

Smart Water Monitoring and Controlling System

¹Ayaz Ahmed, ²Ajay Betur P

¹P G Scholar, ²Assistant Professor
ECE Department,
JNNCE, Shivamogga 577204, Karnataka, India

Abstract: For all existing creatures on earth, water is the principal requirement for their life and farm production and cultivation water is the basic requirement and vital element. It is a piece of eminent information that only 3 percent is fresh water on Earth's surface that can be used for humanoid consumption, where roughly 70 percent of the Earth's exterior is water. Additionally, in the existing state, with the increasing inhabitants in cities, there is a severe need for saving water. Checking the water level in the water chamber or else borewell etc., theatres employing the main part in cultivation. In general, whereas filling up the overhead containers, the utmost of the period's water runoffs leads to ample waste of water. For instance, if a water level falls beneath the onset level aimed at driving water in a borewell as well as in a tank, the pump motor might get impaired owing to dry running. In these situations monitoring the water level in addition to regulating the water pump, therefore, turn out to be an essential chore. To hand various other states exist wherever water level monitoring is an important chore. It possibly is secondhand to reserve water or to train the water practice of a water source. To restrain this problem, an IoT in addition to web-centered Smart Water Level Monitoring and Controlling System (WLMCS) has been advanced. This efficiently cuts the waste of water by nursing the level of water in the overhead chamber as well as hinting the consumer whether the motor is turned on or turned off the motor. This system automatically controls the motor turning on and off appropriately eluding the water depletion in line for to runoff of the overhead chambers as well as the problem in arrears to underflow of water in the overhead chambers.

Index Terms: Arduino UNO, Node MCU, MQTT protocol, Wi-Fi, IoT.

I. INTRODUCTION

Water is the utmost vital need for life to all living existences on Earth. Water is a valuable natural resource with static considerable accessibility. With nonstop growing in our nation's population, the per capita accessibility to utilize water is rapidly going down. Speedy industrialization and urbanization have directed to improve our standard of living which has enlarged the need for fresh water.

Present days Water is an inadequate source, especially for farming, the industry also for living beings present on earth together with humans. For each continent in the world water shortage is already affecting. The overall valuation of the water accessible on the globe remains 140 crores cubic kilometers. On view, only 3percent remains handy on behalf of human intake. As well as in the form of icecaps plus glaciers only two-thirds of this water exists which makes it unusable. Scientists claim that we currently live in a period where several towns will stay dead. The latest study by Indian Institute of Science foretold, in three years due to water shortage and fast development in solid and cemented constructions Bangalore will be a dead city, by the study city will hang out to dry soon as nearly 79 percent of the city is already deterioration in water bodies and very nearly to 70 percent of the inhabitants is currently reliant on underground water. Though there is a severe necessity to save water, each droplet of water sums to battle with water scarceness [1].

Loads of individuals don't grasp the true prominence of consumption of sufficient water every single day. Excess water is misused via several unrestrained modes. This problem is gently correlated to poor water distribution, incompetent use in addition to the lack of sufficient as well as combined water management. Hence effective usage and water monitoring exist as a probable constraint aimed at home/office water managing method. At present, the evolution of technology seems like the main feature certain to individuals as well as machines. Technology shows a vigorous part in each instant of their whole lifecycle of a humanoid, starting after a newborn baby to a precise old guy. If to nearer vision is occupied upon the technology, for every single pace we take or move it contracts by the technology.

Unique cause intended for water waste is the abundance of overhead containers. Several people still implement the old-fashioned system of pumping these overhead containers, i.e., by hand operation of the motor to fill the containers. As a result, if an individual overlooks to switch off the motor manually then water from an overhead tank gets waste, there are many ways to avoid these situations by the existing technology but didn't get an exact solution. A few disadvantages of the present mechanism of the overflow control systems are:

- Ball Mechanism: loosing of its mechanism after some time.
- Fuzzy: requirement of too many complications in setting up the system.
- Radio Frequency Communication based: requirement of manual view.

