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IOT Based -Pipeline Flow Controlling and Management

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ABSTRACT

Water is the most precious and valuable asset because it's a basic need of all the human beings but, now a days water supply department are facing problem in real time operations. This is because of less amount of water in resources due to less rain fall. With increase in Population, urban residential areas have increased because of these reasons water has become a crucial problem which causes the problem of water distribution, interrupted water supply, water conservation, water consumption and also the water quality, so to overcome water supply related problems and to make system efficient there is need of proper monitoring and controlling system. This project is focusing on continuous and real time monitoring of water supply in IOT platform. Continuous monitoring of water supply helps in the proper distribution water which further helps in having a record of available amount of water in tanks, flow rate, abnormality in distribution line. Internet of things is nothing but the network of physical objects embedded with electronics, sensors, software, and network connectivity. Using IOT monitoring can be done from anywhere as central office. Using Thinkspeak as free sever, data is continuously pushed on cloud and it can be seen in real time operation. Using different sensors and Node MCU using ESP8266 microcontroller, data can be monitored and also control operation from cloud with efficient client server communication can be done.

Keyword: - Node MCU using ESP8266 microcontroller, Limit Switch, Flow sensor, Turbidity sens , Valves, Motors, Relays, Pump.

1. INTRODUCTION

According to recent survey, water has become a big issue because of less rain fall, increase in population many cities are facing this problem people have to suffer from this problem they don't have sufficient amount for their daily needs. Due to lack of monitoring water can't be supplied properly, some areas in city get water while other some areas can't so, there is a need of continuous monitoring, water supply scheduling and proper distribution another problems are excessive consumption, overflow of tanks, leakage in pipeline ,interrupted water supply. Water is a basic need of every human being everyone has to save the water many a times with lack of monitoring ,overflow of these overhead tanks can occur because of this lots of water get wasted, another thing because of overflow in the pipelines with more pressure there is possibility of pipeline damage, leakage detection is one more problem all these problems are because of lack of monitoring, manual work, less man power, Before implementing this project I have done study on Aurangabad city to understand water supply distribution and related problems with the system, after taking a survey I observe that all the work is manual and need a better technology to make proper distribution. By focusing on problems in traditional methods our system design and develop a low cost embedded system device for real time monitoring of water distribution system in Internet of things (IOT) platform. IOT is a world where billions of objects can sense, communicate and share information; all interconnected over public or private Internet Protocol (IP) networks. These interconnected objects have data regularly collected, analyzed and used to initiate action, providing a wealth of intelligence for planning, management and decision making.

This Paper is structured as follows. Section 2 presents existing system for water flow controlling and management system. Proposed work is actually the modification in existing work has been explained in Section 3. The results are taken on think speak server which are displayed in Section 4. The future improvement in the system and paper is concluded in Section 5 & Section 6 respectively.

2. EXISTING SYSTEM

In the past, decisions are being made regarding the management of our water resources that have not always helped us become more secure or sustainable. We have disrupted and over allocated river flow regimes, sometimes to the point of drying them up, along with their downstream lakes. We have overdrawn groundwater aquifers; polluted many, if not most of our water bodies including estuaries, coastal zones and even oceans; and degraded ecosystems. We have done this mainly to satisfy short-term economic goals, often goals that may not

have included the long-term environmental or even economic sustainability of region or basin, and indeed our own health. There is no escape from the fact that the need and demand for finite and vulnerable water will continue to expand and so will competition for it. More uncertainty in water availability, higher frequency of extreme weather events, and more rapid return flows of water to the atmosphere are expected in the future. Given the changes in the hydrologic cycle as a result of land use and climate changes and the closed character of many basins, allocations to, and patterns of future water use, will deviate from past trends. So a system is needed where there is a continuous monitoring of water, water supply scheduling, proper distribution of water.

3. PROPOSED SYSTEM

Before explaining the proposed system let us give how water flows into the taps in houses. Cities usually source water from rivers, lakes, and ground water reservoirs. From these water sources, the water is pumped from pump houses into treatment plants through pipes. Water is cleaned at the treatment plant and from there it is piped into reservoirs. The reservoir is the storehouse for the treated water. Water is pumped from these reservoirs to the overhead tanks spread across the city. The water then gets distributed to houses and factories through a network of pipes working on gravitational force. In some cases, the water is directly supplied from the reservoirs to the houses. As all the cities are working on a smart city concept, our system focus on, Internet of things which is new scenario to make city as a smart city with different application. Main objective to implement this project is to design and develop a low cost reliable and efficient technique to make proper water distribution by continuous monitoring and also controlling it from a central server so that we can solve water related problems. Proposed system consists of Node MCU using ESP8266 microcontroller , different sensors such as flow sensor, and turbidity sensors are used. This system solves problem of Overflow, Quality of water and makes a proper distribution. Continuous monitoring and controlling from a central server is possible using this system.

