Proc. Annual Symposium on Research & Industrial Training, 01(2014) 69-73
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DIGITAL METER TO MEASURE WATER CONSUMPTION

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ABSTRACT

Today the measurement of water usage is very important factor due to the cost of the water bill. Traditional analog meters are having in houses and at the end of the month meter reader would read and give the bill. The main problem was until the bill was received customers couldn't see their monthly bill. The requirement is arise when the water wastage is high compared with the usage of the water. Therefore identifying the unit consumptions house owners can reduce their monthly bill. This digital water meter is a flexible, cost effective and durable water consumption meter. In first,theHall Effect water flow sensorwas usedto sense the water consumption of a house. When water travels from the water flow sensor it emits stream of pulses. Then the microcontroller wascounted the number of pulses came from water flow sensor and it was counted a liter when considerablepulsespassed through the sensor. Those values were displayed in a LCD(Liquid Crystal Display).Screen attached to the microcontroller. The microcontroller was programmed to display the total water liters being used. By using several commands and by using some buttons attached to the water meter house owner can see the water usage and monthly water bill. This meter is very useful to customer to see their water bill and reduce their water usage.

Keywords: *NWSDB, Hall Effect, Proteus, LCD, PIC*

1.0 INTRODUCTION

Around 80% of the Sri Lankan population has access to safe drinking water of which 40% is through pipe water supply systems of the National Water Supply and Drainage Board (NWSDB). Mainly NWSDB obtains their income by charging for the water units they provided for the customers. Each and every regional office of NWSDB has appointed several officers to gather meter readings and to issues bills for the customers[1].

But in the process of acquiring consumed water units NWSDB uses traditional analogue water meter which are likely to be error occurring. These may need continuous repairs due to mud, dirt and due to wear and tear of the wheels included in the meter. The NWSDB like to use digital water meters to measure water units but the price of today digital water

meters in the market are very high (normally 120$).Therefore in my study a low cost digital meter was introduced for the customers with providing some extrafacilities. The main objective of my research was introduced a low cost digital meter to measure water consumption. Thisdigital water meter was displayed total water liters, monthly consumed water liters, monthly consumed water units and price for consumed water units.

2.0 EXPERIMENTAL

2.1 Circuit implementation

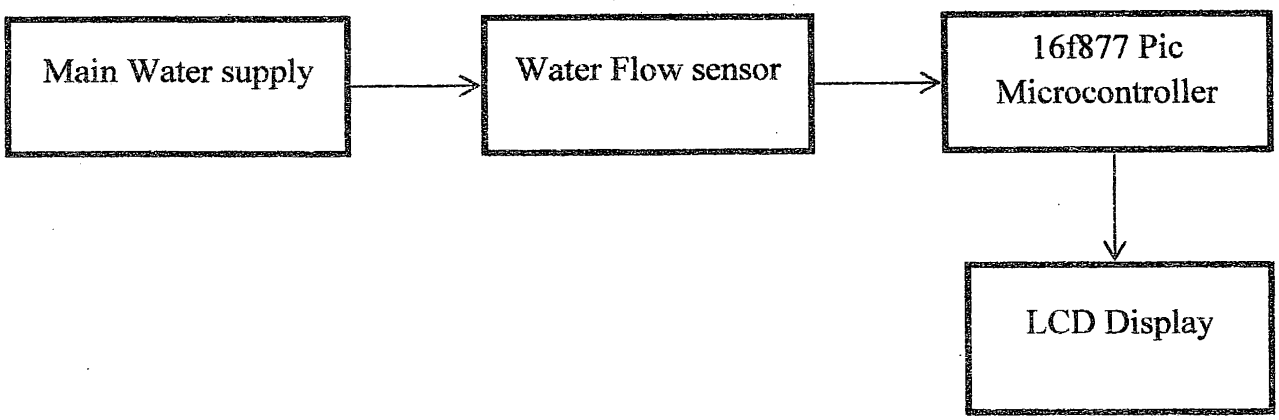

Figure1: Block diagram

A Hall Effect water flow sensor was used to detect the volume of water consumed. TheHall Effect water flow sensorconsists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed was changed with different rate of flow. The hall-effect sensor emits the corresponding pulse Signal When voltage provide for sensor from 3.5v-24v the sensor provide stream of pulse vary from 0v-5v.The frequency of pulse was varied according to the flow rate[2]. Then 16f877 pic(Peripheral Interface Controller).Microcontroller was used for the programming part[3]. After the calculations of microcontroller the output was displayed in LCD display

3.0 RESULTS AND DISCUSSION

First the circuit of the system was tested by the Proteus software. In this case a pulse was given to the pic microcontroller using pulse generator in Proteus software and the programme was written to display total liters, water units and price for water units.

