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AUTOMATED IOT-BASED WATER DISTRIBUTION SYSTEM ENSURING 55LPCD PER PERSON

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Abstract

Water scarcity is a problem in many rural and semi-urban areas. Water distribution is also not done properly. The water supply systems that cities have are not working well. Some people get much water and others do not get enough. Also, the quality of water is not checked regularly to solve these problems we are talking about a system that automatically give water to each house. This system makes sure that each person gets 55 liters of water per day. It also stops water from being wasted. The system uses sensors, like pH sensor, TDS sensor, TWS sensor, to check the water and the 3Phase voltage, current also monitored it will avoid the dry run of the motor. If the supply is lost the message send to the officials. Each house has its tank to store water. This tank is checked using sensors and the water flow is controlled automatically. The big tank that supplies water to the area is also checked for water level and quality. All the information is sent to a place where the city officials can see it. We have made two systems for people to check their water usage and for city officials to check the water supply. We are using RFID cards to control who can enter the area where the big tanks. If the water quality becomes bad we send messages to the officials. This new system makes sure that water is distributed fairly. It also saves electricity. Stops water from being wasted. It makes everything transparent so that everyone knows what is happening with the water supply. The Water distribution system is very important. This new system will make it better. Water scarcity will be. Water distribution will be done properly.

Keywords: Internet of Things ,55LPCD Water, pH sensor, TDS sensor

1.Introduction

Water is really important for people to survive. There are people living in cities now and they need more water. This makes it hard for city authorities to make sure everyone has water[1]. In small towns and semi-urban areas water is sent to people's homes from big tanks on top of buildings. There is no one to check if the water is being used properly or if the pumps are working efficiently. The government says people in areas should use 55 liters of water per person per day. Some families use more water than they need while others do not get enough. This is not fair. Can cause problems. With the help of technologies like Internet of Things, we can make smart systems to manage water. These systems can check the water quality make sure it is distributed fairly and use energy wisely. Special sensors and control systems can help city authorities keep an eye on the water supply all the time. This study suggests a system to distribute water automatically. The system will check the water levels in the tanks and

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2.Literature Review

In our municipal water system water is pumped from where it comes from to a big tank up high and then sent to homes through pipes.

The way its distributed is usually done by people and on a set schedule not based on how much water people need.

* In small towns and villages water only comes once or twice a day.
* There's no way to see how water each house is using.

Some houses store a lot of water in big tanks while others might not get much at all[2]. Another big issue is that we don't check the water quality often Sometimes water, from the tanks has bad stuff in it but nobody tells the authorities or the people using the water. Also pumps are often turned on and off by people, which can waste electricity. Because we don't have systems to track things it's hard for the municipal authorities to see how much water is being used[3], how full the tanks. If the water supply is working well.

3.Methodology

The proposed system has two parts: municipal overhead tank monitoring and household water distribution management. In the overhead tank we use sensors like pH sensor, TDS sensor and turbidity sensor to check the water quality. We also use a sensor to measure the water level in the municipal overhead tank[4]. The data we collect is sent to a central monitoring system where the municipal authorities can see how the water supply is doing. Each household gets its water storage tank that can hold about 500–600 liters of water. We put sensors and multiple water level sensors in the household water storage tank to measure the water level correctly.

The municipal overhead tank monitoring and household water distribution management system figure out how water each household needs every day based on how many people are in the family. The system then supplies water to the household water storage tank automatically using valves[5]. When the household water storage tank has water the valve closes by itself.

We use an RTC module to set the time, for the water supply. The municipal overhead tank monitoring and household water distribution management system also uses GSM communication to send alerts if the water quality becomes bad[6]. To make sure only the right people can get into the municipal overhead tank we use RFID authentication at the municipal tank gate.

