

IOT BASED WATER QUALITY AND MOTOR MONITORING IN BOREWELL

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Abstract

Due to increase in population and over abuse of water and ground water resources, water level has diminished. Irregular distribution of rainfall and monsoon failure makes most of the people to depend on ground water. So they are compelled to bore wells and rely upon it. But Water quality is affected by both the natural and human activities. Most of the waste are thrown in the landfills and buried on the land. This affects the water quality and also affects the farmland. The progressions in innovation like Iot (Internet of things), cloud computing, Big data, Web office can be utilized to structure a system to overcome these huge significant problems like low quality drinking water, expanded labour prerequisites, irreversible harm caused to inadequately checked motor. So that, we have developed the project which monitors the water quality and motor parameters to avoid the breakdown of the motor. The framework has two sensors for in particular pH sensor to check water quality, ultrasonic sensor to check the water level, temperature and current sensor for motor observing. Single microcontroller chip is used to collect the data from the sensors and a Wi-Fi chip is utilized to send the collected information of a bore well to the cloud. If the data of the water and the motor is abnormal compared to threshold which is set through the code, the information is sent to the mobile application of the person in that locality. In this manner by this framework it is convenient to screen various parameters of borewell remotely in a mobile application.

Keywords: Node MCU, IoT interface, pH sensor, DHT-11, Ultrasonic sensor, ACS712.

I. INTRODUCTION

Because of increment in urbanization, quick financial improvement, an ever-increasing number of difficult issues emerges. Water contamination and groundwater ruining are the significant worry for all individuals. The water quality parameters that are routinely checked are pH, turbidity,

colour, conductivity, dissolved oxygen, chloride, sulphate, smelling salts, nitrogen, nitrate, nitrite, natural carbon, phosphate, different metal particles, etc. The conventional strategy for water quality testing wastes an excessive amount of strength and material assets and long-lasting breaking down, the maturing of trial hardware and different issues. Sensors are a gadget which can take care of every one of

these issues. It can easily transfers and control the signals. Because of ease use of the sensors, monitoring of water quality becomes more simple. The framework executes automation, intelligence and system of water and motor

The most traditional technique for water quality testing is to gather tests from the wellspring of water and afterward sending the sample to the research facility for testing and analysing the nature of water. It has downsides as it requires the part of labour, space, and cash and furthermore it is a tedious procedure. Another observing framework dependent on IoT portal which defeats all the impediments of the customary technique and it doesn't require a checking Centre where numerous individuals are should have been utilized to screen the borewells. The pH, turbidity of water and motor temperature, and current drawn by the motor are totally distinguished persistently the entire day. The single microcontroller chip gets the information from the sensors, which distinguish the estimations of the water parameters and motor parameters, after that processes and examine them.

The identified qualities are sent through the IOT passage. On the off chance that the parameters of the water and the motor is unusual contrasted with a limit which is set through the code, the data is sent to the mobile application showing a information to the

individual in that area who introduced the application. In this way it is advantageous to take convenient measures

and to recognize the continuous circumstance of water quality remotely.

The normal plan for Internet of things(IoT) are of two kinds; portal without using sensors and using with sensors. IoT perform out a few basic capacity from making an interpretation of conventions to encoding, handling, overseeing information, sifting information. IoT gathers messages from the sensors, stores information suitably until they can be pre-prepared. It at that point sends the outcomes, chooses if the information at a given phase of preparing ought to be transitory, persistent or kept in memory. So that we can collect the information whenever needed and can be processed

II. LITERATURE SURVEY

[1]Mr.Kiran Patil , Mr.Sachin Patil , Mr. Sanjay Patil and Mr.Vikas Patil"Monitoring of Turbidity, PH and Temperature of Water Dependent on GSM"proposed a methodThe traditional method of testing Turbidity, PH & Temperature is to collect samples manually and then send them to laboratory for analysis. However, it has been unable to meet the demands of water quality monitoring today. So a set of Monitoring of Turbidity, PH & Temperature of Water quality has been developed. Turbidity, PH & Temperature of water are automatically detected under the control of single chip microcontroller all day.

