**IoT based Digital Water Supply system using Raspberry Pi**

**Contents:**

* Abstract
* Introduction
* Block Diagram
* Working Principle
* Requirements for Hardware and Software
* Specifications
* Applications
* Advantages
* Reference

**Abstract**

In urban areas the water supply to residence and commercial establishments are provided at a fixed flow rate. There are incidents of excess water drawing by certain customers/users by connecting motor-pump sets to the water lines which is considered as water theft. In this project it is proposed to develop an embedded based remote water monitoring and theft prevention system by recording the flow rates at the consumer/user end. In order to implement the proposed water supply system, each consumer end should be provided with a web based mobile application consisting of so many options for the user to record the flow rate using a level sensor and to transmit the same to a remote monitoring station using IOT and it is also provided with an electrically operated solenoid valve to supply water to the consumers. The valve turns on/off by the central processing unit Raspberry Pi to stop the water supply whenever the flow rate exceed a predefined limit. It is proposed to employ a Internet of things for wireless communication so that the information can be passed to many responsible officers cell phone for immediate action

**Introduction:**

With the continuous economic growth, the water demand of enterprises is also increasing. The monitoring of water resource for these enterprises can prevent the occurrence of stealing water and leaking water effectively. Therefore, the monitoring system of urban water supply has aroused extensive attention in recent years. Urban water supply networks form the link between drinking water supply and drinking water consumers. These large-scale networks are vital for the survival of urban life, for maintaining a healthy level of economic development, and for the continuous operation of factories and hospitals.

In world, urban water supply systems are public enterprises, usually part of a local government, and the recent increased interest in privatizing public enterprises has not led to reforms of water systems. Nevertheless, in about 50 cities in the developing world, the water system either has been privatized or franchised to a non-governmental entity for its operation and maintenance.

In this research work it is proposed to develop an embedded based remote water monitoring and theft prevention system by recording the flow rates at the consumer/user end. . In order to implement the proposed water supply system, each consumer end should be provided with a web based mobile application consisting of so many options for the user to record the flow rate using a level sensor and to transmit the same to a remote monitoring station using IOT and it is also provided with an electrically operated solenoid valve to supply water to the consumers.

With the rapid development of global system Internet infrastructure and information communication technology in the past few decades has made the communication is reliable for transmitting and receiving information efficiently. So here we used IoT for efficient communication purpose.

Sever with database

Monitor

Relays

Water flow sensor

Raspberry Pi

IoT enabled Web based App

Solenoid Valves

Leakage detector/ Moisture sensor

**­­­**

Power Supply LM 317

**Working Principal:**

In this project, it is proposed that the usage of Anti-theft control system for drinking water supply. By implementing this proposed system in a real time; surely it will be able to control the drinking water theft in the domestic areas using water flow sensor. In urban areas the water supply to residence and commercial establishments are provided at a fixed flow rate. There are incidents of excess water drawing by certain customers/users by connecting motor-pump sets to the water lines which is considered as water theft.

In this work, it is proposed to develop an embedded based remote water monitoring and theft prevention system by recording the flow rates at the consumer/user end In order to implement the proposed water supply system, each consumer end should be provided with a web based mobile application consisting of so many options for the user to record the flow rate using a level sensor and to transmit the same to a remote monitoring station using IOT and it is also provided with an electrically operated solenoid valve to supply water to the consumers.

The system is provided with an electrically operated solenoid valve to supply water to the consumers. The valve turns on/off by the central processing unit Raspberry Pi to supply the water for a particular time period. The system is provided with an electrically operated solenoid valve to stop the water supply whenever the flow rate exceeds a predefined limit. The processor will switch ON/OFF the solenoid valve using a TRAIC switch. It has been employed a IOT for wireless communication so that the information can be passed among consumer and service provider.