Software Dashboard

Fig 1 : Municipal Water Tank Monitoring

Fig 2 : Home Water Tank Monitoring

Hardware Dashboard

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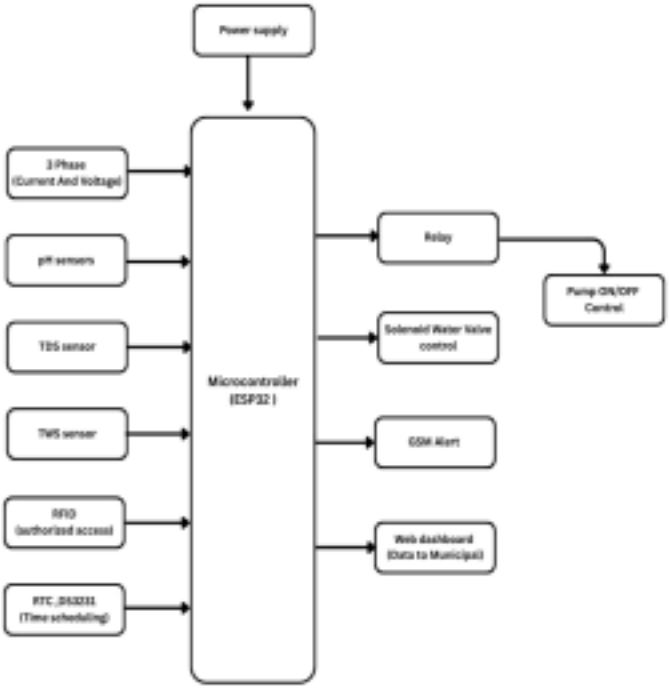

Fig 3 : Block Diagram Of Municipal Water Tank

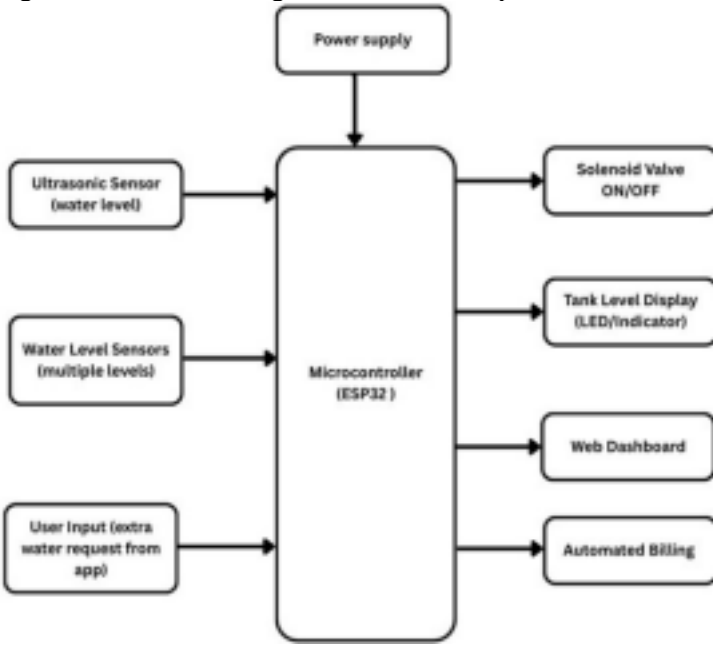

Fig 4 : Block Diagram Of Home Water Tank

Methodology with Formula

1.Water Distribution

Water required is calculated using:

Water Required = Population × 55

Here, population means number of people in a house.

Each person needs 55 liters per day.

For example, 5 members need 275 liters. 2.pH Value

pH = $-\log_{10}[H^+]$ This formula is used to find the pH level of water. It depends on the amount of hydrogen ions present. Based on the value, we can understand whether the water is acidic or alkaline.

3.TDS

TDS = k × EC

EC is electrical conductivity. TDS indicates the number of dissolved salts and minerals in water.

4.Turbidity

Turbidity = $\log_{10}(I_0 / I)$

It measures how clear or muddy the water is using light intensity.

5.Ultrasonic Sensor

Distance = (Speed of Sound × Time) / 2 Used to measure water level in the tank

S.No	Feature	Existings System	Proposed System
1.	Water Distribution	Manual	Automated
2.	Water Usage Control	No Limit	55 LPCD per person
3.	Water Quality Monitoring	Not available	pH, TDS, Turbidity sensors
4.	Tank Level Monitoring	Manual Inspection	Ultrasonic sensors
5.	Supply Control	Manual valve	Automatic solenoid valve
6.	Monitoring	No centeralized monitoring	IoT dashboard
7.	Security	No access control	RFID authentication

Table 1 : Performance Analysis

4.Result and Discussion

The new water system that uses Internet of Things technology was tried out with a model that had a tank for the whole town and smaller tanks for each

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house. This system was able to check the water to see if it was good and if there was enough of it. It used tools like pH and turbidity sensors to do this. These tools sent information to a dashboard where town officials could see what was going on with the water system right away.