[2] Jianjunzhanget.al., “Design and implementation of an online water quality monitoring system based on iot” Stated a method for increasing environmental protection, an online monitoring platform was designed based on IOT and Hadoop and it is implemented. This platform used the wireless detection sensor and to store the collected water quality data in the Hbase of the server

[3], Bojan Palmaret.al., “Water quality monitoring automation of rivers in Serbia” developed a the monitoring of automatic stations of river water quality in Serbia. One automatic station observing basic parameters such as temperature, pH value, dissolved oxygen concentration. Two extra automatic stations were installed on the river Tisa, with a higher number of parameters – in addition to basic parameters there were sensors for turbidity, ammonium ion and chlorophyll

[4] Vaishnavi V.Daigavaneet.al., “Water quality monitoring system based on iot” proposed the present a design and development of a low cost system for real time monitoring of the water quality in IOT (internet of things). The system consists of several sensors. The parameters such as temperature, PH, turbidity, flow sensor of the water can be measured. The measured values from the sensors can be processed by the core controller. The Arduino model can be used as a core controller. Finally, the sensor data can be viewed on internet using WI-FI system

[5] T.Hasan, Samiha Khan, et.al., “Gsm based automatic water quality control analysis” designed a chip microcontroller all day. The system consists of pH sensor, turbidity sensor and conductivity sensors of water quality testing, single-chip microcontroller data acquisition module, information transmission module, monitoring center and other accessories. Various parameters of water quality are automatically detected under the control of single chip microcontroller all day.

[6] D.B.Palamkaret.al., “Review of parameter monitoring & controlling system for three phase induction motor using plc & scada” developed a three phase induction motors are mostly used in AC motors in industry. Here the review of monitoring and control system for the induction motor based on programmable logic controller (PLC) & SCADA is described

[7] Prof. M. S. Badmerna et.al., “PLC & SCADA based condition monitoring of three phase induction motor” proposed. Three phase induction motors are mostly used AC motors in industry for various operations. Here the implementation of condition monitoring system for the 3-phase induction motor based on programmable logic controller (PLC) & SCADA technology is described. Also the implementation of speed control, direction control, parameter monitoring on SCADA screen is provided. Variable Frequency Drives (VFD) can also use to control

the motor rotation direction and rotation speed of the three phase induction motor

[8] K.Rajasekar, et.al., “Measurement and analysis of water quality using gsm” stated a system using Measurement and analysis of water quality has been developed, in this system various parameters of water quality are automatically detected under the control of single chip PIC microcontroller throughout the day. Single chip gets the data, then processed and analyzes them. Then the data are instantaneously sent to the monitoring center by GSM. The abnormality in the water quality is reported to the monitoring center and management mobile to take the corresponding measures immediately

[9] S.Pingle et.al., “Automatic measurement and reporting system of water quality based on gsm” describes a automatic measurement and reporting system of water quality. The set up consists of PIC microcontroller, water quality sensors, base station, monitoring center and other system. The parameter involved in the water quality determination such as the PH level, DO, Turbidity and Temperature

III. PROBLEM DEFINITION

People still depend on ground water to manage the water scarcity. So monitoring of water quality is important and it should be done in easy way. The abnormality of motor causes serious damage. So it is necessary to monitor both the water quality and motor parameters.

IV. HARDWARE DESCRIPTION

pH SENSOR:

pH is a proportion of corrosive and base estimations of the liquid. pH is acceptably identified with the hydrogen particle focus in the liquid. The scope of pH begins from 0 to 14. The neutral solution has a pH of 7 and if the pH esteem is more lesser than 7, it is a base solution. On the off chance that the pH esteem is lesser than 7, it is an acidic solution. pH is a measure of free hydrogen and hydroxyl particles in the water. When there are all the more free hydrogen particles in water, at that point it demonstrates it is acidic in nature though when there are all the more free hydroxyl particles in water, at that point it shows it is essential in nature. pH can be influenced by chemicals in the water. pH is an imperative pointer of water that is evolving synthetically. pH is communicated in "logarithmic units". Excessively high and low pH esteems can be used for the utilization of water. High pH causes a bitter taste. The water with low pH will consume or break up metals and different substances. The sensor is used to measure the acidity of water in the range between 0-14. Here, each type of sensor to measure the different quality of water. Our pH Sensor can be utilized for any lab or exhibition that should be

possible with a conventional pH meter, including corrosive base titrations, observing pH in an aquarium, and exploring the water nature of streams and lakes

CURRENT SENSOR:

