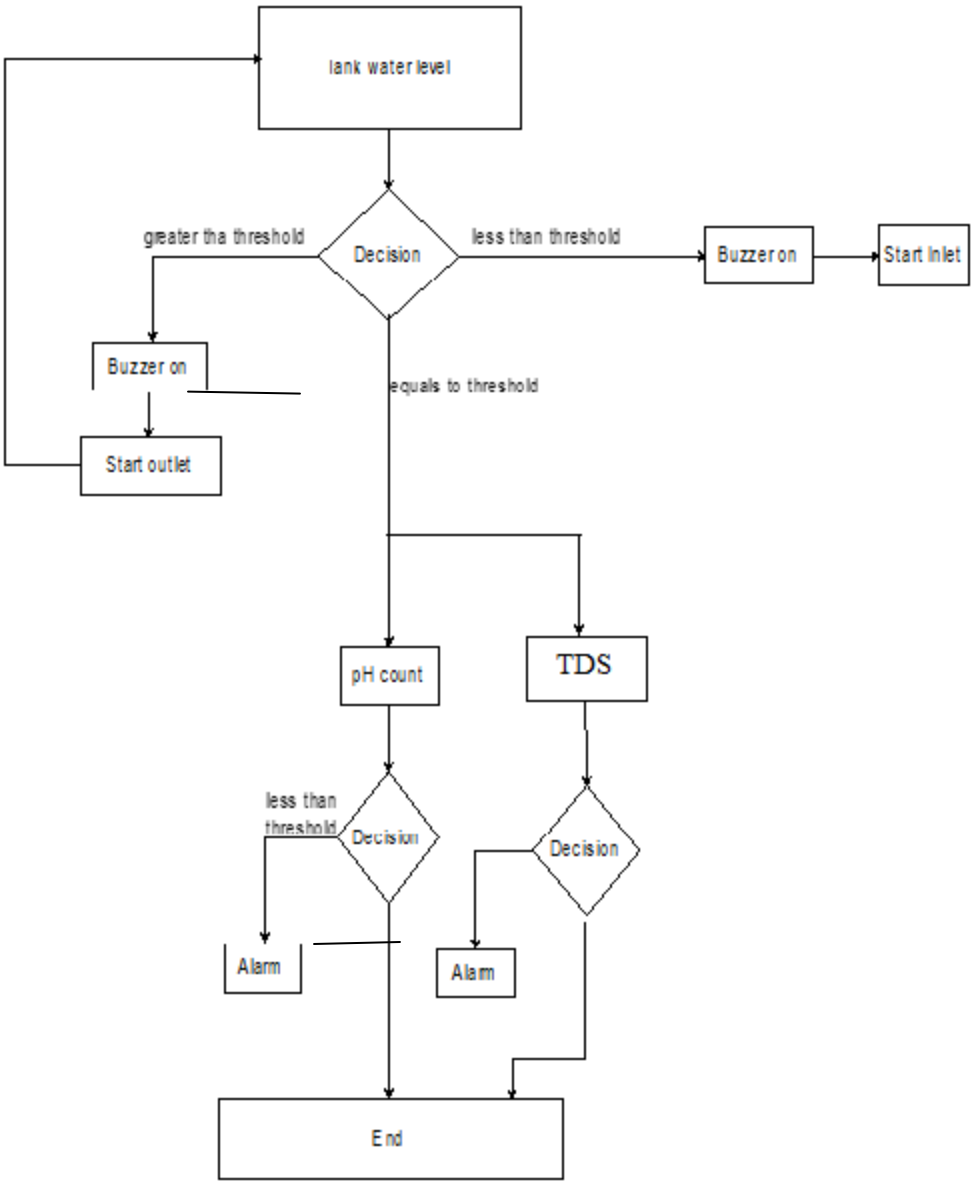

Fig 5.1: Flow Chart for Project

6. RESULTS:

The solution presented here is a low-cost, delay-tolerant system to be attached to water treatment facilities. Water quality sensors are connected to a microcontroller board which saves the continuous stream of data collected by the sensors to a multi-gigabyte storage card. The capacity of the storage card can be chosen to fit the needs of the individual sensor users. A wireless transmission system, such as Zigbee, attached to the microcontroller can then transfer this data from the storage card to a computational device such as a laptop or desktop computer. The storage card can retain the data for as long as several months depending on the storage capacity of the card. This allows data retrieval to occur on a more random basis, which opens up a myriad of possibilities for the logistics of how data is retrieved. For example, on the Napo River, automatic data retrieval could occur with a cell phone or a computer on a boat that is within close proximity to the sensing device, whenever the boat happens to pass by. Depending on the Zigbee device chosen, the transmission distance of the Zigbee device can range from 300 Ft. to 28 miles. The farther the transmission distance the larger the power consumption and cost of the Zigbee will be [5]. However a 300 Ft. transmission distance is large enough to allow a passing boat to retrieve data. Microcards that can store 8-16 gigabytes are relatively cheap and can meet the demands of the system.

Many of the sensors of interest do not have large memory requirements which provides a 1 byte reading for every measurement. If 10 sensors that produce approximately the same data size per reading are attached to the device and each takes a reading every second, only 0.32 gigabytes of storage will be used to save this data over the course of one year. Therefore an 8 gigabyte SD card which can be found for only $5 would be able to store data from the device for multiple years. In this way, the data can be retrieved from the device at frequent or infrequent intervals creating a delay-tolerant system

7. FUTURE WORK:

A. Micro Controller Based Embedded Software Design:

The software implemented by using micro-controller so that it can integrate with various embedded devices.

B. Hardware Complexity Reduction*:*

The complexity that introduces due to hardware components will be resolved in future up-gradations.

C. Addition of sensors:

You can add different types of sensors such as salinity, turbidity, etc. to check quality of water.

8.CONCLUSION:

This research work is very important to build the system to study the quality parameters of water to determine the quality of water. The designed system is used to check the different water samples at various temperatures. This water quality testing and water management system model is very beneficial for the society and industries in the various applications of water such as drinking, washing and cleaning etc.

Overall, the implementation of Zigbee based WSN for water quality testing and water management system offering a less power consumption with long battery life is presented. The use of WSN makes it suitable for remote areas for testing and management of water with ease of installation and maintenance. As this system is user friendly, management can be done easily.

9. REFERENCE:

[1] Zigbee, Wikipedia, http://en.wikipedia.org/wiki/ZigBee (2016) The Zigbee Alliance website [Online], http: //www.zigbee.org/

[2] P. Payment, M. Waite, A. Dufour, “Introducing parameters for the assessment of drinking water quality.” In Assessing microbial safety of drinking water: Improving approaches and methods, 2003.

[3] R. Sadiq, H. Najjaran, Y. Kleiner, “Investigating evidential reasoning for the interpretation of microbial water quality in a distribution network”, Stochastic Env. Res. and Risk Assessment. vol 21(1), 2006, pp. 63-73

[4] L. Joon-Taek, C. Soo-Hyun, S. Dong-Hern and K. Young-Hak, “Design and Implementation of Fish Farm Monitoring System using Embedded System”, Journal of Contents, Vol.3, No.1, pp.71-79, 2003.

[5] H. Ceong, J-S. Park, and S. Han, "IT convergence application system for eco aquafarm," in Conf. Rec. 2007 IEEE Frontiers In The Convergence of Bioscience and Information Technologies (FBIT 2007), pp. 878-883.

[6] S. Han, Y. Kang, K. Park, and M. Jang. "Design of environment monitoring system for aquaculture farms,". in Conf. Rec. 2007 IEEE Frontiers In The Convergence of Bioscience and Information Technologies (FBIT 2007), pp. 889-893

[8] David, Cristina C., and Arlene B. Inocencio. “Understanding Household Demand for Water: The Metro Manila Case”, Economy and Environment Program for Southeast Asia, Vol. 02, No. 02, 2011, pp. 1-10.

[9] D. He and LI-Xin Zhang, “The Water Quality Monitoring System Basedon WSN”, proceeding International on consumer electronics, pp. 3661-3664, 2012.

[10] "U.S. Geological Survey." Mercury Contamination of Aquatic Ecosystems. U.S. Geological Survey, 1 Apr. 1997. Web.

[11] Ritter, Christie, Prof. Alan Mickelson, Daniel Knight, Jared Leventhal and David Espinoza,"Presenting the NapoNet: Developing Global Competencies through Comunications in the Peruvian Amazon", The 2nd Annual ASEE International Forum of the 2013 ASEE Annual Meeting, Atlanta, Georgia, June 22, 2013.