NODE MCU: Node Micro Controller Unit is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266 and we are using it as a wifi module. Likewise, it is driven by low battery power (3.3v) and is of low cost when contrasted with other miniaturized scale controllers/processors like Arduino and Raspberry pi.

RELAY: Relays are the switches which aim at closing and opening the circuits electronically as well as electromechanically. It controls the opening and closing of the circuit contacts of an electronic circuit. When the relay contact is open (NO), the relay isn't energizing with the open contact. However, if it is closed (NC), the relay isn't energize given the closed contact. However, when energy (electricity or charge) is supplied, the states are prone to change.

PUMP: A pump is a mechanical device that is used to pick up water from low-pressure level to high-pressure level. Basically, the pump changes the energy flow from mechanical to the fluid.

TURBIDITY SENSOR: Turbidity sensors measure the amount of light that is scattered by the suspended solids in water. Turbidity sensors are used in river and stream gaging, wastewater and effluent measurements, control instrumentation for settling ponds, sediment transport research, and laboratory measurements.

SOFTWARE USED: The IDE used in this project is ARDUINO UNO. Programming language used here is **C**. There are different free servers for viewing data on to cloud Think Speak is one of them. Think Speak IOT is easy to use with less errors and simple commands**.**

3.1 Circuit Diagram

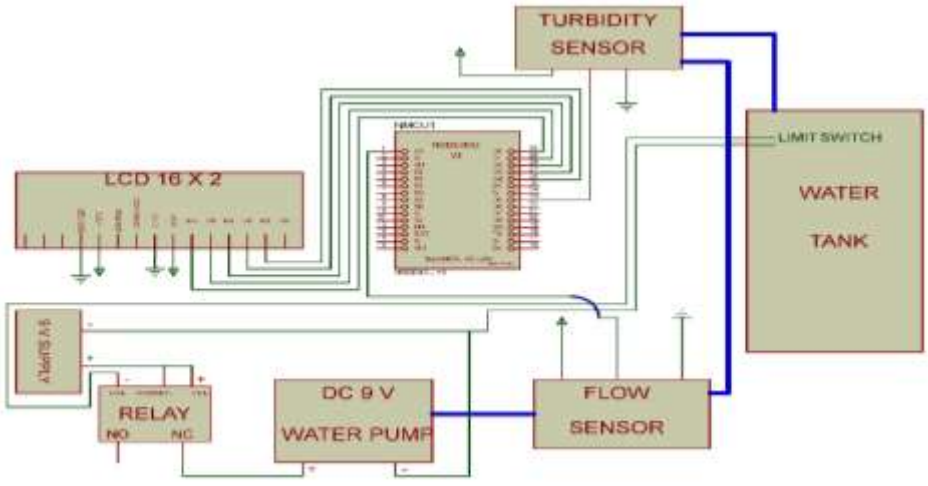

Fig.1 Circuit Diagram

3.2 Working

We are using 9-12V output DC voltage adapter which convert 220V AC to 9 to 12 DC voltage at output. The output of 9-12V is assumed as a battery of 9-12V DC I in which one positive terminal is connected with the relay common and one coil shunted together. The other terminal of coil is connected to one terminal in the limit switch which acts as limit sensor. The other terminal of the limit switch is directly connected to the negative pin of the battery. The water pump is connected in such a way that when there is a no current in the coil the water pump is active by connecting it with normally closed terminal on the relay and other with negative terminal of the battery to complete the circuit.

