HOUSEHOLD WATER SUPPLY REAL TIME QUALITY MONITORING &USAGE ALERT SYSTEM

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Abstract: **Water is one of the life saver substances on earth. We need to ensure the safe supply of the drinking water quality that should be monitored in real time. In this paper we present a low cost system for real time monitoring of the household water supply quality in IOT (internet of things) and over usage alert system. Introduced system consist of several sensors which is used to measure physical and chemical parameters of the supply water. The water quality parameters such as temperature, pH and flow of the water is measured. The measured values from the sensors is processed to arduino. The sensed data can be viewed on internet using cloud computing. An alert system is send to the mobile if quality of the supply water is not in the desired value. Using flow sensor we measure the usage of water in a home and there by identifying that they use their water in limit. If they over used the water an alert message is send to the house maker. Thus there by limit the over water usage and save the water and money. Water scarcity is main issue due to the pollution of water and wastage. By this proposed system these two problems can be solved.**

Index Terms - **pH sensor, Temperature sensor, Flow sensor, Arduino, WI-FI module, GSM, Water wastage, cloud.**

I. INTRODUCTION

Without oxygen and water living beings cannot survive, it is the most essential element to human life. But the rapid development of the world and human activities led to contamination of the water resources. The water is valuable for all the human beings, so we need to check the quality of water in real time. Using of the contaminated water is the leading cause of many epidemic diseases and skin allergies. Drinking Water Supply Lines Conditions is worst as there is no proper checking of lines which is aged and may pollute the supply water to household. Water is contaminated with Lead PCBs, Cyanides, Mercury, Hospital Waste, Pharm Waste etc. thus water quality monitoring is necessary to identify any changes in water quality from time-to-time to ensure the safety. It can be done by checking the water quality parameters is maintained in the desired value. The quality of the water should be continuously monitored and if any abnormalities occurred should send the alert to the authorities immediately. The pH value of the water shows water is acidic or basic. The pH meter will help to get the pH value. The pH value 7 is the pure water, less than 7 pH values indicate it is acid and more than pH 7 value indicate alkalinity. The normal range of pH of the water is 7. In water normal value of pH doesn't maintain then it will causes the irritation to the eyes, skin etc. So importance of water for our health is not only in drinking water only but also in our daily use too. For drinking purpose we may purify the water but for bathing, washing our mouth, eyes etc. we may not use the purified water. Sometimes children's in home drink these waters directly from taps. So it is necessary to know the safety of supply water to our home. Water temperature may vary as it is passing through pipe lines. External environment temperature may affect the temperature of the supply line water. If high temperature water comes to our tap and it may cause minor burns to us. In the existing system there is no supply water safety alert system only on the supply tanks there will be checking the quality of the supply water. Water quality safety detection has been carried out manually by taking water samples collected from the source manually and taken this to the laboratories for analysis. Thus a real time cost effective system is not implemented yet. Considering all these facts we need to design a cost effective and efficient water quality monitoring system for household water supply lines. Real time water quality monitoring system can be done using IOT environment. In this proposed system we are using temperature sensor for sensing the temperature, pH sensor for identifying the impurities in the water, and flow sensor for the measuring how much water used.

II. LITERATURE REVIEW

This section gives a literature review of the existing water quality parameters monitoring system papers are given:

In 2017[1]Brinda Das, P.C. Jain "Real-Time Water Quality Monitoring System using Internet of Things'' introduced a system for water parameters monitoring system for eliminating time consuming process that is done by manually. In this system it gives the basic idea of how IoT works. It uses the zigbee system for the transmission of data to the controller. From the arduino will send the data to the cloud using Wi-Fi module. This paper is focusing in the pollution occurring in the water bodies. Using proximity sensor helps to give alert to the authorities if someone trying to makes the water bodies pollute. Thus system gives

an idea about water pollution in rivers that can be identified and other water bodies that can be also be applied for the drinking water supply to household purposes and to make it more cost effective than this paper.

