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Ultrasonic Flow Meter

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Abstract—*An ultrasonic flow meter is a type of flow meter in which two ultrasonic water coupled piezoelectric transducers are mounted on the pipe, that measures the frequency shift caused by the liquid flow. These transducers emit the ultrasound pulses and by averaging the time difference between the pulses of ultrasound measures the frequency shift from the Doppler's shift effect. the time difference is calculated by GP22ASIC and generated digital signal is processed by microcontroller and flow rate is being displayed on the LCD. The main thing in this ultrasonic flow meter is that the GSM communication is possible so human interruption is avoided*

Keywords—*Ultrasonic water coupled sensor, EEPROM, supervisory circuit, flow rate, Time to digital converter.*

I. INTRODUCTION

Ultrasonic flow meters are one of the most popular types of meters used to measure liquid flow in pipes. The most common variety has boththransducers can send and receive the ultrasonic beam. Figure 1 shows the block diagram of UFM. Both the transducers are mounted on either side of the flow meter, or the pipe wall. The sending transducer sends an ultrasonic pulse at an angle from one side of the pipe which is received by the receiving transducer. The flow meter measures the time that the ultrasonic beam takes to travel across the pipe in forward and reverse direction. When the signal travels along the direction of the flow, it travels more quickly compared to the condition of no flow in pipe. On the other hand, when the signal travels in opposite direction of flow, it slows down. Other than the ultrasonic sensor there are so many advantages and application of ultrasonic flow meter. By using the extended EEPROM in our system it is possible to store the data for long time and automatic billing is generated according to volume of water used by customer. All these information is directly send to the customer through the GSM communication. Over all the ultrasonic flow meter fulfill the current requirement.

II. LITERATURE SURVEY

Lot of research work has been carried out for evolving different water flow measurement techniques. Luis Castalier et.al (1997) describes design and fabrication of a low cost water flow meter which can measure up to 9 litre/minute, avoiding direct contact of flow with silicon sensors in. Techniques of measuring water flow rates with the help of neural networks had also been proposed. ShiqianCai and HalukToral(1993) proposed a technique of measuring flow rate in Air-Water Horizontal Pipeline with the help of Neural Networks. In this paper the Kohonen self-organizing feature map (KSOFM) and the multi-layer back propagation network (MBPN) were applied in a hybrid network model to measure the flow rate of individual phases in horizontal air water flow.

Santhosh KV and BK Roy(2012) proposed an intelligent flow measurement technique using Ultrasonic Flow Meter with optimized neural network. The objective of this work includes: to extend the linearity range of measurement to 100% of the input range, to make the measurement system adaptive to variations in pipe diameter, liquid density, and liquid temperature, and to achieve the above two objectives by an optimal Artificial Neural Network. Young-Woo Lee et.al(2008) had developed a wireless Digital Water Meter with Low Power Consumption for Automatic Meter Reading in which they used magnetic hole sensors to calculate the amount of water consumption and they had used ZigBee wireless protocol to transfer amount of water consumption to the gateway.

III. SYSTEM BLOCKDIAGRAM

Figure 1 shows the block diagram of the ultrasonic water flow meter.There are two sensor used, one for inlet and another for outlet, the time difference between the two sensors is directly proportional to the flow rate. GP22ASIC IC is used to convert the time difference into the digital value and it is given to controller.The role of microcontroller in ultrasonic flow meter is very important. The keypad is interfaced with microcontroller for making any changes in the system and this is done

by only the authorized person. There is also supervisory circuit that reduce the power consumption and it will make power efficient system.24LC512 are the EEPROM used for the data logging. System communicate to the customer through GSM module. The total system operates on Li-ion battery having life of 10 years.

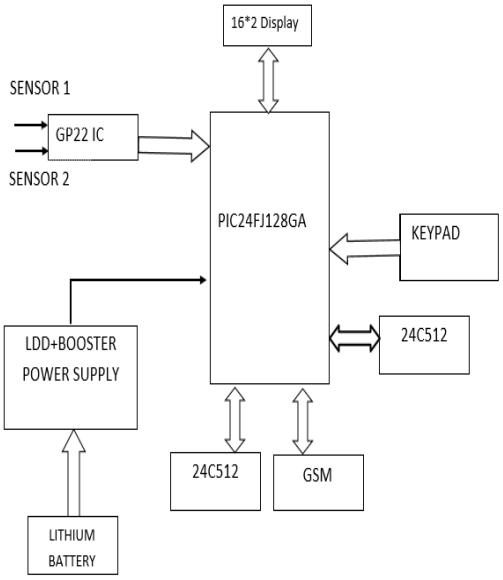

Figure 1: Block diagram of system

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IV. OBJECTIVES AND SPECIFICATION OF THE SYSTYM

4.1. Objective: -

Following are the objectives of the project:

- To avoid wastage of water.
- To make sure that each customer using required amount of water.
- To fulfil government requirements.
- No human interrupt required.
- To make the entire process automated.

