IOSR Journal of Engineering (IOSR JEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
PP 45-49

Digital Water Meter and Automatic Generation System

Mr.V.Suresh[1,] Mr.K.Baskar[2], Mr.C.Durai[2], Mr.K.Vairamuthu[2], Mr.S.Vengadesh[2].

1. EEE Dept, Assiociate prof / S.K.P Engineering College, Thiruvannamalai.
2. UG Scholars / S.K.P Engineering College, Thiruvannamalai.

Abstract *– This paper aims at providing a solution to the problems faced in the existing analogue water meters that include the low accuracy in flow measurement, air valve issue, manual billing system and uneven distribution of water. The DIGITAL WATER METER overcomes these limitations. It automates the billing system using a low power wireless technology-ESP8266 WIFI Module. Water consumption is monitored in real time and the data is transmitted to the data centre via ESP8266 for storage, billing and maintenance purposes. It also has a special advantage of open tap and leakage detection and generating alert messages when leakage gets detected so that we can able avoid the leakage as well as wastage of water. This project will help us in effective water conservation. In this study we suggest including cloud storage as well as live monitoring through the website for monitoring live data of water usage and conservation.*

Keywords *– DIGITAL WATER METER, ESP8266 WIFI Module, LCD (Liquid Crystal Display), RTC (Real Time Clock).*

I. Introduction

Accurate flow measurement is an essential step both in the terms of qualitative and economic points of view. Many countries currently lack proper water meter management, with many municipalities and bulk water suppliers not having the capacity to undertake and manage optimal and integrated meter calibration, replacement, reading and information management systems. Often the divided responsibility between billing and meter man agreement (typical of the institutional arrangements within most municipalities) results in poor billing, incorrect information capture, and poor maintenance. This is further compounded by the fact that where initiatives of water demand management and conservation are required, the data is not easily accessible to the departments responsible for this task, leading to the frequent lack of integration between domestic and bulk water metering.

So, the one who is not using the water most of time have to pay the same amount that of the person using the water at max. This project solves the existing problem economically and efficiently.

II. Water Measurements:

2.1 Water Flow Meter:

Water flow meters are used to measure the volume of water used in commercial and residential buildings. The water is supplied to homes and offices via a public water supply system. Water meters may also be used at water sources or throughout the water system to calculate the flow rate of a part of the system.

Water flow meters may also measure the flow rate of slurries or fluids in closed pipes. The flow rate of water is measured in cubic meters (m3) or litres on an electronic or mechanical register.

Water flow meters can measure hot water, cold water, clean water, dirty water and slurries.

Two common methods are used in water flow meter measurement: velocity and displacement flow meters. Each type takes advantage of a variety of technologies.

2.2 Paddlewheel Sensors

The Paddlewheel sensor is a cost effective and most commonly used water flow meter. It may also be used to measure flow rates of water-like fluids. Many paddlewheel sensors are sold with insertion or flow fittings. Like turbine meters, they require 10 pipe diameters of straight pipe on the inlet and 5 pipe diameters on the outlet. The rotor of the paddlewheel sensor is fitted perpendicular to the flow rate. It will make contact with a limited cross-section of the flow.

2.3 Positive Displacement Flow Meter

This type of flow meter is used in applications where a straight pipe is not available and if a paddlewheel sensor and turbine flow meter would experience too much commotion. Positive displacement flow meters are used for viscous liquids as well.

2.4 Magnetic Flow Meters

This type of flow meter does not have moving parts and used in wastewater applications or with dirty liquids that are conductive. Displays are an important part of this type of flow meter which can be used for data logging or remote monitoring.

2.5 Ultrasonic Flow Meters

This flow meter is used in applications where sewage and dirt are involved such as waste water, slurries and other dirty liquids. This type of water usually damages conventional flow meters. Ultrasonic flow meters operate on the principle that a frequency shift of the ultrasonic signal occurs when it is reflected by gas bubbles or suspended particles in motion. This is also known as the Doppler Effect.

2.6 Yf-S201 Hall Effect Water Flow Meter / Sensor

We use paddle wheel sensor. This sensor sits in line with your water line and contains a pinwheel sensor to measure how much liquid has moved through it. There's an integrated magnetic Hall Effect sensor that outputs an electrical pulse with every revolution. The hall effect sensor is sealed from the water pipe and allows the sensor to stay safe and dry.