In 2018 [2] Ashwini Doni, Chidananda Murthy ''survey on multi sensor based air and water quality monitoring using iot''

It gives an idea about the difficulties in the conventional methods for monitoring of air and water that involves the manual collection of water, air sample from different locations and sending it laboratories and analysing. In this paper they give the idea about how to implement water quality measuring parameters for water and air purity using IoT. Theoretical accepts are given in this paper. From this paper I get the idea about what parameters to be included for the measuring of water quality.

In 2014 [3] Qiao Tie-zhu, Song Le, "The Design of Multi-Parameter Online Monitoring System of Water Quality Based on GPRS" introduces a water quality monitoring system based on GPRS. The collected data is transmitted is done using GPRS. They have more drawbacks as it is not cost efficient and less fast. These drawbacks is can be removed by using it in IoT. Disadvantage for the large area it will become costly

In 2015[4] A.N.Prasad, K. A. Mamun, "Smart Water Quality Monitoring System" proposed a system for monitoring Fiji Islands that requires a water parameter quality monitoring system by using IoT and remote sensing technology. Monitoring, collecting and analysing the data from remote locations is done here. Gives the basic idea of the water quality analysis in different regions.

In 2014 [5] Gaikwad Sonali Ashok "Water Anti-Theft and Quality Monitoring System by Using Plc and Scada'' In this paper they use programmable logic controller and scada for the monitoring of the water from the supply line to the customer. They uses the scada software for monitoring the water parameters and give an alert system in that. Main disadvantage   of this is not cost-effective. As implementation cost is high for the plc for large and small areas. Also implementation is also difficult.

III. METHODOLOGY

   The overall block diagram of the house hold water quality monitoring and usage alert system is given below. This proposed block diagram consist of several sensors for measuring the water quality parameters. The main water quality measuring parameters are pH sensor, temperature sensor and flow sensor. To the water supply line the sensors are inserted there by its senses all the data from supply line. The sensed value is transmitted to the controller. Here the controller is arduino and it will collect all the data and analyse the data. Then it is transmitted to cloud by iot module. From there we will get all the data of the water parameters by time to time. Also there is an alert system which will inform if the water parameters are differ from any normal condition by GSM module to mobile.

A. System specifications

 The main sensors using here is pH sensor, temperature sensor and flow sensor. The other main components are arduino uno, voltage regulator, Wi-Fi module and GSM module. The Block diagram of Household Water Supply Real Time Quality. Monitoring &Usage Alert system is as follows. It includes temperature sensor, pH sensor, flow sensor, GPS module and a Wi-Fi module, for regulating the power used a voltage regulator. For the development of the prototype we proposed arduino uno board which is easier to configure, flexible and cost effective. Arduino is the main head of the prototype which controls and coordinate all the sensors and other components connected to it. All the sensor data are given to the arduino board which collects and process it. A GPS module is provided to send alert message to the user when the water usage exceeds a particular limit also provides alert when water quality falls below the required range. It's a very much easy to implement.
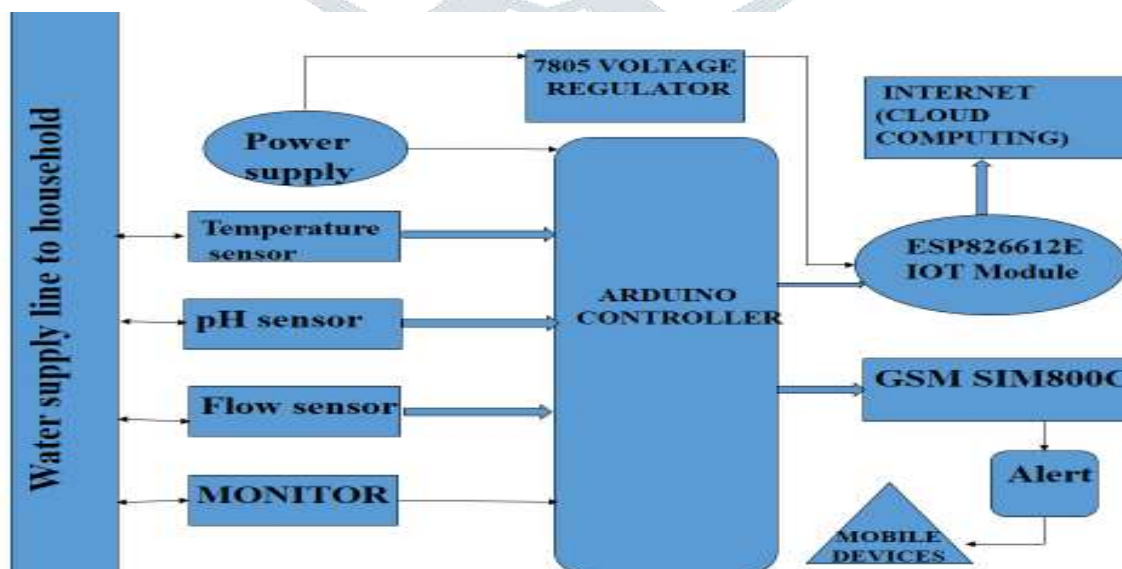

