



GLOBAL JOURNAL OF RESEARCHES IN ENGINEERING  
GENERAL ENGINEERING

Volume 13 Issue 3 Version 1.0 Year 2013

Type: Double Blind Peer Reviewed International Research Journal

Publisher: Global Journals Inc. (USA)

Online ISSN: 2249-4596 Print ISSN:0975-5861

## Cost Effective Digital Water Billing System

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*Abstract-* People, mainly in developing country are not aware about the pure water problem around the world. This paper focuses on water uses and wastage in developing country. It shows an automatic water measuring and billing system. Implementing high end technology for developing country like Bangladesh is very difficult. So a very cheap and cost effective water billing system is being introduced in the paper to save water for future.

*GJRE-J Classification : FOR Code: 090509*



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# Cost Effective Digital Water Billing System

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## I. INTRODUCTION

Water is an essential element for various purposes. It has a wide range of uses. But water, strictly saying usable water is being wasted by people in every moment because of poor management of related organizations mainly in developing country like Bangladesh. One of the examples is Dhaka WASA. Common people also are not aware about it. So, it is very important to find an automatic system for the management of water. In Bangladesh, there is 6.4% of water [1] but pure drinking water is far less than that. Again Arsenic contamination of the ground water including water pollution has reduced the safe water coverage [2]. Because of greenhouse effect and climate change northern part of the county is facing water problem and drought. 19 draught periods occur during 1960 to 1991 [3].

People living in City area in Bangladesh are not very aware of water problem and waste huge amount of water. Implementation of a modern billing system can reduce the wastage of water showing the bill depending on the amount of water used. In developed countries water meter is used at a wide range. But in Bangladesh, it is a new one. On the other hand, importing devices at a wide range is costly. While this device is very economical and can stop the wastage up to large extent.

## II. PROJECT OUTLINE

When fluid passes through a venture pipe, it creates a pressure drop. These two pressures need to be measured and pressure is directly related to flow rate [4]. i.e.  $Q \propto (P_1 - P_2)$ ; Where, Q = flow rate and  $P_1, P_2$  = pressure at two different cross section.

Various instruments are used in this project. Table 1 shows the list of the instruments.

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Table 1 : List of Instruments

Mechanical	Pipe
	Reducer
	Bellows
	Sticks
	Wood Board
	Clamp
	Screw
Electrical	Variable resistance
	IC7805
	Capacitor
	Microcontroller chip
	Diode
	Resistor
	Switch
	Transformer
	Printed circuit board
LCD Display Board	

Two bellows are used which will expand as a result of pressure. A stick is attached with variable resistance and bellow to measure the displacement. Figure 1 shows the arrangement. As a result, the variable resistance changes its value with the displacement of sticks and it is being converted into voltage to give as an input to the display with the help of microcontroller. Then calibration is done to determine the actual volume. Figure 2(a) and 2(b) shows setup and schematic diagram for water billing system.