The ultrasonic sensors fitted at all the tanks can detect the level of water and incase tank is filled the automatically valve gets turned off so as to prevent water overflow. In case leakage occurred in the water pipelining the moisture sensor will detect the leakage and immediately it the problem will be updated to the mobile app so as to take necessary action. The mobile based web App will be provided to both water supplier and consumer. The supplier by sitting at one place and supply the water to different areas by just giving the inputs to mobile App. The consumer also can demand for the water instantaneously using the mobile app. If he is a postpaid customer the bill will be generated to him at the end of month depending on the usage or if the consumer is prepaid the he suppose to pay the bill before he can order for water. The complete data base regarding water consumption, supply, bills and other things are recorded in the database.

**Requirements for Hardware and Software**

**Hardware:**

* Raspberry Pi
* Relay
* Solenoid Valve
* Monitor
* Ultrasonic sensors
* Moisture sensor
* Flow sensor
* Power Supply

**Software:**

* Python
* Linux
* IoT
* PHP
* Mysql
* CSS
* Java Script

**Technical specifications:**

* Operating voltage of embedded circuitry is 3.3vdc
* Current consumption of device in active mode 200mill amp
* Operating frequency of device is 10MHZ to 60MHZ

**Advantages:**

1) Economical

2) Portable

3) Low maintenance cost

4) It can be used to supply the water Automatically by sitting at one place

5)It generates the water bill automatically on the basis of usage.

6) If not used water valve can be turned off in case home is shut.

7) water pipe leakages can be tracked using IR sensor.

8) Drawing of excess water using pumps can be detected using Water flow pressure sensor.

9) Water Quality can be monitored.

10) Automatic Bill can be generated easily.

11) On demand water supply to consumer is provided.

12) Water Theft Detection is prevented.

13) Water overflow can be avoided.

Limitations

* If leakage occurred identification of exact location is quite difficult since underground pipelining is done

**Applications:**

* It can be used in Fuel supply system in underground tunnels.
* The concept can be used in electricity management system.
* The concept can be used in Home appliance control.
* The concept can be used in Health care sector.
* The concept can be used in Making of smart cities.

**References:**

[1] Gouthaman.J, Bharathwajanprabhu.R & Srikanth.A “Automated urban drinking water supply control and water theft identification system” Proceeding of the 2011 IEEE Students' Technology Symposium, IIT Kharagpur pp.87-91, 2011.

[2] S.Leirens, C. Zamora, R.R. Negenborn, and B. De Schutter “Coordination in urban water supply networks using distributed model predictive control” Proceedings of the 2010 American Control Conference, Baltimore, Maryland, pp. 3957–3962, 2010.

[3] Shicheng Dong, Hao Jin “Design of wireless monitoring system for urban water supply based on embedded technology” International Conference on Measurement, Information and Control (MIC), pp.348-351, 2012

[4] Lingjuan Wu, Jennifer Trezzo, Diba Mirza, Paul Roberts, Jules Jaffe, Yangyuan Wang, Fellow and Ryan Kastner IEEE Members.”Designing an Adaptive Acoustic Modem for Underwater Sensor Networks”.

[5] Peng Jiang , Hongbo Xia , Zhiye He and Zheming Wang “Design of a Water Environment Monitoring System Based on Wireless Sensor Networks” Sensors, ,pp. 6411-6434, 2009.

[6] H.G.Rodney Tan, C.H.Lee and V.H.Mok, “Automatic Power Meter Reading System Using GSM Network”, 8th International Power Engineering Conference (IPEC),pp-465-469, 2007. [7] Ma Ming, “Design of embedded system application platform based on ARM”, Manufacturing Automation, vol.34, pp 15-16, 2012.

[8] Hen Hui, Zhou Wenchao and so on, “Design of the embedded remote meter reading system based on Ethernet”, Electronic Design Engineering, vol. 20 pp. 184-186, 2012.

[9] Stancil, Stoian and Kovacs, “Urban water supply distributed system”, vol.3, pp.316-321, 2008.

[10] K.Veeranna Reddy, Y.Tirumala Babu,“A study on auto theft prevention using GSM”, International Journal of Engineering Trends and Technology,vol.2, pp. 60-64, 2011.