The people who tested this system found out that it worked well. It gave each house the amount of water, which is 55 liters per person per day[7]. For example a house with five people got 275 liters of water per day. A house, with three people got 165 liters. When the house got all the water it needed the valve closed by itself. This stopped much water from being used and wasted[8]. The system also checked the water to see if it was bad. If the water was bad it sent a message to the town office and the house. The system used sensors to check the water level in the tanks and stop them from overflowing[9]. This system made the towns water system work better. It made sure everyone got a share of water. It used electricity and made everything more transparent[10]. The Internet of Things water system is a good way to manage water. It helps the town and the people who live there.

The water system that uses Internet of Things less electricity. The system makes sure that everyone gets a share of water and it can check the water in real time. This helps us use water in a way that's good for the planet. In the future the system can be made better by adding things like mobile phone apps and special computers that can store a lot of information. This can help us predict how much water people will need. This can help make villages and cities smarter and more able to manage water in a way that's good for everyone. The Internet of Things technology and the water distribution system can help make a life for people, in rural and urban communities. The water distribution system is an important part of this.

technology is very helpful[11].

5.Conclusion & Futurework

This paper is about a system that helps distribute water to people in a way. The system is based on Internet of Things technology. It is designed to make sure that every household gets the right amount of water. Each household should get 55 liters of water per person per day. The system calculates how water each household needs by counting the number of people living there.

The system also checks the quality of the water before it is sent to households. It uses sensors to check things like how clean the water is and how much dirt is in it. The system can also control how much water goes to each household tank[12]. This means that water does not overflow and get wasted. There is a platform that lets both the people in charge of the water and the residents check how much water is being used. The system also uses cards to make sure that only the right people can use it. It can send messages to peoples phones. It has a special clock that helps it work at the right time.

The people who made the system tried it out and it worked well. It helped manage the water and it used

References

1.Domestic Water Quantity, Service Level and Health, WHO Guidelines, Geneva, 2017.

2.Ministry of Jal Shakti, Rural Drinking Water Supply Standards – 55 LPCD Guidelines, Government of India Report, 2020.

3.IEEE, A. Kumar and S. Patel, “IoT Based Smart Water Distribution System,” IEEE International Conference on Smart Cities, pp. 120–125, 2021.

4.R. Sharma and P. Gupta, “Sensor-Based Water Quality Monitoring System Using IoT,”

International Journal of Engineering Research and Technology, vol. 9, no.

5, pp. 345–350, 2020. 5.M. Ali, S. Khan, and T. Ahmed, "Smart Water Management Using Wireless Sensor Networks," Journal of Environmental Monitoring Systems, vol. 8, no. 3, pp. 210–218, 2019

.

6.J. Lee and K. Park, "Real-Time Water Quality Monitoring Using IoT Sensors," International Journal of Smart Sensor Networks, vol. 6, no. 2, pp. 55–63, 2018.

7.S. Reddy and V. Kumar, "Automated WaterDistribution and Monitoring System for Smart Villages," International Journal of Advanced Research in Electrical Engineering, vol. 7, no. 4, pp. 115–121, 2021.

8.P. Singh and A. Verma, "Ultrasonic Sensor Based Water Level Monitoring System," International Journal of Electronics and Communication Engineering, vol. 5, no. 6,

pp. 101–106, 2019.

9.D. Johnson and M. Brown, "Smart Water Distribution Using IoT and Cloud Computing," International Journal of Smart Infrastructure and Systems, vol. 10, no. 1, pp. 44–52, 2022.

10.UNICEF, Water Supply and Sanitation Monitoring Report, UNICEF Publications, 2021.

11.S. Madakam, R. Ramaswamy, and S. Tripathi, "Internet of Things (IoT): A Literature Review," Journal of Computer and Communications, vol. 3, no. 5, pp. 164–173, 2015.

12.L. Da Xu, W. He, and S. Li, "Internet of Things in Industries: A Survey," IEEE Transactions on Industrial Informatics, vol. 10, no. 4, pp. 2233–2243, 2014.

13.V. G. Nair, P. S. Kumar, and A. S. Menon, "IoT Based Smart Water Quality Monitoring System," International Journal of Scientific & Technology Research, vol. 8, no. 10, pp. 123–127, 2019.

14.A. Zanella, N. Bui, A. Castellani, L. Vangelista, and M. Zorzi, "Internet of Things for Smart Cities," IEEE Internet of Things Journal, vol. 1, no. 1, pp. 22–32, 2014.

15.K. Ashton, "That 'Internet of Things' Thing," RFID Journal, 2009.