Internet of Things (IoT) can stay presumed to employ a structure of associated corporal things otherwise devices that exist for connecting the internet. In-built-sensors, embedded devices, etc., are the 'components' of IoT that assign an IP address, as a result, they can interconnect, gather as well as send data above the network deprived of physical aid after the consumer. The exact value of IoT is not only meant to power on light from a distant site but fairly what we do with the data which we get from sensors. Even IoT has some disadvantages like, for compatibility there is lack of international standards, though IoT emanates using specific convicts for instance shortage of universal normal aimed at compatibility, leads to miscarriage due to multifaceted systems, less

security, there is also benefiting from IoT such as devices can communicate with each other, devices can be operated remotely, right to use to concurrent data, as well as operative mechanization overcome these disadvantages also proves as a reliable tools.

II. RELATED WORK

Researchers ought to projected dissimilar prototypes for domestic, farming, industries zones using IoT, Wireless Sensor Network (WSN) in addition to several supplementary technologies. A few of the correlated work is elucidated here.

1. S. Pudasaini et al. [2] presented a system of an automated water level controller by SMS notice. They focus on helping a consumer in load flaking founded state like Nepal. SMS notification was introduced to the regulatory frame using the objective that water could be managed by the user in load peeling. Dual contexts work synergistically; an automatic level control framework in addition to the SMS frame. The method was shaped in the Arduino project forming the atmosphere and shifted toward the Microcontroller. The water level in the frame is well-ordered logically. The controller habit battery influence. Next to the so forth fact the framework practices an invalid level plus the standing of load peeling; the SMS cautionary stays directed towards the consumer.
2. S. B. Jagadal et al. [3] presented a controller frame that can be castoff towards displaying several tanks through nursing the action of machines which propels water by an 8051 MCU interfaced using LCD to the overhead tanks from the sump. At this point, they offered a multi-tank controller frame through 4 tanks en route for perceiving. The development stayed shaped towards four machines in cooperation means automated as well as physical. Here is an automatic fill substitute that seals each of the tanks one by one in a sequential way logically. An LCD platform of dimensions 40X2 is interfaced with an 8051 microcontroller to illustrate the eminence of the tank. They direct the project to LCD from 8051 MUC.
3. M. Shankari et al. [4] outlines, plus practice of water level mechanism which is distant, programmed, economically savvy as well as hard is discussed; it makes use of dual Radio Frequency receivers in conjunction with a controller respectively presented at the tank as well as the sump. Radio Frequency receivers remain exploited aimed at far-flung communication. The aforementioned is automated employing the aid of a trivial ruler controller. The context need not worry with any deliberation of the user except the sump is empty.
4. S. Paul et al. [5] propose a technology to regulate pumps by smartphones used domestic purposes to fill the water tank, plus in turn depletion of water could be avoided. A simple prototype of an android centered use is proposed via which water pumps could stand to operate by using wireless radio transmitters or Wi-Fi router.
5. B.OFlynn et al. [6] propose a project that is accessible to monitor the spatial as well as sequential circulation of water eminence and ecological limitations of a river catchment. It is proposed to determine a self-directed system of sensors that could be installed over a widespread area and the system trial factors such as temperature, pH, depth, dissolved oxygen, conductivity, and turbidity.

III. SYSTEM OVERVIEW

The Figure 1 consists of two important sensors called, ultrasonic sensor and flow sensor. A Arduino UNO is deployed to collect datqa from ultrasonic sensor and transmit to the ESP8266 Node MCU. Node MCU receive the data from arduino and data is processed as the application logic is implemented and data is analyzed. Node MCU then connects to the webpage using MQTT protocol. Flow sensor is used to avoid the water leak and to prevent water theft. The wireless communication technology used would be WiFi.