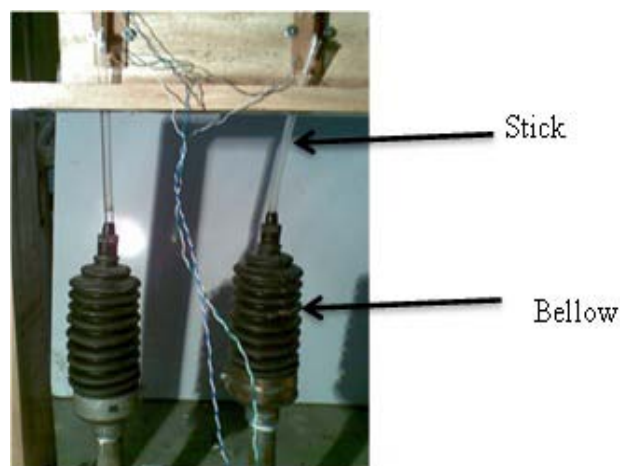


Figure 1 : Attachment of Bellows with the Sticks

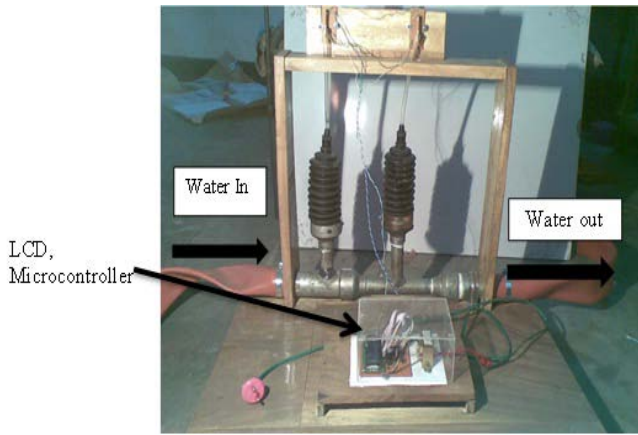


Figure 2(a) : Set up of the System

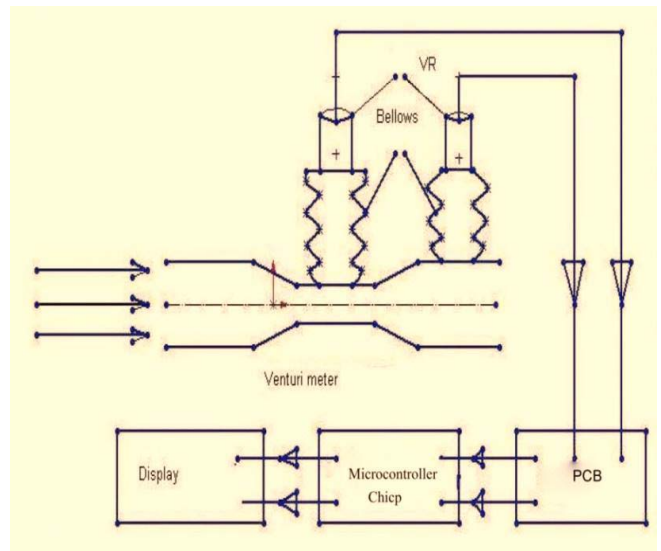


Figure 2(b) : Schematic Diagram for Water Billing System

### III. WORKING PROCEDURE

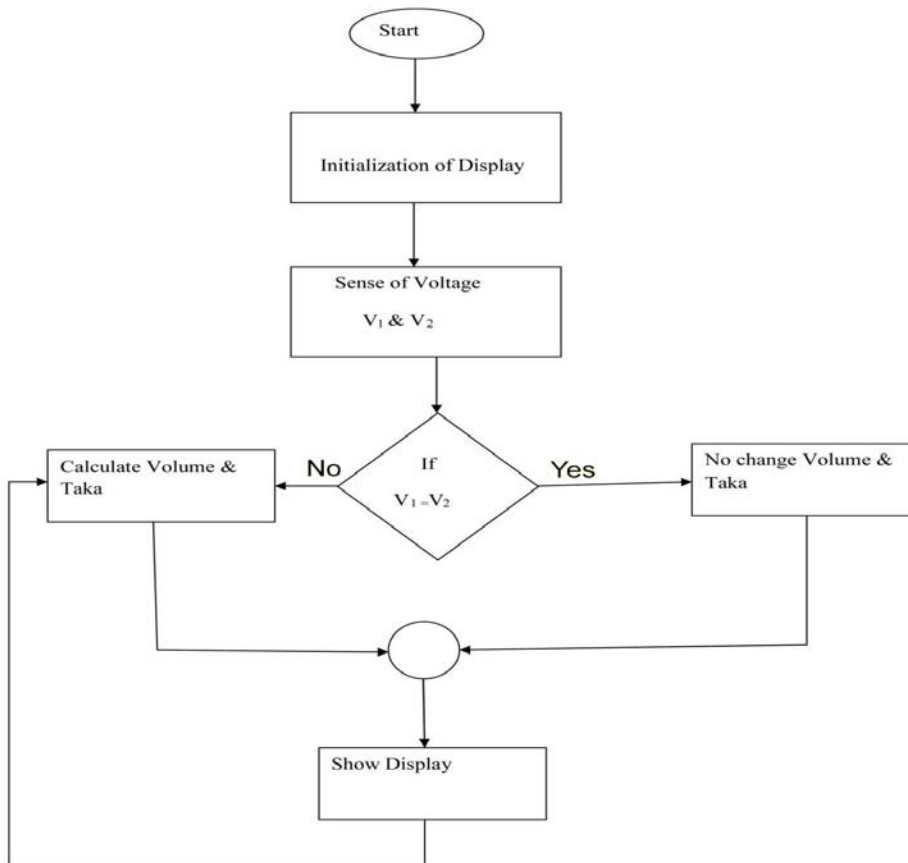


Figure 3 : Working Process of Automatic Water Billing System

### IV. CALIBRATION

Calibration is the process of comparing a value with a standard value. It is an important task for any experiment. From the calibration graph, actual volume of the water is achieved. Then on this basis, final program is being burnt in microcontroller.

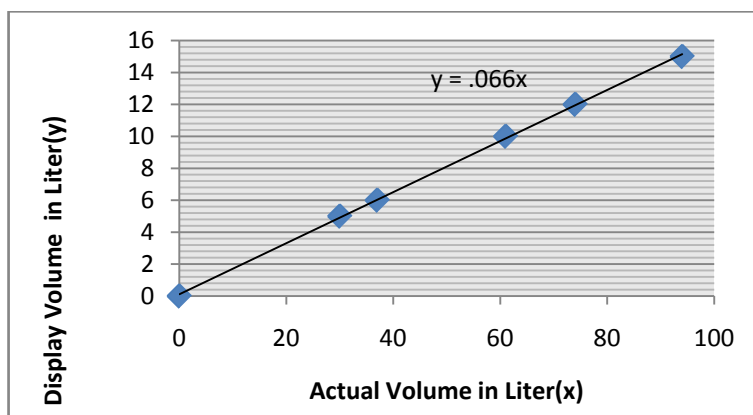


Figure 4 : Calibration Curve

## V. COST ANALYSIS

Name of component	Specifications/details	Cost (BDT)
<b>Mechanical parts</b>		
3/2 inches MS Pipe	6 inches;2 pieces	130
3/4 inches MS Pipe	6 inches;2 pieces	52
Reducer	1.5" - .75"; 4 pieces	260
Bellows	2 pieces	300
2 inches Rubber Pipe	6 feet	90
3/2 inches MS Pipe	6 inches;2 pieces	130
3/4 inches MS Pipe	6 inches;2 pieces	52
Reducer	1.5" - .75"; 4 pieces	260
Bellows	2 pieces	300
2 inches Rubber Pipe	6 feet	90
U-clamp	3 pieces	15
Round clamp	3pieces	50
Stick	1 feet	5
5/2 inch screw	2 pieces	6
1 inch screw	8 pieces	12
Tape	1piece	10
<b>Electrical Parts</b>		
LCD	1 pieces	250
PCB	1 pieces	25
Power supply	1 pieces	55
Microcontroller	1 pieces	75
Variable resistance	2 pieces	40
Connecting wire	2 yard	10
Diode	2 pieces	10
Capacitor	2 pieces	10
Resistor	3 pieces	8
Plug & wire	1 pieces & 2 yard	15
Wooden structure	1piece	300
Accessories		450
Welding, circuit assembly etc.		200
<b>Total</b>		<b>2378</b> <b>(USD 30.52 as on</b> <b>03 Sep 2013)</b>

## VI. CONCLUSION

Digital Water Billing System will introduce a new era in Bangladesh. Principle target of the project is to ensure proper utilization of the limited natural resource, water. This system is very useful as it gives direct observation of the billing and amount of water used for a particular time. It may be weekly, quarterly or monthly. This can be re-adjusted according to consumer choice and need. If this product can be spread throughout the country, people will become aware about the use of water. That will control the wastage of water.

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