.When the current is flowing through an conductor it causes a voltage drop. Then the relation between current and voltage is given by Ohm's law. Estimation of current is fundamental for the correct working of gadgets. View of voltage is Uninvolved undertaking and it tends to be managed without influencing the work. While estimation of current is a Meddling errand which can't be identified straight forwardly as voltage. For estimating current in a circuit, a sensor is required. ACS712 Current Sensor is the sensor that can be utilized to gauge and compute the measure of current applied to the conductor without influencing the exhibition of the system.ACS712 Current Sensor is a completely coordinated, the hall-effect impact based direct sensor IC. This IC has a 2.1kV RMS voltage segregation alongside a low obstruction current conductor

To detect current a liner, low-balance Corridor sensor circuit is utilized right now. This sensor is situated at the outside of the IC on a copper conduction way. At the point when current courses through this copper conduction way it produces an attractive field which is detected by the Hall effect sensor.The thickness of the copper transmitter permits endurance of the gadget at up to 5× overcurrent conditions. The terminals of the conductive way are electrically secluded from the sensor leads (pins 5 through 8). This permits the ACS712 current sensor to be utilized in applications requiring electrical seclusion without the utilization of opto-isolators or other exorbitant disengagement procedures

ULTRASONICSENSOR:

Ultrasonic sensors work by emitting sound waves at a frequency unreasonably high for people to hear. They at that point trust that the sound will be reflected back, ascertaining separation dependent on the time required. This is like how radar the time it takes a radio wave to return subsequent to hitting an item. The sensor decides the separation to an objective by estimating time slips by between the sending and getting of the ultrasonic pulse. The workingguideline of this module is easy. It sends an ultrasonic heartbeat out at 40kHz which goes through the air and if there is a catch or item, it will reflection back to the sensor. By computing the movement time and the speed of sound, the separation can be determined.While a few sensors utilize a different sound producer and collector, it's additionally conceivable to join these into one package device, having a ultrasonic component shift backand forth among transmitting and getting signals.This kind of sensor can be made in a littler bundle than with

isolated components, which is helpful for applications where size is at a higher cost than expected. While radar and ultrasonic sensors can be utilized for a portion of similar purposes, sound-based sensors are promptly accessible they can be had for only two or three dollars now and again and in specific circumstances .For case, while radar, or even light-based sensors, make some troublesome memories accurately, ultrasonic sensors have no issue with this. Then again, if an object is made out of a material that retains sound or is formed so that it the sound waves from the receiver, readings will be unchanged. Distance = $\frac{1}{2} T \times C$.At 20°C (68°F), the speed of sound is 343 meters/second (1125 feet/second), but this varies depending on temperature and humidity

TEMPERATURE SENSOR:

DHT11 sensor comprises of a capacitive humidity detecting component and a thermistor for detecting temperature. The stickiness detecting capacitor has two anodes with a humidity holding substrate as a dielectric between them. Change in the capacitance esteem happens with the adjustment in moistness levels. The IC measure, process this changed opposition esteems and change them into computerized from .Temperature sensor DHT 11 shown in figure 3.5 used for estimating temperature this sensor utilizes a Negative Temperature coefficient thermistor, which causes an reduction in its obstruction esteem with increment in temperature. The temperature scope of DHT11 is from 0 to 50 degree Celsius with a 2-degree exactness. Humidity scope of this sensor is from 20 to 80% with 5% exactness. The testing pace of this sensor is 1Hz .for example it gives one perusing for consistently. DHT11 is little in size with working voltage from 3 to 5 volts. The most extreme current utilized while estimating is 2.5mA

VOLTAGE REGULATOR:

The voltage controller IC 7805 is really an individual from the 78xx arrangement of voltage controller ICs. It is a fixed straight voltage controller. The xx present in 78xx speaks to the estimation of the fixed yield voltage that the specific IC gives. For 7805 IC, it is +5V DC directed force supply. This controller IC additionally includes an arrangement for a heat sink.The voltage regulator shown in figure 3.6has input voltage that can be up to 35V, and this IC can give a steady 5V for any estimation of information not exactly or equivalent to 35V which is as far as possible.The input voltage will be in the range of 7v to 35 v which is given to the input pin.Then we can apply the unregulated voltage to the pin for the regulation. The ground pin is connected neutral and the output pin is to take the regulated voltage which is in the range of 4.8 v to 5.2 v.