Fig 1. Block diagram of the proposed system

B. Flow chart of the proposed system

    The sensors will be connected to the supply line. The pH sensor will sense the pH level of the water. Thus if there is any change in the pH value which is normal 7 varies that is above 7 or below 7 it will be impure. Temperature sensor will be used to sense the temperature of the supply line. Flow sensor is used to measure how much water is flowed through the pipe to the house. The sensed value is given to the arduino. There to Wi-Fi module then to the cloud where we can see the values of the sensed system. Here the cloud used is things speak. There is an alert system is given in this proposed system. Thus if there occurs any abnormal conditions like impure water which pH is not in the specified level to temperature is high and over usage of the water is occurred then arduino will send alert to GSM which will send data alert to the mobile phone or the authorities. The system is programed in such a way that for a home set a level of water to be consumed per day if they use the water above that particular level then the system send the alert system to that customer. Like that for any change in pH of the water and temperature above designed level occur alert is send to the particular customer and the water authorities.

Fig 2. Flow chart of the proposed system

IV. RESULT AND DISCUSSION

    As usage of water is increasing in our daily life. Without water the existence of life is not possible. So a system for monitoring the quality and usage of water is essential. The water quality management system is very useful for our day to day society as it provides safety for drinking water. The prototype is developed in arduino ide software. The library files are downloaded and edited in the ide software. For the cloud connectivity we use thingspeak software. We created a login