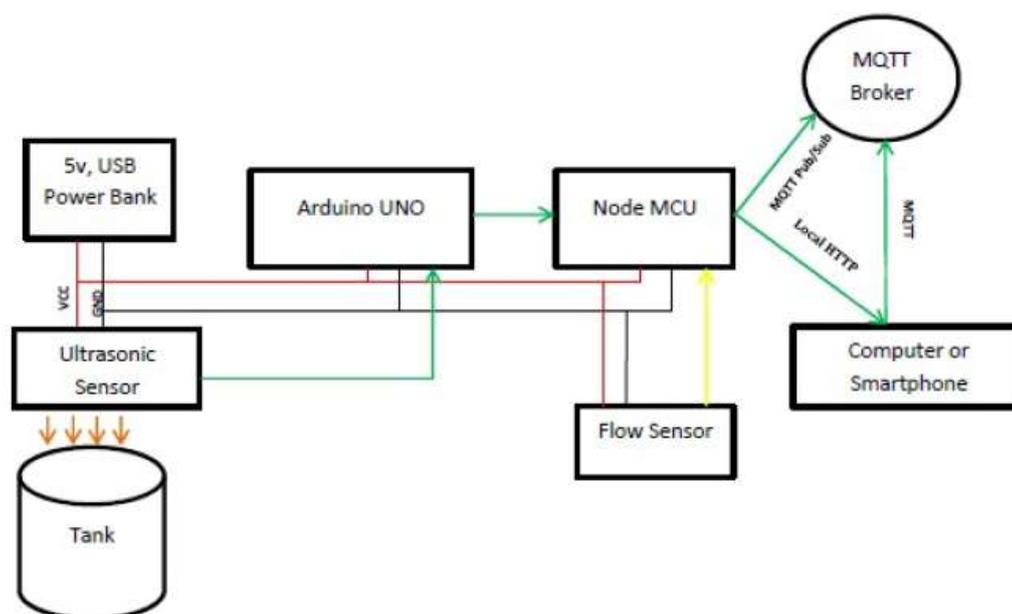


Figure 1: Block diagram of the proposed system

In Figure 2, the flow and steps of proposed system is shown.

Steps:

1. A water level detector that is Ultrasonic Sensor (HC-SR04) desired to be tailored by a water tank. The detector resolves up to whatever level of the tank is occupied with water.
2. Arduino Uno is to be connected to the Ultrasonic sensor.
3. Node MCU run the water level functional logic written to switch ON and OFF pump motor automatically.
4. In demand to switch a propel, i.e. switching it on plus off, a relay is en route for involved employing the core power source and to the pump.\)
5. As per the logic is written Node MCU the water level in the container, if the water level is below the pre-defined threshold level then it triggers the relay and switch ON the electrically powered and if the level of water is beyond the pre-defined onset level at that point Node MCU again triggers the relay turn OFF the motor automatically.
6. To monitor the water, water stream sensor is associated to Node MCU. Flow sensor sends the pulses to Node MCU and required math operations are carried Node MCU and if the water flow rate is less then water leakage is determined.
7. If the Phone/Computer is not associated with the similar Wi-Fi router, the message among the request as well as the static classification in the motor in addition to the tank will resolve via the internet.
8. After the Smartphone/Computer is connected to internet, the resulting water level condition and flow rate reading is updated in webpage through Node MCU using MQTT protocol.
9. It is to be renowned that the consumer prerequisites ought to a live internet link plus power source to the tools must be ON all through this practice.