ESP-8266 WIFI MODULE:

The ESP8266 Wi-Fi Module is an independent SOC with coordinated TCP/IP convention stack that can give any microcontroller access to your Wi-Fi organize. The ESP8266 is prepared to do either facilitating an application or offloading all Wi-Fi organizing capacities from another application processor. Each ESP8266 module comes pre-modified with an AT order set firmware, which means, you can essentially attach this to your Arduino gadget and get about as a lot of as a Wi-Fi Shield offers. To transmit the data that is sensed from the sensor to a remote cloud storage a Wi-Fi module is necessary here we chose NodeMCU esp8266 Wi-Fi module. It is a System on a Chip (SoC) design with processor in it and it consists of 9 pins for general purpose input and output purpose along with Rx, Tx pin for transmission and reception. The Tx and Rx of ESP8266 is connected to the 2nd (Tx) and 3rd (Rx) pin of the Arduino Uno to send the temperature and humidity values to it. It works on an input voltage of 3.3V

DC Motor

An electric motor is an electrical gadget which converts electric energy into mechanical power. The fundamental running principle of a DC motor is: "on every occasion a current wearing conductor is placed in a magnetic area, it studies a mechanical pressure". The course of this force is given by way of Fleming's left-hand rule and its importance is given by using $F = BIL$. Where, B = magnetic flux density, I = cutting-edge and L = period of the conductor within the magnetic discipline. Fleming's left hand rule: If we stretch the primary finger, second finger and thumb of our left hand to be perpendicular to each different, and the course of magnetic subject is represented by the primary finger, path of the contemporary is represented via the second finger, then the thumb represents route of the pressure skilled by means of the carrying conductor. When armature windings are linked to a DC supply, an electric powered modern-day units up in the winding. Magnetic area can be provided by subject winding (electromagnetism) or with the aid of the usage of everlasting magnets. In this case, modern-day carrying armature conductors experience a pressure due to the magnetic subject, in line with the principle said above. Commutator is made segmented to acquire unidirectional torque. Otherwise, the direction of force could have reversed every time whilst the path of motion of conductor is reversed within the magnetic area. This is how a DC motor works

V. PROPOSED METHODOLOGY

WORKING:

Because of the absence of labour and poor support of open borewells, it is smarter to screen the borewells centrally using IoT. The dry run of motor is shown by increment in temperature before the breakdown of motor. Thus motor temperature should be checked. The water quality parameters like pH which shows whether the water is acidic, basic or appropriate for drinking reason; turbidity which demonstrates the darkness or impurity of water are checked. pH sensor are utilized to check the water quality and DHT 11 sensor is utilized to check the dry run out, high motor temperature shows different irregularities in motor. Current sensor (ACS712) is utilized to check the current drawn by the motor which indicates whether the engine is running under loaded or unloaded condition. To measure the depth of the water in borewell we are using ultrasonic sensor. The pH sensor is mounted on the borewell containing water. The temperature and current sensor are kept flawless with motor. Under motor running condition and water nearness in borewell the individual qualities are estimated by the sensors. These sensors are associated with Arduino Uno utilizing wired links. The sensor output are sent to Arduino microcontroller which is modified utilizing Arduino IDE programming characterizing the limit esteems. ESP8266 Node Microcontroller is a wi-fi chip giving the system network to whole module by going about as the nearby hotspot. The information from the sensors is taken to Arduino and it transfers to ESP8266 node MCU. Since ESP8266 goes about as wi-fi chip, information can be brought from ESP8266 node MCU to the server remotely

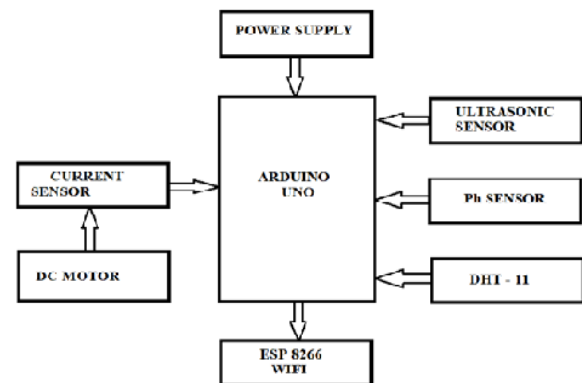


Figure1:Flow diagram

WORKING PRINCIPLE:

The figure 1 shows the flow diagram of the proposed system. The DC motor is connected with an current sensor to know the current consumed by the motor. The output of the current sensor is given to the analog pin (A0) of the Arduino. The trigger and echo pin of the ultrasonic sensor is connected with digital pin 9th and

