International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-9 Issue-5, March 2020

Secured Domestic Water Monitoring and Distribution System

M. Sasireka, S. Santhiya, A. Santhoshkumar, R. Meganathan, V. Monika

Abstract— Excess usage of water than it is actually needed and water theft are the major issues leading to water scarcity nowadays. Some people draw more water by using motor pump. Whenever they use motor pump, or they open the valve to the maximum, the flow rate will be increased. Hence in the proposed system, measurement of flow rate plays a vital role. Water monitoring and theft prevention system are employed which records the flow rate and thereby providing notification about the theft and excess usage of water. In the proposed system, each consumer end is provided with a water flow monitoring system which consists of a flow sensor to measure the flow rate and an arduino controller for recording the flow rate. The flow rate value will be sent to the water distribution station using GSM. The flow rate is fixed by the central water distribution station, so that each consumer end will be receiving an equal quantity of water. Solenoid valve is attached in the Pipeline so that the flow rate can be varied by adjusting the valve position. The valve position, time of supply and the flow rate will be controlled by the central water distribution system. The GSM MODEM is initiated by the ON/OFF switch which is controlled by the arduino.

Keywords— ARDUINO CONTROLLER, FLOW SENSOR, GSM, SOLENOID VALVE

I. INTRODUCTION

In this rapidly growing environment, there comes an enormous demand for water especially in industries and for domestic needs.Thus water monitoring plays an important role to prevent stealing of water and water leakage. The connection between the drinking water supply and consumers is established by domestic water suppl. This is essential for the survival of life and to maintain the health of people and for the continuous working of industries, homes and hospitals. In order to slaughter the contemplated water supply system, each consumer end should be serve with an arduino based water flow monitoring system consisting of a arduino controller to record the flow rate using a flow sensor and to transmit the same to a remote monitoring water distribution station using GSM Module

Revised Manuscript Received on March 30, 2020.
***** Correspondence Author
M. Sasireka, Assistant Professor, Electronics and Instrumentation Engineering, Kongu Engineering, Erode India.
S. Santhiya, Electronics and Instrumentation Engineering, Kongu Engineering, Erode India.
A. Santhoshkumar, Electronics and Instrumentation Engineering, Kongu Engineering, Erode India.
R. Meganathan, Electronics and Instrumentation Engineering, Kongu Engineering, Erode India.
V. Monika, Electronics and Instrumentation Engineering, Kongu Engineering, Erode India.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)

In the Pipeline Arrangement, an electrically operated solenoid valve is attached. Based on the valve position and the supply duration, each consumer end is supplied with fixed quantity of water. Whenever the flow rate exceeds beyond the fixed limit, then the central water distribution station closes the solenoid valve and stops the water supply to the particular consumer. The arduino controller will switch the solenoid valve state using a TRIAC switch. It is prospective to engage a GSM MODEM for wireless communication so that the data can be passed to consumer for notification and to the responsible officer's mobile number for immediate action.

II. LITERATURE REVIEW

Harold Li, et.al. [1] explains an efficient energy management frame work to provide satis.factory QOI experience in IOT sensory environments. Energy consumption decision is made energetically at process time, as the optimum for long-term traffic statistics under the constraint of the service delay..A study based on using the sensor with networks to perform water level monitoring is given to indicate the ideas and algorithms proposed in this paper, and a simulation is made to show the performance of the proposedalgorithms.

Jayti Bhatt, et. al. [2] emphasized to ensure the safe supply of drinking water should be detected in real time. In this new approach IOT (Internet of Things) based water recording has been suggested. In this paper, the design of IOT based water recording system that records the consumption of water in real time. The measured values from the sensors are handled by arduino controller. These processed values are transmitted remotely to the central controller using Zigbee protocol. At last the water flow rate data can be viewed on handheld devices using cloudcomputing.

Michal Lom, et. al. [3] describes the conjunction of the Smart City Initiative and the concept of industry 4.0. The topic of the smart city Water Monitoring System Based on IOT cannot be seen only as a technical solution, but different economic, humanitarian or legal aspects must be involved as well. Elements of the product are equipped with their own intelligence. IoT can be considered as an element that can create a connection of the Smart City Initiative and Industry 4.0.

Nikhil Kedia, et. al. [4] highlighted the water monitoring methods with embedded sensors, government role,operators are to be ensured the dissipation information,sensor cloud domine is also explored. Improving the water monitoring by using updated technology will be feasible for consumption of water usage.

III. MATERIALS AND METHODS

In the proposed method, theft control system for drinking water supply is entrenched. This system inexorably will able to control the water theft in the domestic areas. The distribution of water supply will be done with a fixed flow rate. Some people may draw excess water using motor pump. This is considered to be water theft. The proposed method detects this water theft by continuously monitoring the flow rate at the consumer end with the help of flow sensor and arduino based controller. The flow rate is transmitted to the to a remote water distribution station using GSM.

