

# IoT ENABLED WATER DISTRIBUTION SYSTEM

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**Abstract:** The IoT Enabled Water Distribution system is proposed for managing, monitoring and efficient distribution of water. With the increase in population, the urban residential areas were increased because of this reasons water has become a crucial problem which affects the problem of water distribution, interrupted water supply, water conservation, water consumption. In order to fulfill the water demand of the continuously growing population, it is essential to provide the sufficient and uniform quantity of water to each and every area. IoT Enabled Water Distribution System as the name says it all about managing water supply throughout the scale, including small societies, townships, urban infrastructure and also for irrigational use. The water supply with continuous monitoring makes a proper distribution so that, we can have a record of the available amount of water in tanks, flow rate, abnormality in the distribution line. IoT is a network of physical objects which are embedded with electronic devices, sensors, software, and network connectivity. Monitoring can be done from anywhere as a central office. As per the scarcity of the water, it will be indicated by sending short message service notification as well as notification of water supply timing to societies.

**Index Terms –** *Efficient Distribution, Continuous Monitoring, Flow Sensor, Internet of Things, Solenoid Valve.*

## I. INTRODUCTION

We know that for every living thing on the earth the water is the main important resource. Without the water there is no living will live on the earth. But based on the present reports the water resources are reducing day by day and maybe there will be no water in 2040. Based on the present statistics from PHMED (Public Health and Municipal Engineering Department) the supply of water is not efficiently taking place due to lack of water resources and improper management of water. Current water distribution and management system involves water wastage and faces new challenges like system lags behind related to technical aspects. So, we have only chance to use the available water resources efficiently. In order to curb the problems involved in the existing system, solutions are implemented in the proposed system. We have a responsibility to provide the water to those who are not getting water. So, now we are having two main challenges in front of us and they are using the available water resources efficiently, effectively and another one is to save the water resources for future use. The present existing system will not face the above challenges due to improper management and also it has a lot of issues. So we have to rectify those problems to face the above challenges. Our project is used to rectify those problems and it will make the present system to face those challenges.

## II. LITERATURE SURVEY

Nowadays the municipal corporation supplies the water resources in different ways. For example, in most of the cities, the water is supplied by water tanks through the vehicles<sup>1</sup> and in most of the places the traditional water distribution system is used. It means the main water tank is placed in one place and the pipelines are connected to each and every house and by using these pipelines the water is distributed to each and every house<sup>2,9</sup>. In most of the areas, people are using groundwater by using bore wells and motors for their use. But by using the present system we are not efficiently transferring the water to each and every place due to the unavailability of the water resources, improper water management and also due to the improper maintenance. Now a day's the municipal corporation supply the water daily once or twice based on the availability of the water in that place but they are not specifying their supplying time<sup>3,7</sup>. So, people are waiting daily until they send the water. So, it is important to mention the people at what time the water is to be supplied.

### 2.1 Problems Identification

The existing system has more problems that's why it will not face the challenges mentioned above. The major problems which are present in the existing system are explained below. They are listed as:

#### 2.1.1 Improper Management

At present the municipal corporation system is supplying the water without any proper management that is the people who are having the water resources they get more amount of water and for others, the water is not sufficient. So, for supplying the equal amount of water to each and every area we have to maintain proper management for the distribution of water.

#### 2.1.2 Wasting of water

Now a day's water is wasted in many ways due to the irresponsibility of the people because we have more amount of water than we need. It mostly takes place in the areas where the water resources are mostly available. So, due to our negligence, we are wasting the water at the public taps and at our home, etc.

### 2.1.3 Improper Maintenance

Due to the improper maintenance of the municipal corporation, the water wastage is taking place in many ways like improper fixing of the taps, improper installation of the pipes and also using the fewer quality materials cause damages and leakages<sup>4</sup>.

### 2.1.4 Less Quality of Water

The present system is supplying the water simply by adding the bleaching powder. By adding the bleaching the water is not purified, it just kills the bacteria only but it is harmful to the people's health. So, we have to use the most advanced methods for the purification of water.