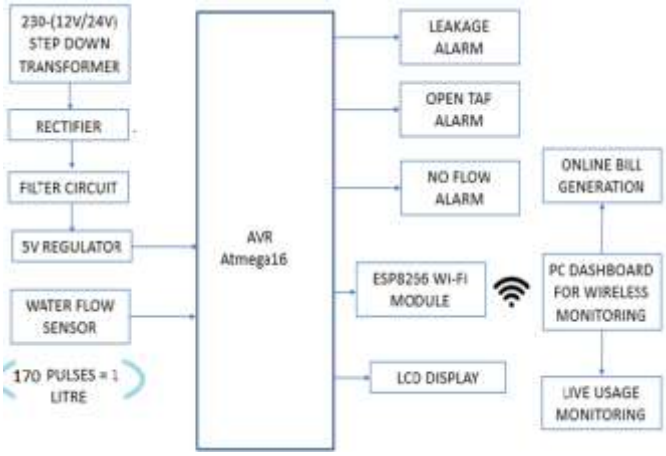
The sensor comes with three wires: red (5-24VDC power), black (ground) and yellow (Hall Effect pulse output). By counting the pulses from the output of the sensor, you can easily calculate water flow. Each pulse is approximately 2.25 milliliters. Note this isn't a precision sensor, and the pulse rate does vary a bit depending on the flow rate, fluid pressure and sensor orientation. It will need careful calibration if better than 10% precision is required. However, it's great for basic measurement tasks.

The pulse signal is a simple square wave so it's quite easy to log and convert into liters per minute using the following formula.

Pulse frequency (Hz) / 7.5 = flow rate in

Fig. Water flow sensor

III. System Architecture



1. Control Unit

The control unit consists of solenoid valve, water flow sensor, water sensor, AVR Atmega16 microcontroller, RTC, ESP8266 WIFI Module, and Liquid Crystal display (LCD) as shown in Fig. Each of the unit is describe below:

A) Microcontroller

The microcontroller used in Digital water meter is AVR Atmega16. "AVR" stands for **A**lf and **V**egard's **R**ISC processor. It has features 8-bit RISC architecture, low consumption, and better performance. It has 40-pin DIP package.

b) Program Memory Organization

Program instructions are stored in non-volatile flash memory. Although the MCUs are 8-bit, each instruction takes one or two 16-bit words. The size of the program memory is usually indicated in the device itself (e.g., the ATmega64x line has 64 KB of flash, while the ATmega32x line has 32 KB). There is no provision for off-chip program memory; all code executed by the AVR core must reside in the on-chip flash.

c) Data Memory Organization

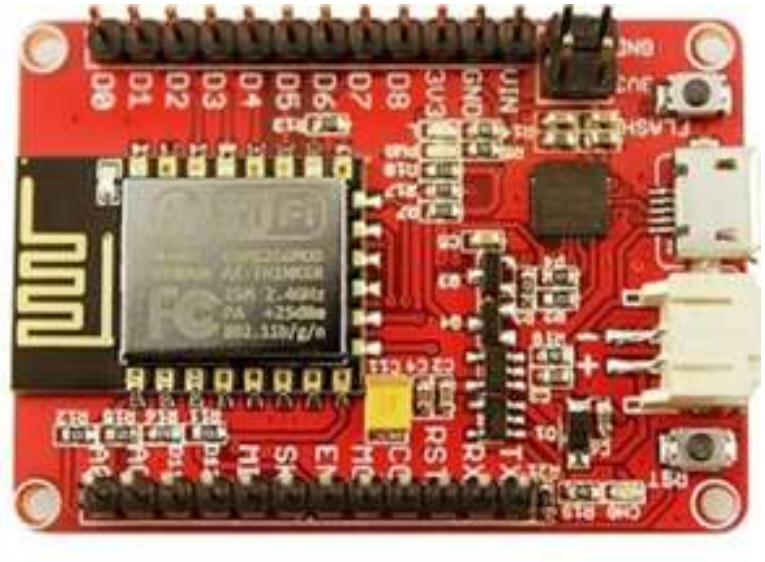
The data address space consists of the register file, I/O registers, and SRAM. Some small models also map the program ROM into the data address space, but larger models do not.