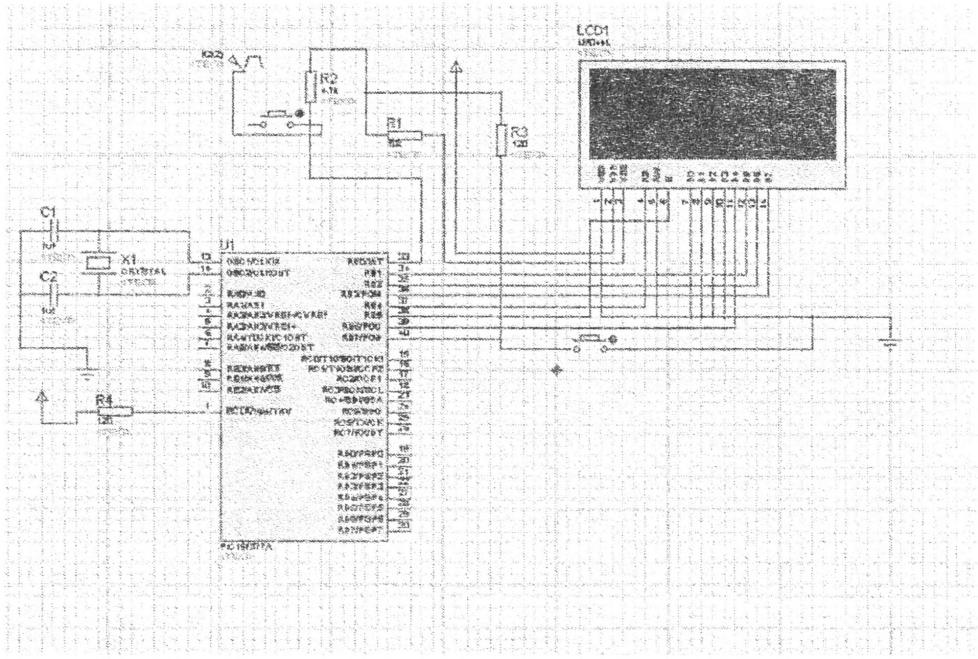

Figure 2: Proteus design

The actual water flow sensor was given pulses according to the water that travel through the water flow sensor. The accuracy of the water flow sensor was $^{+}\_3\%^{2}$.And also there was an equation that is specific for the water flow sensor that gives thefrequency (number of pulses) of the water flow sensor.

$$F = 8.1 * Q \qquad (1)$$

Where,

F = Frequency (Number of pulses), Q = Water flow rate

The sensor was given pulse stream when water travel through the sensor and the pulse depends on the flow rate of water according to the above equation[4]. According to my experiment, it was confirmed that the number of pulses given from the water flow sensor depends on the flow rate of the water. That means number of pulses were increased when water flow rate was increased. Therefore the programme was written to update liters according to the output pulses of water flow sensor. Following table shows the experimental results that were used to calculate water liters which travelled through the water meter.

Table 1: The experimental values of number of pulses

Liters	No of pulses
1L	512
1L	508
1L	503
1L	499
1L	504
1L	502.6

Above table shows the experimental values of number of pulses that emits from water flow sensor for 1 liter of water. The experiment was done by travelling water through the sensor in different speeds. However, finally the results showedthat approximately 500 pulsesshould bepassedby the water flow sensorfor one literof water.These results were taken from travelling one liter of water through the sensor and get number of pulses from programming the pic microcontroller. After calculating the number of liters the programme was extended to display water units and the price according to consumed water units as follows.

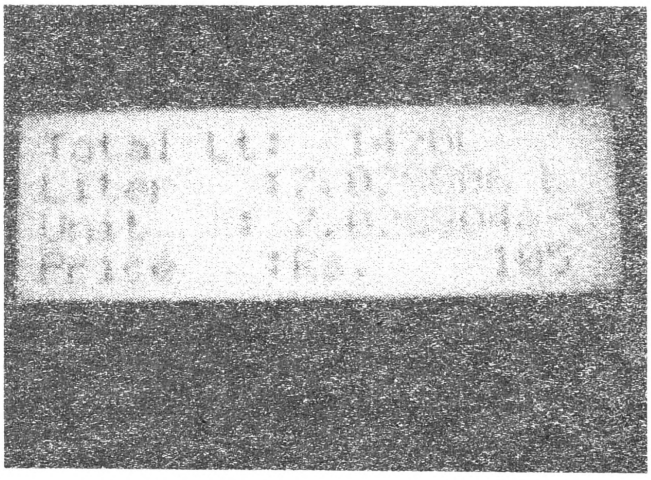

Figure 3: Display output of the project

And a reset button was set to reset water bill monthly. When the reset button is pressed the Liter was reset but Total Lt was not reset. Therefore customers can see their monthly water bill in LCD display. A rechargeable battery was used to avoid the disturbances due to power loss.

4.0 CONCLUTION

In this study, a low cost digital water meter was developed to show customer's monthly water bill accurately. It helped the customersto see their water bill monthly, weekly or daily and they can reduce water wastage by considering water bill. My digital water meter is a flexible, cost effective and durable water consumption meter. The future improvement of the research was remote water billing system. In future, the system will be expanded to automatically sending water meter readings to the NWSDB and receive monthly bill for the customer's mobile phone from SMS.

ACKNOWLEDGEMENT

Authorswould like to take this opportunity to thank everyone who helped to complete this study successfully.

REFFERNCES

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