### 2.1.5 Water Leakage

The leakage of water is the most common problem in the existing system. While the water is supplied through the pipelines from the municipal tank, due to the breaking of the pipes or improper installation the water is leaked and it is very difficult to easily identify the leakages by the maintenance people<sup>5</sup>. So, more amount of water is wasted unnecessarily.

## 2.2 Statistics of Existing System

The below Figure 1 and 2, describe the present statistics of the municipal corporation system. The given statistics are plotted as per the data collected by the Public Health and Municipal Engineering Department (PHMED) <sup>6,8</sup>. In this, we have plotted the statistics about water supplied per day in Million Litres per Day (MLD) between 3 different districts in our state compared with the last 2 years.

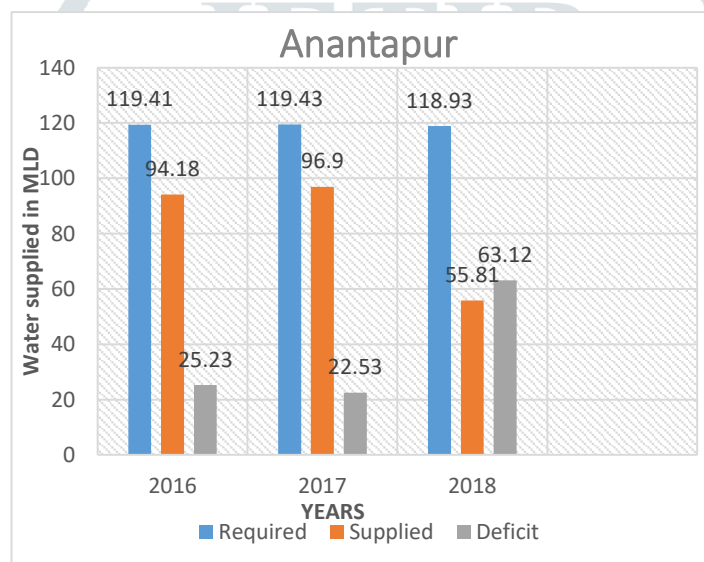


Figure1: Statistics of Anantapur

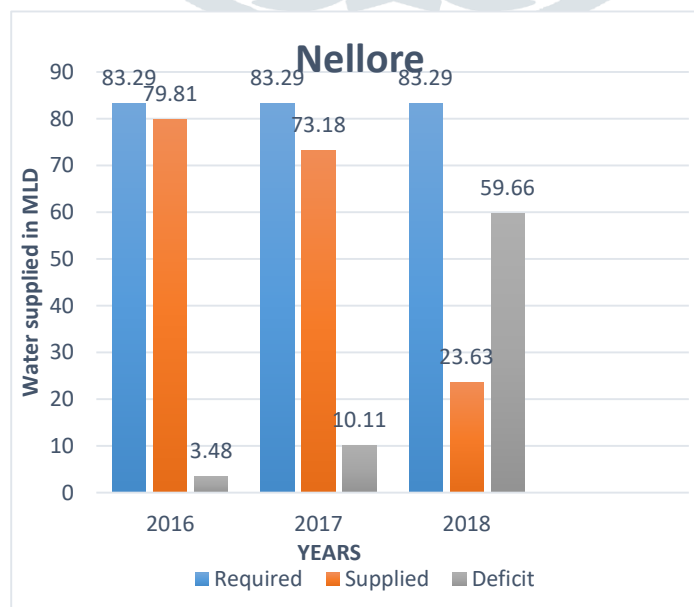


Figure2: Statistics of Nellore District

From the above figure 1, we observe that the blue color bar represents the amount of water required to the Anantapur district and the orange color bar represents the amount of water supplying and also the grey color represents the deficiency of the water as per their calculations. So, by comparing the last 3 years the deficiency level is increasing year by year in the Anantapur district of Andhra Pradesh state<sup>10</sup>. Similarly, figure 2 represents the statistics of the Nellore district. In this also the water deficiency is increasing by comparing with the past 3 years. But in some areas of these districts the water is supplying more than the requirement and some areas water is not necessarily supplied.