When the water level reaches upto the limit switch, the negative terminal of coil is active making the current to flow in the coil, so enabling the common switch to go to normally open terminal, thus breaking the current flow with the DC pump and this process goes on. Now as shown in circuit we are using Node MCU ESP8266 as the microcontroller which normally connects with the USB cable as an input voltage of +5V DC at Vin pin. In order to give power to microcontroller and flow sensor which together works on +5V DC we need to regulate the adapter voltage from 9-12V to +5V DC. So we need LM-7805 voltage regulator which gives the output +5V DC as required specifically. Now the flow sensor is connected with the pipeline in order to measure the flow in L/hrs. The turbidity sensor is submerged in the water to find the amount of suspended particles. It gives the output in mg/litres and operates on 3.3V input voltage which is provided by Node MCU. The output of both turbidity sensor and flow sensor are posted on thinkspeak server by updating the URL of field by feeding the URL of field 1 and field 2 with turbidity sensor value and flow sensor value simultaneously and displaying the graph on the thinkspeak channel which can be shared both publically and privately.

4. RESULT

A feed for each parameter is created on thinkspeak. First it checks turbidity of water. As motor get started it will fill water in the overhead tanks according to its level of water in tank water is supplied. These valves operate automatically, flow sensors gives flow rate in ml/sec. The system processes within given time period at thinkspeak .It can also operate as continuous process i.e. it means proper scheduling is done for distribution. On thinkspeak server we can see previous record also as data is continuously pushed on cloud so that we can monitor and control it in real time. 16*2 LCD is used to observe data locally.

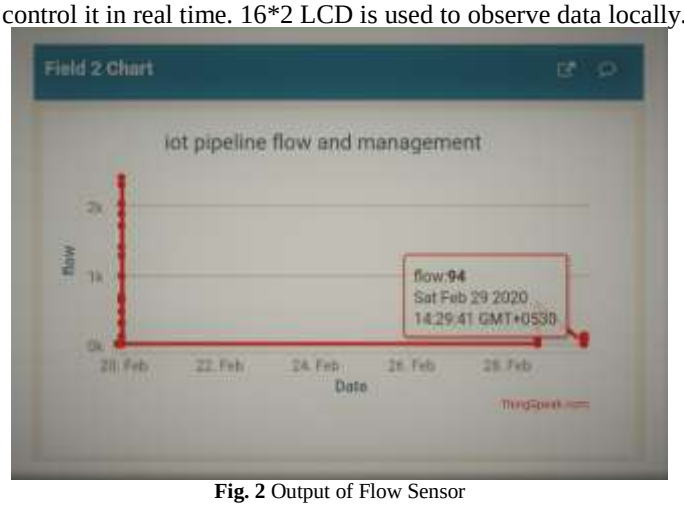

Fig. 2 Output of Flow Sensor

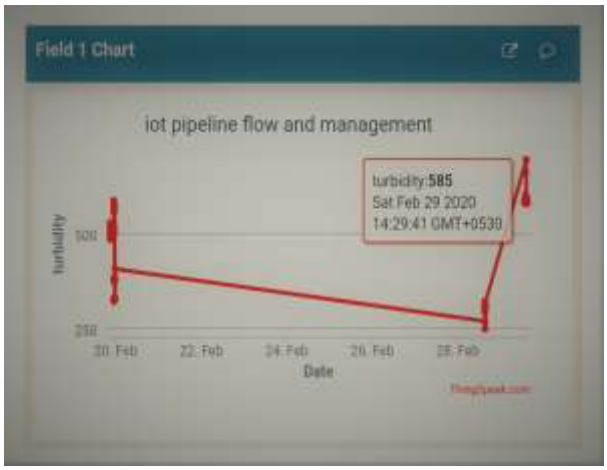

Fig. 3 Output of Turbidity Sensor

Fig 2 displays the output of flow sensor on think speak server. Once the water limit reaches the threshold the flow can be reduces or the supply may be cut down. Fig 3 displays the output of turbidity sensor on think speak server. The output corresponding to turbidity sensor is analog in nature and it is converted in the range from 0 to 1024.the threshold is assumed as 500. As the value shown in figure 3 is 584 the water can be treated as good quality water.

5. FUTURE SCOPE

So far, it has been implemented that the system can collect data successfully and communicates with web server. But here, if the water quality is bad which is checked by turbidity sensor, we can stop the line by manual work only. So the future work and expectations will be to automatically stop the line once it is found that water quality is below the threshold.

6. CONCLUSION

Using this system, secure and continuous monitoring is possible No need to go on field for monitoring so manual work has been reduced to large extent making system more efficient, reliable, low cost and accurate. We can get Data monitored from anywhere and controlling is also possible from a remote server. It is Economical in development.

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