4.2. Specification: -

- Battery Life up to 10 years.
- Total system required current only 700uA.
- Extra supervisor circuit for less power consumption.
- System based on PIC24FJ128GA
  having large number of I/O port.
- Extended EEPROM used.

V. HARDWARE DESIGN

5.1. Component list:

- GP22IC
- AT24C512
- GSM Module
- Lithium Battery
- 16*2 LCD Display
- Microcontroller PIC24FJ128GA308

VI. SOFTWARE DESIGN

6.1. MPLABX IDE: -

MPLAB is a free integrated development environment for the development of embedded applications on PIC and dsPIC microcontrollers, and is developed by Microchip Technology. MPLAB X is the latest edition of MPLAB, and is developed on the Net Beans platform. MPLAB and MPLAB X support project management, code editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers. MPLAB is designed to work with MPLAB-certified devices such as the MPLAB ICD 3 and MPLAB REAL ICE, for programming and debugging PIC microcontrollers using a personal com-
puter. PICKit programmers are also supported by MPLAB. MPLAB X is the first version of the IDE to include cross-platform support for Mac OS X and Linux operating systems, in addition to Microsoft Windows. MPLAB X supports the following compilers:

- MPLAB XC8 C compiler for 8-bit PIC devices
- MPLAB XC16 C compiler for 16-bit PIC devices
- MPLAB XC32 C++ compiler for 32-bit PIC devices
- HI-TECH C C compiler for 8-bit PIC devices.
- SDCC open-source C compiler

6.2. Flow chart: -

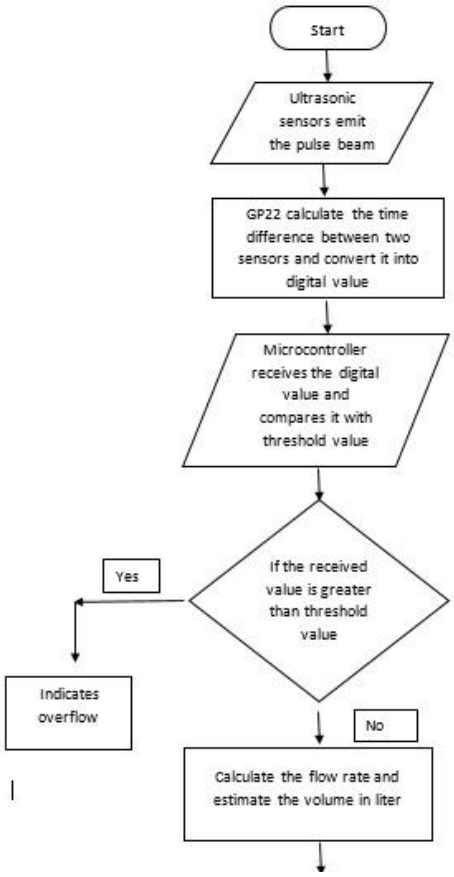

Figure 2. Flow chart of the system.

VII. TEST AND RESULT

Figure 3. Finalize setup

VIII. CONCLUSION

Our system works on Doppler's effect that states that when a wave travels through a moving medium then it's frequency varies with respect to direction of flow of medium. We can calculate the time difference by taking inverse of the frequency. From this time difference the velocity of medium can be calculated. Thus, flow rate can be measured.

REFERENCES

[1] Santhosh KV and BK Roy,"An Intelligent Flow Measurement Technique using Ultrasonic Flow Meter with Optimized Neural Network", International Journal of Control and Automation Vol. 5, No. 4, December, 2012.

[2] M. Comes1), P. Drumea1), M.Blejan1), I. Dutu1) and A. Vasile2), "ULTRASONIC FLOWMETER", 1) Hydraulics and Pneumatics Research Institute, Bucharest, Romania 2) "POLITEHNICA" University of Bucharest.

[3] Velmurugan.R and Rajalakshmy.P, "Ultrasonic Flowmeter using Cross-Correlation Technique",International Journal of Computer Applications (0975 – 8887) Volume 66– No.10, March 2013.