account in the thingspeak and created a channel for the sensors we used. Then the write key and URL code are copied and given to the ide developed code and uploaded to the arduino board. Thus the corresponding working flow chart is developed in the thingspeak software, which a user can login from anywhere having network accessibility. The screenshot of the flow chart developed for each sensor working is provided. The IOT used in the system provides real time monitoring of the system easier.
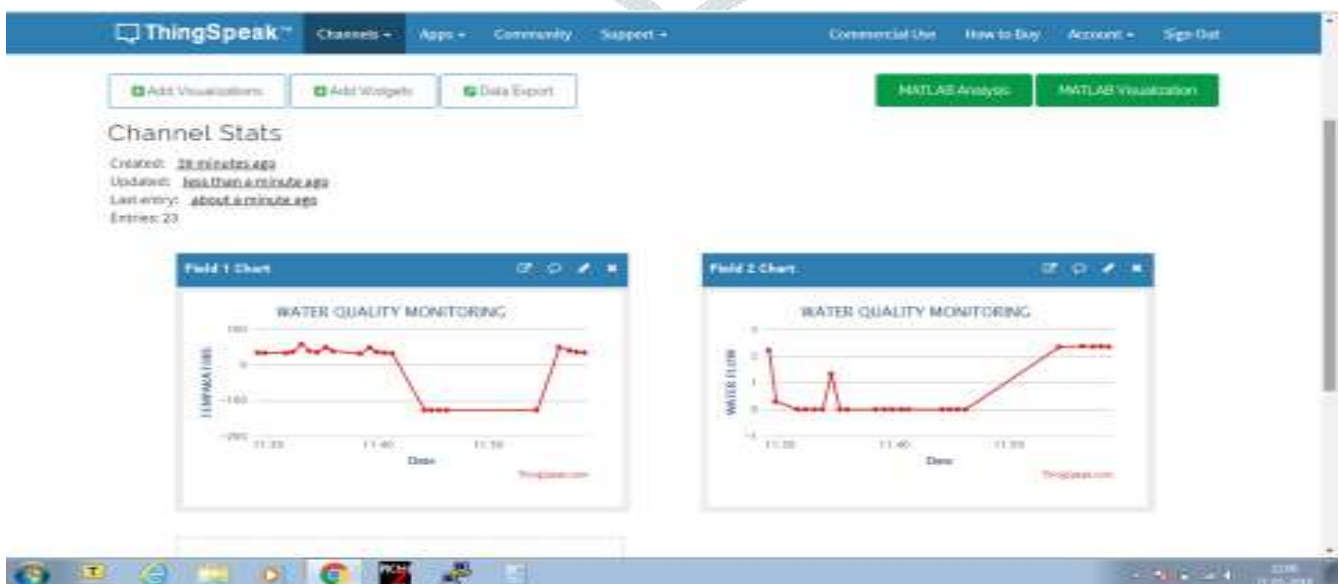
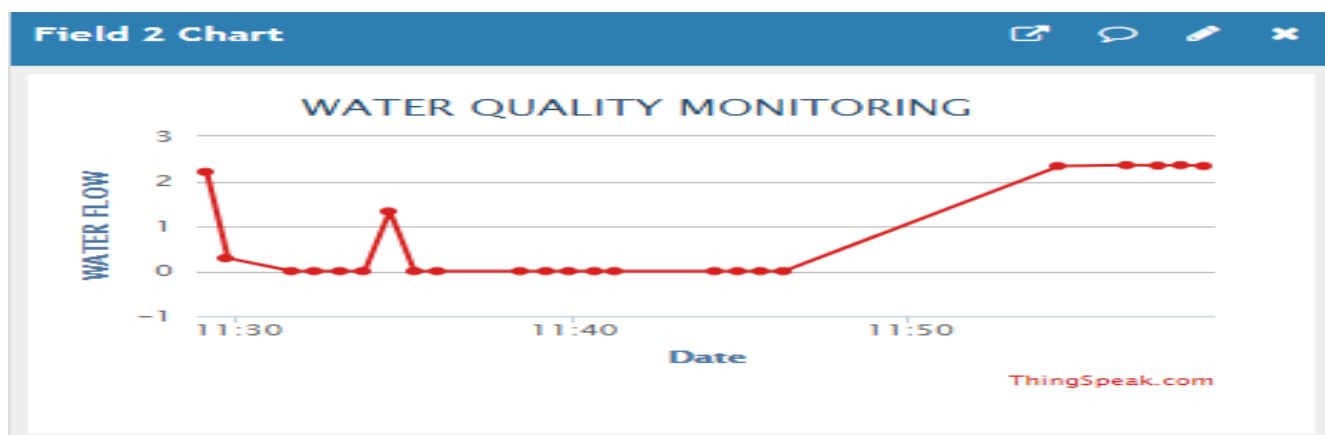Fig 3. Screenshot of the sensor output obtained in thingspeak

Fig 4. Screenshot of the temperature sensor output

V. CONCLUSION AND FUTURE SCOPE

Due to tremendous increase in the water pollution in our society water quality measurement have very much important. The water supply lines in India have no such quality test for the supply line. Thus a quality check for the water from the household supply line is much important. Also water scarcity is becoming an important problem too. Thus the proposed system is efficient in checking the water quality parameters measurement system and give an alert to the customers or the authorities if any abnormalities occurred. It also gives the consumer an alert if there is any over usage of water. By this we can save the wastage of water from household purposes there by save water and money. Proposed system is cost-effective and easy to implement. The water quality parameters can be seen from any Wi-Fi access place through cloud. This proposed system is effective in using in industries too. The system can be modified by controlling the valve of the supply line by a mobile phone or any other gadgets. That means any alert message regarding impure water comes the consumer can close the supply line.

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