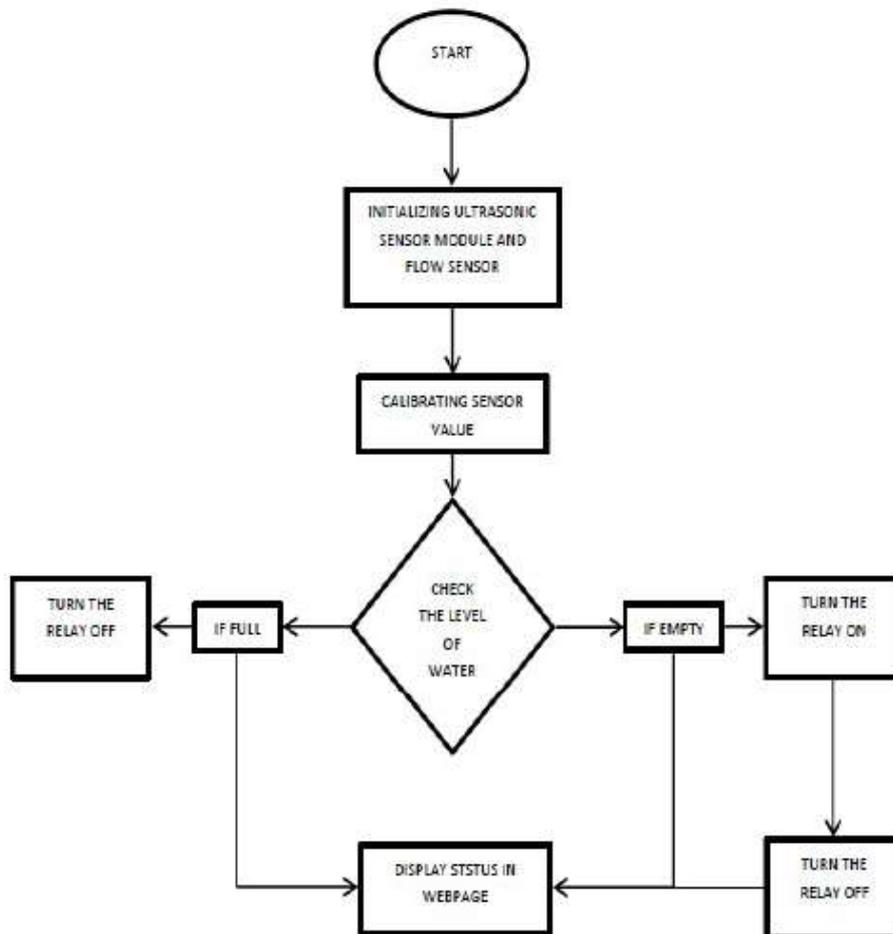


Figure 2: Flowchart of the proposed system

IV. IMPLEMENTATION

When HC-SR04 (ultrasonic sensor) is sited on the upper of the tank towards the water, an HC-SR04 determines the time taken to send a signal and receiving back the echo from an object. From the TRIG pin, time taken to send data and using ECHO pin time taken to receive the echo from an object is determined. The determined time after the ultrasonic device is directed to Arduino Uno and then this data is sent to Node MCU serially. The TRIG pin and ECHO pin of the HC-SR04 is allied towards the 9th pin plus 10th pin respectively. The determined data after Arduino is sent through Tx pin to the Rx pin of Node MCU. Here in Node MCU, the

functional logic is written as to switch ON and OFF the motor automatically en route for pumping the water from source tank to destination tank and to update the status in webpage created to monitor the water. The logic program is inscribed in such a manner that momentarily as the water level stays beneath the pre-determined threshold level D4 pin of Node MCU triggers the relay via signal pin of the relay, then the relay will be in normal open (NO) condition. The positive terminal of pump is linked to a positive end of the voltage source and negative end of the pump is linked to NO terminal of the relay and COM end of the relay is connected to ground terminal of voltage supply so that motor gets ON when relay is NO condition and when the water level is above the pre-determined threshold level, the relay will trigger to NC condition via D4 pin of Node MCU and signal pin of relay then motor gets OFF. Like this water is controlled automatically. To know whether water is getting leaked through pipes while pumping, the YF-S201 water flow sensor is used. The DOUT pin of YF-S201 is allied towards the D3 pin of Node MCU, from a DOUT pin of sensor number of pulses that are determined and sent to Node MCU. If the flow rate of water reaches below the threshold level then it is determined as water is getting leaked from the pipe. The level of water and flow rate of water is updated to the webpage through ESP8266 chip molded on Node MCU. Through this controlling and monitoring of water can be easily done.