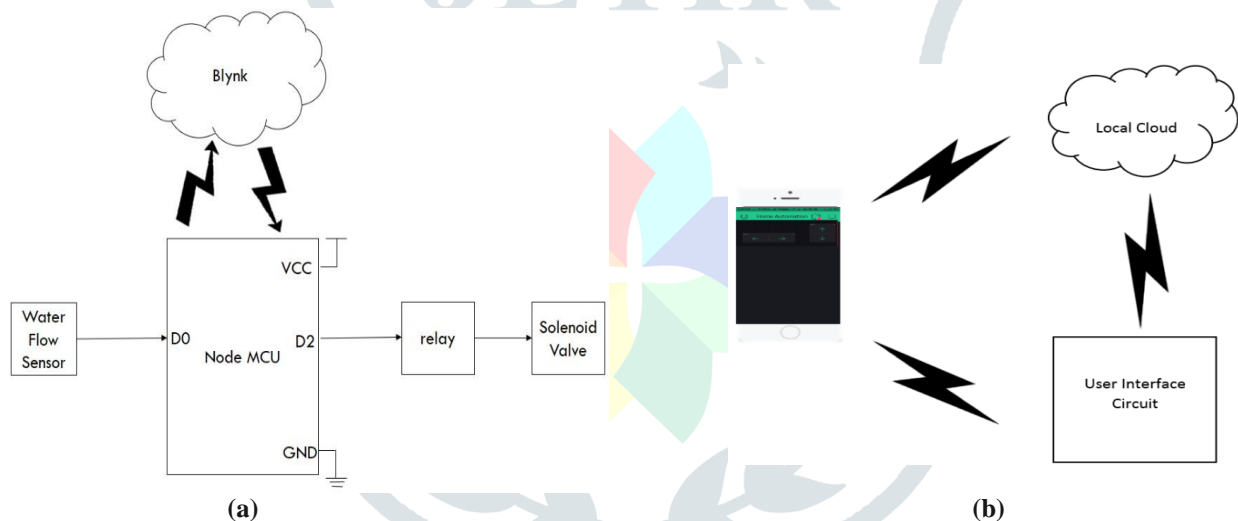
**III. METHODOLOGY**

The main objective of our methodology is "Providing efficient distribution, management, and conservation of water to sustain for the future generation". This methodology is used to avoid all the problems mentioned in the existing system and also it has more advanced features. In this method, we are adding some additional circuitry to the existing system for effective usage of water. By adding our circuitry to the existing system we have to face those two challenges mentioned above. In this methodology, we are using the latest technology called as Internet of Things. In this, the entire circuitry is controlled using the Internet as mentioned in the title. So, human interference is reduced by using this technology. The entire working process of our system is totally divided into two interfaces.

**3.1 Interface**

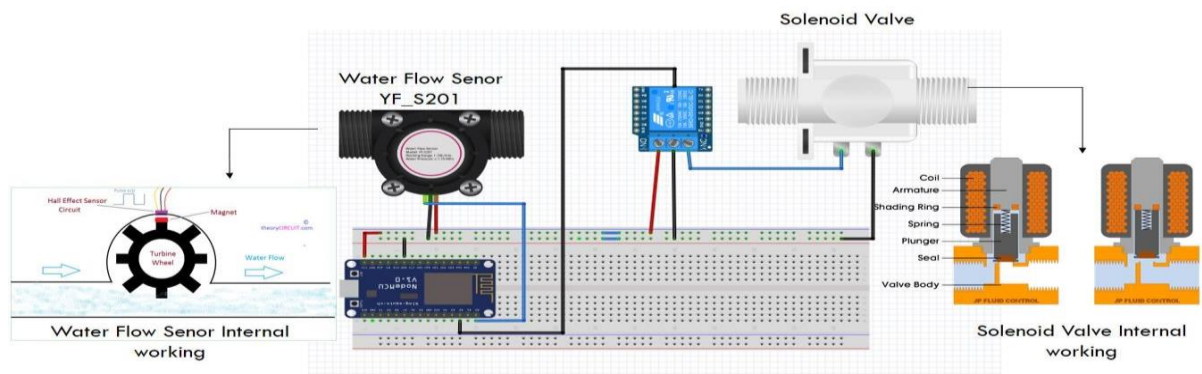
In the user interface section, we are adding a special feature in the entire distribution system. This interface is user controlled and is easily controlled by the users. If the supplied water is not sufficient to the people, in that case, we are providing a special feature that they can request the water to the municipal corporation as per their requirement by using a special application provided by us. It is a user-friendly application and even uneducated people also easily access that application. By using that application the people easily request the amount of water they require at any time. Whenever the request is placed, the municipal corporation will supply that amount of water to the requested people.