d) LCD Display

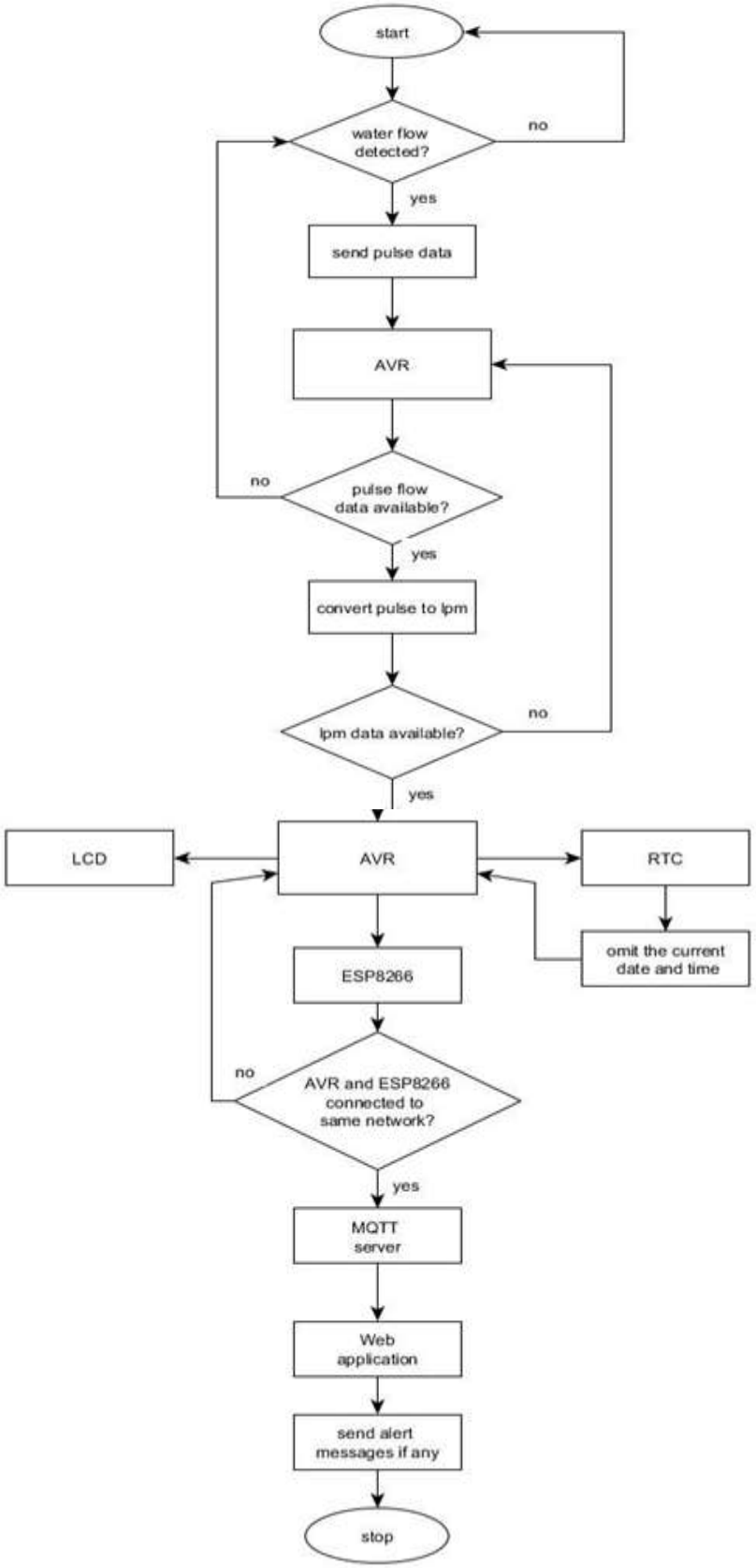
In Digital water meter 16x2 Display is used. It stores the display data transferred from the microcontroller in the internal display RAM and generates dot matrix liquid crystal driving signals. Each bit data of display RAM corresponds to on/off state of a dot of a liquid crystal display.

e) ESP8266 MODULE:

The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) capability produced by Shanghai-based Chinese manufacturer by Espresso. The processor core, called "L106" by Espressif, is based on Tensilica's Diamond Standard 106Micro 32-bit processor controller core and runs at 80 MHz (or over clocked to 160 MHz). It has a 64 KB boot ROM, 64 KB instruction RAM and 96 KB data RAM.