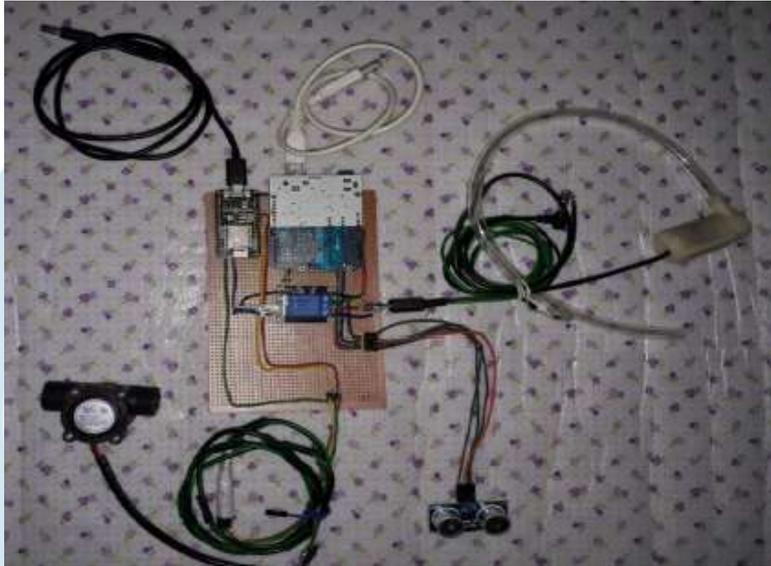


Figure 3: Implementation of hardware

V. RESULTS

Succeeding results are achieved in this system they are,

1. Water Level Detection and Pump Controller

- The waterless running of a water pump could reason harm to the pump, hence it is required to check the water level in the core tank.
- The water in the core tank can be sensed via the Level sensor.
- If the water level is beneath the onset, then power ON the pump to fill the water hooked on the tank.
- If the water is adequate in the tank then power OFF automatically by the controller.