The below diagram represents the block diagram and cloud interface of the user interface system.



**Figure.4: (a) User Interface Block Diagram, (b) Cloud Interface**

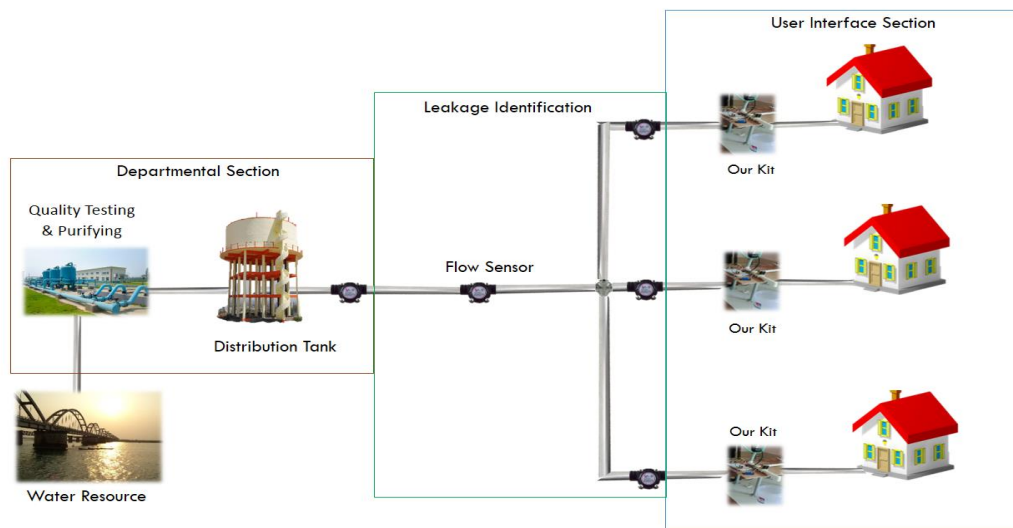
By using this user will request the water by using a mobile app and then the request is placed in the municipal corporation which is monitored in the local cloud and is accepted by the municipal water department and then by using the user interface circuit the ordered amount of water is supplied automatically to that particular user. The circuit diagram for the user interface kit is given in below figure.4. The circuit is the combination of some sensors like Water flow Sensor, Solenoid valve, and ESP8266 Node MCU board.



**Figure.5: User Interface Circuit Diagram**

The Flow sensor is an electronic device which is used to measure the amount of water flowing through it. This sensor is connected to the water pipeline and it contains a pinwheel sensor which is used to measure the quantity of water moved through it. There's an integrated magnetic Hall Effect sensor that gives an electrical pulse as an output with every revolution. Flow sensors use acoustic waves and electromagnetic fields to measure the water flow through a given area via physical quantities, such as acceleration, frequency, pressure, and volume. The sensors are strongly designed and provide a digital pulse every time repeatedly when the water passes through the pipe.

A solenoid valve is an electromechanically controlled valve. The valve contains a solenoid, which is an electric coil at its center with a movable ferromagnetic core. This core is called the plunger. In the rest position, the plunger closes off a small orifice. An electric current passing through the coil produces a magnetic field. The magnetic field emits a force on the plunger. As a result, the plunger comes towards the center of the coil so that the valve opens. This is the basic principle used to open and close the solenoid valves.