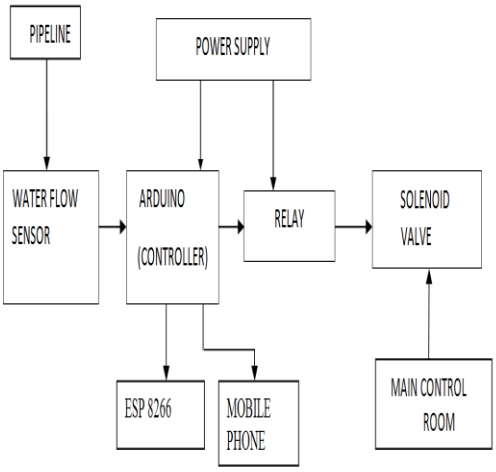

Figure 1 Block diagram

A.FLOW SENSOR: It consists of a pin wheel sensor to measure the quantity of liquid flowing through it. It is located along the pipeline. It also has an embedded Hall effect sensor, which produces electric pulse for every revolution.

B. SOLENOID VALVE: It is an electrically operated valve by which the flow rate can be adjusted.

C.ARDUINO: It is an open-source software used to control the opening and closing of the solenoid valve.

D.SINGLE CHANNEL RELAY: Relay is an electrically operated switch. It switches the motor ON or OFF based on the instruction from the arduino controller.

E.GSM: It is the global system for mobile communication.It is used to send the information about the overconsumption and water theft to the Central Distribution Station.

F.METHODOLOGY: In this, the system is equipped with an electrically operated solenoid valve to supply water to the consumers. The valve position is diverse by the central water distribution station PC to supply the water for specific time duration.

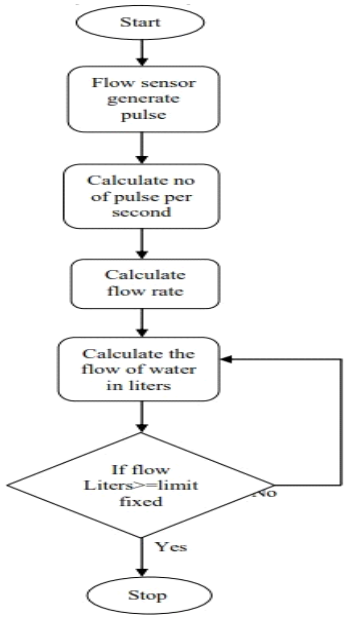

Figure 2 Flow Chart

The setup is equipped with an electrically operated solenoid valve to pause the water supply whenever the water theft is recognized or flow rate outstrip a predefined limit. The arduino controller will switch the solenoid valve state using a TRIAC switch. It is prospective to exploit a GSM MODEM for wireless communication so that the data can bereached to consumer for proclamation and to the respective officers cell phone for prompt action.

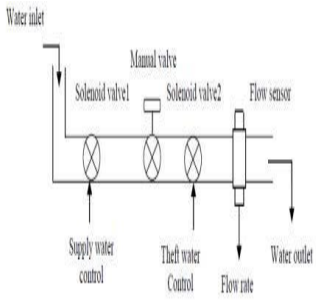

Figure 3 Pipeline arrangement

IV. RESULTS AND DISCUSSION

In the proposed system the fixed extent of water is outfitted and when it influence the specific restraint, it blocks contribute the water. The automated distribution water supply monitoring system ensures proper water supply, avoid wastage of water, and tariff efficient. Flow sensor overcomes the elemental limitation such as fewer veracity and human blunder. It supplies the rigid amount of water with opportune quality and quantity at correct time. The flow sensor used is of YF-S201.This sensor install in line with the waterline and consists of a pinwheel sensor to assess how much liquid has moved over it. There's an unified magnetic hall effect turbine water flow sensor that yield an electrical pulse for every rotation. The hall effect turbine water flow sensor is airtight from the water pipe and grants the sensor to reside safe and dry.

Three colored wires, red indicates 5-24V DC power, black for ground and yellow gives the Hall effect pulse output are attached with the sensor. The flow rate is calculated by counting the pulses from the sensor output. Each pulse is relatively 2.25 millilitres, It determine the average flow rate. The pulse signal is an uncomplicated square wave so it is absolutely easy to log and convert into liters per minute as follows:

Pulse frequency (Hz) / 7.5 = flow rate in L/min.

Flow rate at the pulse frequency of 3 Hz:

Pulse frequency(Hz)=3 Hz

Flow rate= pulse frequency(Hz)/7.5

Flow rate= 3/7.5

Flow rate = 0.4 L/min

The matrix switch is used to eclectic the limit for the water consumption, the YF-S201 hall effect flow sensor is used to determine the flow rate in the pipe line by using arduino controller, the extent of water consumed by the user is deliberate. If the flow rate and water consumed is less than the set value, the solenoid valve is 100 % opened. When the amount of water consumed reaches the set point, then the solenoid valve will be in 100% closed position and the controller will affirm the user by sending a message through GSM module.