IV. Work Flow:


start
water flow detected?
no
yes
send pulse data
AVR
no
pulse flow data available?
yes
convert pulse to lpm
lpm data available?
no
yes
LCD
AVR
RTC
omit the current date and time
ESP8266
no
AVR and ESP8266 connected to same network?
yes
MQTT server
Web application
send alert messages if any
stop

Once the Digital water meter starts up, all the peripherals are initialised. The controller checks for water flow if water flow is detected then one more check will be performed by the controller if the customer has paid the trailing months bill and only if the bill has been paid the controller opens the solenoid valve and starts recording the quantity water flow webpage and the data will be sent to the data-centre, this process will be infinite loop.

V. Conclusion

Direct meter reading for billing is not required since automatic billing is achieved and user is notified through wireless communication. Leakage detection, prepaid billing, ESP8266 WIFI Module interface options can be provided to ensure the water usage.

Reference

[1]. Tavares, Sayonara AC, et al. "Telemetry for Domestic Water Consumption Based on IOT and Open Standards." 2018 Workshop on Metrology for Industry 4.0 and IoT. IEEE, 2018.

[2]. V. Sharath, S. Suhas, B. S. Jain, S. V. Kumar, and C. P. Kumar, "Smart aqua meter," in Advances in Electronics, Computers and Communications (ICAECC), 2014 International Conference on. IEEE, 2014, pp. 1–5.

[3]. Da Silva, Marcos Frei Campos, and Daniel Patrick Pereira. "System for Measurement and Control of Water Consumption Using Wireless Sensor Network." Computing System Engineering (SBESC), 2011 Brazilian Symposium on. IEEE, 2011.

[4]. Mudumbe, Mduduzi John, and Adnan M. Abu-Mahfouz. "Smart water meter system for user-centric consumption measurement." Industrial Informatics (INDIN), 2015 IEEE 13th International Conference on. IEEE, 2015.

[5]. Rathore, M. Mazhar, Awais Ahmad, Anand Paul, and Seungmin Rho. "Urban planning and building smart cities based on the internet of things using big data analytics." Computer Networks 101 (2016): 63-80.

[6]. ZHANG, Lixun, et al. "A PWM speed controller of dc motor using avr microcontroller [j]." Machinery & Electronics 4 (2004): 009.

[7]. Hunkeler, Urs, Hong Linh Truong, and Andy Stanford-Clark. "MQTT-S— A publish/subscribe protocol for Wireless Sensor Networks." Communication systems software and middleware and workshops, 2008. Comsware 2008. 3rd international conference on. IEEE, 2008.

[8]. Real Time Clock - https://www.pantechsolutions.net/how-to-interface-i2c- rtc-with-avr-development-board

[9]. A. Stanford-Clark and H. L. Truong, MQTT for sensor networks (MQTTs), http://www.mqtt.org/MQTTs Specification V1.0.pdf, Oct. 2007.

[10]. N. Kolban, "Kolban's book on esp8266," an introductory book on ESP8266, 2015.

[11]. Node Js - https://nodejs.org/en/

[12]. M. F. C. da Silva and D. P. Pereira, "System for measurement and control of water consumption using wireless sensor network," in Computing System Engineering

[13]. AVR freaks - https://www.avrfreaks.net/

[14]. Laddha, N.R. and Thakare, A.P., 2013. A review on serial communication by UART. International journal of advanced research in computer science and software engineering, 3(1).

[15]. Tilkov, Stefan, and Steve Vinoski. "Node. js: Using JavaScript to build high-performance network programs." IEEE Internet Computing 14.6 (2010): 80-83.

[16]. B. S. Jain, S. V. Kumar , S. Suhas, V. Sharath and C. P. Kumar, "Smart aqua meter," in Advances in Electronics, Computers and Communications (ICAECC), 2014 International Conference on. IEEE, 2014, pp. 1–5.