10th of Arduino. pH sensor is connected with 2nd and 3rd pin of Arduino. DHT-11 is connected with an 7th pin of Arduino. ESP-8266 wi-fi module TX is connected with RX and vice versa to enable the data exchange. The transmitted data is gone be set to ThingSpeak platform so register in ThingSpeak and then login to the ID and by choosing create new channel create a new channel for temperature, pH, current and turbidity and after creating a new channel there will be APIkey available for each channel enter the API in the program specifying API key. Now the Wi-Fi name and Password are replaced with the user Wi-Fi and Password respectively

VI. RESULT AND DISCUSSION

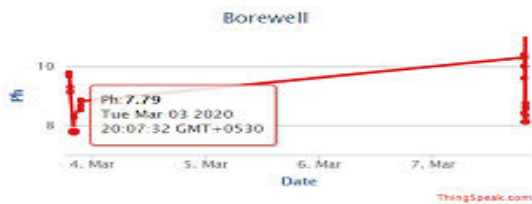


Figure 2 Graph of the pH

The figure 2 shows the graph of the pH value in water. The pH value ranges is 7 to 8 shows the water quality is good and suitable for drinking. The pH value above 9 shows the solution is base



Figure 3 Graph of the Temperature

The figure 3 shows the graph of the temperature value of the motor. The normal temperature value lies between 31°C to 36°C. If the temperature goes beyond this value the motor will get damaged

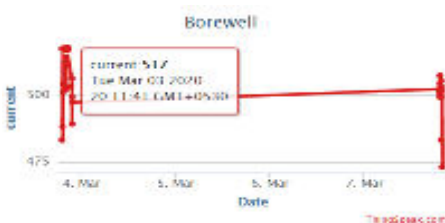


Figure 4 Graph of the current

The figure 4 shows the graph of current which is drawn by the motor. It helps to monitor the current consumed by the motor.

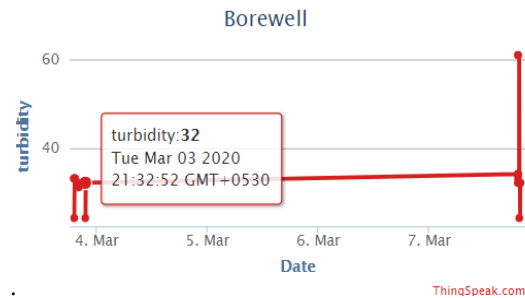


Figure 5 Graph of the turbidity

The figure 5 shows the turbidity value which can be calculated from the pH value.

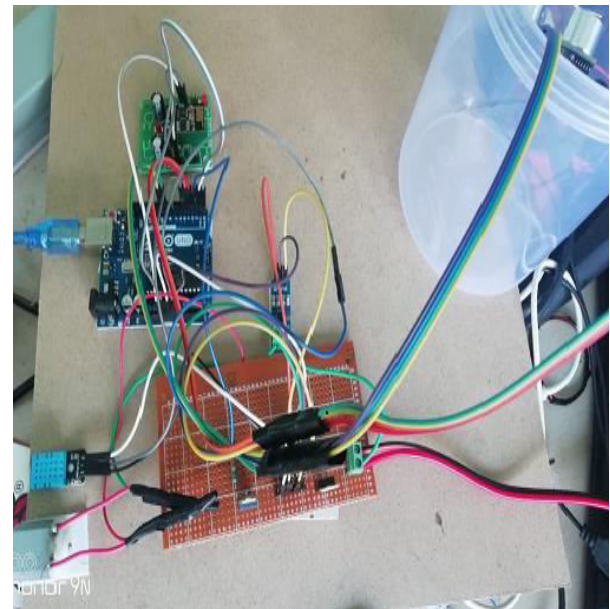


Figure 6 IoT based water quality and motor monitoring in borewell

VII. CONCLUSION

Internet of things is the emerging area which doesn't request human intervention. This project gives us a real life monitoring of water quality and motor parameters of a given environment using IoT. The obtained temperature, pH and current data is sent to a remote cloud storage using Wi-Fi for a graphical analyses of the given data and it can also be viewed lively. The system is a compact, low cost and results in time consumption so abnormalities were quickly recognised. It also can be implemented in industries to monitor the motor and waste water quality before discharging to water bodies.

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