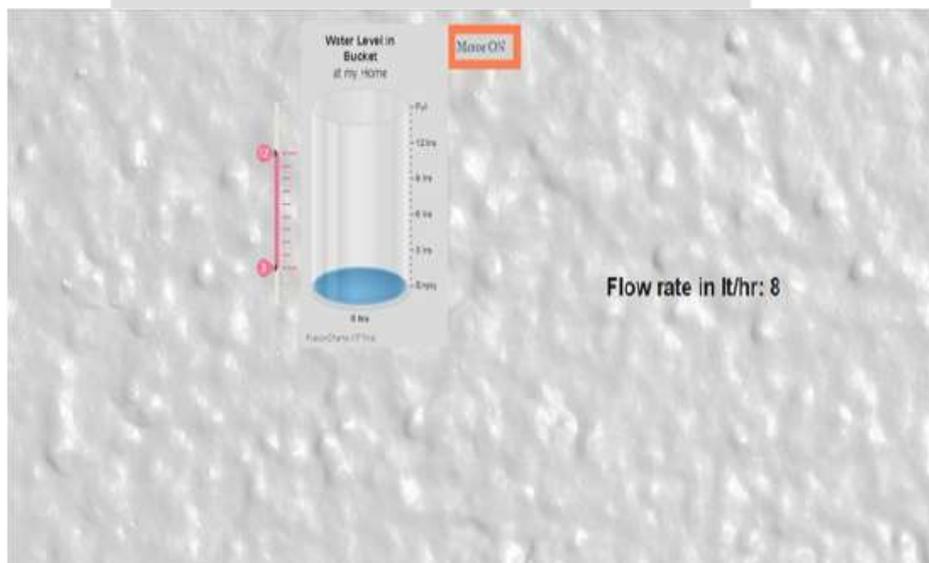


Figure 4: Tank is Empty and Motor is ON

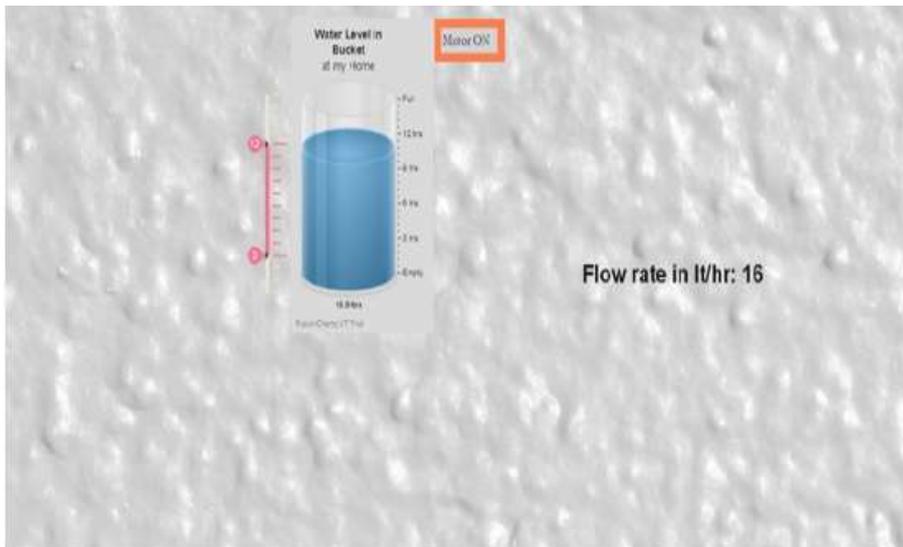


Figure 5: Tank is Half Filled and Motor is ON

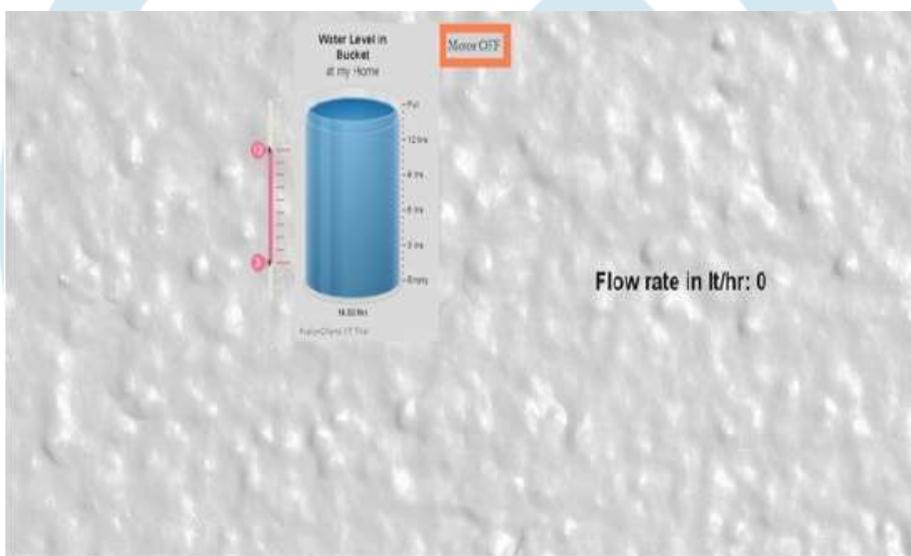


Figure 6: Tank is Full and Motor is OFF

2. Leak or Theft Finding

- Finding of Water Seepage or Theft is done through by means of the Flow sensing device.
- At the normal condition the Flow sensor rate will be high otherwise we can conclude that water is getting leaked or its been stolen when the flow rate is low at every period of time as shown in webpage.