**Figure.6: The Framework of IoT Enabled Water Distribution System**

The above figure represents the entire layout of the IoT enabled water distribution system. It includes both the Departmental Interface and the User Interface sections. This is the overall schematic of this project after it is implemented in real time. The User Interface kit is connected at each and every household. It is a simple interface circuit and the users are easily installed without any municipal support. Each user will have a unique ID which makes the difference between the houses. By using that unique ID, the municipal corporation will distribute the water easily and it will identify each and every user easily and based on that the billing takes place.

**IV. RESULTS AND DISCUSSION**

IoT Enabled Water Distribution System can be useful for monitoring, tracing and manage the remote location valves and meters. In conventional systems, a person has handled such remote location valves and meter management. The main aim of this idea is to focus on various applications of IoT in water distribution which reduces the human effort and overcome the drawbacks in the conventional system.

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COM4
0
7200
400 mL/sec
4797
0
7200
400 mL/sec
5197
0
7200
377 mL/sec
5574
0
7200
377 mL/sec
5951
0
7200
377 mL/sec
6328
0
7200
377 mL/sec
6705
0
7200
377 mL/sec
7082
0
7200
377
Autoscroll Show timestamp
    
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**Figure.7: Result**

In the above figure.7, the result of the project is displayed. It shows the water allocated, the quantity of water supplied and the distribution speed. The water supplying is OFF whenever the water level reaches the allocated quantity. Whenever a user request an order for the extra water, then the order is placed immediately and then the water is supplied to the specified user.

## V. CONCLUSION

Our system will provide an appropriate solution to the daily problems faced by municipal corporations and residential in big cities. By using our system we are going to provide SMS notification regarding water purity, the water level at overhead tanks and also notification about the timing of water distribution. We get real-time monitoring and assistant over water. We believe this system will be one of the most promising for current and coming generation.

## VI. REFERENCES

- [1]. Tangadi Mayur Bhalchandra et.al; “International Journal of Advance Research, Ideas and Innovations in Technology” www.ijariit.com IoT based efficient water distribution system for human and agricultural uses Mayur.
- [2]. Alessio Botta, Walter de Donato, Valerio Persico, Antonio Pescap’è” On the Integration Cloud Computing and Internet of Things” International Conference on Future Internet of Things and Cloud 2014.
- [3]. Daniel Corujo, Marcelo Lebre, Diogo Gomes, Rui L. Aguiar. “A Frame Work for the Connectivity of an internet of things” IEEE 2011.
- [4]. Dan Partynski, Simon G. M. Koo “Integration of Smart Sensor Networks into Internet of Things: Challenges and Applications” International Conference on Green Computing and Communications and IEEE Internet of Things and IEEE Cyber, Physical and Social Computing IEEE 2013.
- [5]. Sanjay rode, “drinking water supply management in municipal corporations of maharashtra” global journal of management” [https://www.researchgate.net/publication/228618841\\_drinking\\_water\\_supply\\_management\\_in\\_municipal\\_corporations\\_of\\_maharashtra](https://www.researchgate.net/publication/228618841_drinking_water_supply_management_in_municipal_corporations_of_maharashtra).
- [6]. Mayur Bhalchandra Tangadi, “IoT based efficient water distribution system for human and agricultural uses”, International Journal of Advance Research, Ideas and Innovations in Technology www.ijariit.com.
- [7]. Santosh Gautam Kashid, “A survey of water distribution system and new approach to intelligent water distribution system”IEEE Xplore Library.
- [8]. G. VenkataRamana, “Network Analysis of Water Distribution System in Rural Areas using EPANET” Science Direct journals and books.
- [9]. Mr.TakeruTsuchiyaEngineer, Advisor, Division 3, Sector Strategy Development Department Japan Bank for International Cooperation “Unaccounted for Water (ufw) Reduction & Controland Water Distribution System Rehabilitation (wdsr)”.
- [10]. Arjun Kumar, “design of water distribution system using epanet”,International Journal of Advanced Research <http://www.journalijar.com>.