TABLE I FLOW LIMIT EXCEEDS BY OVER CONSUMPTION

SI.NO	VOLUME CONSUMED (LTRS/MIN)	VALVE CONDITION
1	1	OPEN
2	2	OPEN
3	3	OPEN
4	4	OPEN
5	5	CLOSED

Above Table I inferred the water consumed by the user. The maximum flow set by the matrix switch was 5 litres/minuteThevalve was 100% open till reaches 4.9 litres/minutes.When the consumer consumes more than 5 litres, the valve is 100% closed. Through GSM module the message to the consumer is sent as “YOUR LIMIT IS DONE”.

TABLE II FLOW RATE EXCEEDS DUE TO WATER THEFT

SI.NO	FLOW RATE (LTRS/MIN)	VALVE CONDITION
1	0.5	OPEN
2	1	OPEN
3	1.5	OPEN
4	2.5	OPEN
5	3	CLOSED

Here, the Table II infers that if the external pump is connected without the knowledge of the user, then the set value given by matrix switch was 3 litres/minutes. Once the pressure inside the water is increased due to the external pump connected, the valve get completely closed when the flow reaches 2.5 litres/minutes By GSM module the message is sent to the user as “EXTERNAL PUMP ISCONNECTED”.

V. CONCLUSION

This arduino based automated water monitoring system equipment surpass solution to surmount the problems faced by typical method and also an intention to make human supervision redundant. The automation of water monitoring system waive water wastage and also provides continuous water flow measurement which helps to preclude water theft. It is an resourceful, malleable and fully automated system, which can be used as quick fix for water monitoring problem and water theft vandalism

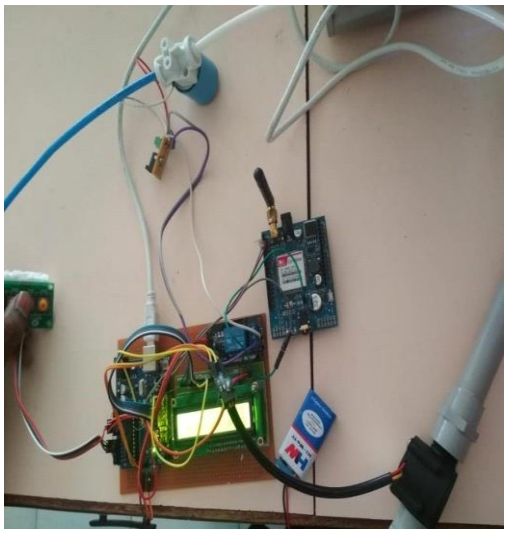

Figure 4 Arduino Controller with flow sensor setup for water monitoring system

Figure 5 Flow rate Display

FUTURE SCOPE

By implementing IOT and additional sensors, more adequate result and high security can be procured.Thedesigncan be altered using SCADA along with PLC. So that it isfeasibletomonitor and control whole system from main control units. SCADA gives graphical interface whichwillbe constructivefor the incompetentoperators to discernandaccumulatedata for futureuse.

REFERENCES

1. Harold Li,ChatschikBisdikian, Joel W Branch and Bo (2013) 'QOI-Aware Energy Management in Internet of Things Sensory Environments'- International Journal of scientific research and management (IJSRM) Volum|1,Issue9 Pages483-487.
2. Jayti Bhatt, Jignesh Patoliya 'REAL TIME WATER MONITORING SYSTEM'- International Journal of Pure and Applied Mathematics Volume 119 No. 15 2018
3. Michal Lom, OndejPribyl, Miroslavsvitek(2011) 'Automated urban drinking water supply control and water theft identification system' - Proceeding of the 2011 IEEE Students' Technology Symposium 14-16 January, 2011, IITKharagpur
4. Nikhil Kedia, KetakeeDagade(2014) 'A Sensor Cloud Based Cos-effective' International Journal of Engineering Research and Applications ISSN : 2248-9622, Vol. 4, Issue 4(Version 6)

AUTHOR PROFILE

M. Sasireka, Completed B.E,Electronics and instrumentation (Anna University) M.E , Applied Electronics (Sathyabama Institute Of Science And Technology) Working in Kongu Engineering College ,Since 2004.

A. Santhosh kumar, B.E Final Year Electronics And instrumentation department Of Kongu Engineering College,Perundurai,Erode-638060.

S. Santhiya, B.E Final Year Electronics And instrumentation department Of Kongu Engineering College,Perundurai,Erode-638060.

R. Meganathan B.E Final Year Electronics And instrumentation department Of Kongu Engineering College,Perundurai,Erode-638060.

V. Monika, B.E Final Year Electronics And instrumentation department Of Kongu Engineering College,Perundurai,Erode-638060.