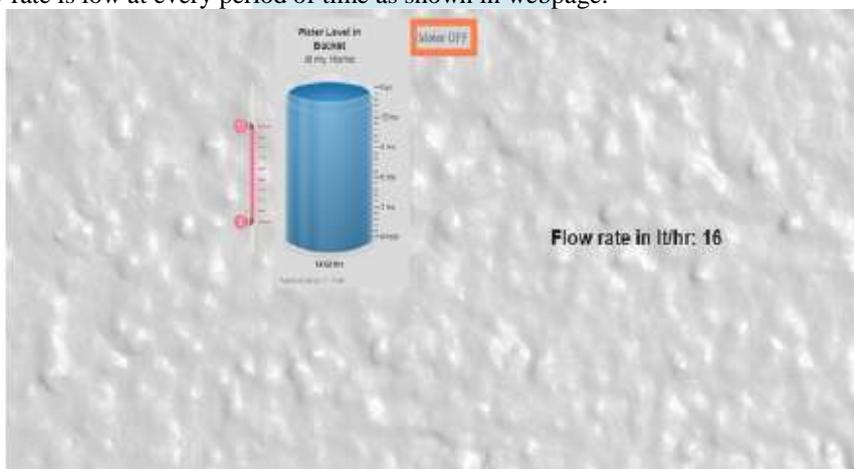


Figure 7: If the Water flow rate is low frequently, then water is getting leaked

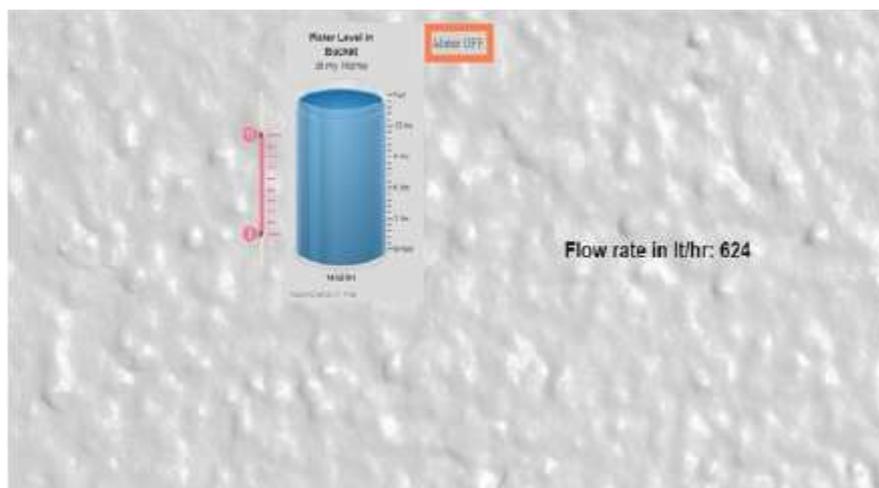


Figure 8: At normal condition

VI. CONCLUSION

The main idea of this proposed system is to mark the integrated water controller as well as the theft recognition method. We can make sure fair water supply towards all consumers by avoiding water burglary as well as confirming by taking needed action. The automatic circulation water supply monitoring system confirms appropriate water supply, avoid depletion of water, and cost-effective. In the current era of science and technology, it is essential to condense the manpower as well as to raise the practices of the instrument. This project carries technology hooked on the line through automating domestic necessities, which mark the effort of the water storing method considerably at ease as well as appropriate over management. The complete system takes a great influence in avoiding water depletion further operative than the physical effort.

In the future extensions to the project, the system can be designed in place of dissimilar bases of water through substituting measuring devices appropriate on behalf of the circumstance. In imminent, the projected system can be secondhand to study as well as monitor the water practice of a precise water basis, therefore, we need to advance such reasoning for the use. The system can similarly use to accumulate in addition to revise the ecological facts of a water basis in addition to its neighboring area by assimilating a supplementary sensor towards the system. Ultimate the project IoT based water level monitoring and the controlling system drive supportive en route for accumulate, explore as well as foresee the module, water level aspect, in addition to additional facts of specific water sources on the specific locality in simultaneous distantly.

REFERENCES

- [1] S. Shankar and D. M. Dakshayini, "Iot-mobile enabled smart water level controlling system to regulate water wastage," International Conference on Advances in Computing, Communications and Informatics (ICACCI), Sept 2018.
- [2] S. Pudasaini, A. Pathak, S. Dhakal, and M. Paudel, "Automatic water level controller with short messaging service (sms) notification," International Journal of Scientific and Research Publications, vol. 4, no. 9, 2014.
- [3] S. B. Jagadal and S. V. Halse, "8051 microcontroller based multiple water tank control system," Journal of Computer and Mathematical Sciences, vol. 4, no. 5, 2013.
- [4] M. Shankari, Jyothi, M. E, N. I, Harsha, and Herle, "Wireless automatic water level control using radio frequency communication," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol. 2, no. 4, 2013.
- [5] S. Paul, M. Das, A. Sau, and S. Patra, "Android based smart water pump controller with water level detection technique," International Journal of Advanced Research in Computer and Communication Engineering, vol. 4, December 2015.
- [6] B.OFlynn, F. Regan, A. Lawlor, J.Wallace, J. Torres, and C. OMathuna, "Experiences and recommendations in deploying a real-time, water quality monitoring system," Measurement Science and Technology, vol. 21, no. 12.