

Design and Development of Low-Cost Smart Water Flow Meter

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Abstract:

The venture is on DESIGN OF SMART WATER FLOW METER which has become a prominent subject in the present mechanical dialog. In this quick paced life water providers and shoppers needs to present another water framework which is increasingly productive and similarly faster. Electronic Water Meters are used to check the volume of water used by private and business structures that are given water by an untamed water supply system. Thusly by using this we can keep seeing on the utilization of water by different customers. The essential objective is to make water supply progressively capable and direct which reduces the manual assistance, pass on confirm and time capable response for the incredible water framework. This quick paced life water providers and purchasers needs to present another water framework which is increasingly effective and nearly snappier. Modernized Water Meters are used to evaluate the volume of water used by private and business structures that are given water by an untamed water supply system. Thusly by using this we can keep minding the use of water by different customers. The essential objective is to make water supply dynamically dependable and direct which decreases the manual assistance, pass on check and time capable game plan for the astounding water structure. Aside from developed nations, the water supplies in others present with a sensor which is worked electronically. In this venture a Node Mcu based charging framework is given. This is a framework which prompts a consistent problem free water supply what's more, charging giving most extreme accommodation to shoppers and improvement in water utilization review.

Keywords: Water meter, Node Mcu

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I. INTRODUCTION

Water infelicity during dissemination is viewed as a paramount waste. It has been optically discerned that a plethora of dihydrogen monoxide adversity transpires near the wellspring of decontaminated dihydrogen monoxide, even afore the circulation organize. Estimations of per capita dihydrogen monoxide accessibility show that India is at present dihydrogen monoxide fixated on; future projections demonstrate that India may have dihydrogen monoxide shortage by year 2050. In this situation, spillages in the dihydrogen monoxide dissemination framework can hugy affect the dihydrogen monoxide accessibility. Dihydrogen monoxide stream preservation envelops the approaches,

procedures and exercises to oversee crisp dihydrogen monoxide as a practical asset, to secure the dihydrogen monoxide condition, and to meet ebb and flow and future human interest. It adscitiously manages conscientiously "taking note of" the vitality meter reading(s). This procedure takes out the customary "paper and pen" and the blunders cognate with manual perusing/recording/preparing of the meter information. AMR appeared since vitality meters turned clever which goes back to the arrangement of microcontrollers in vitality meters. Programmed Meter Reading supplementally makes the information recording expeditious and preserves mazuma on schedule and henceforth concurs to the designation of robotization.

In numerous pieces of the world simple dihydrogen monoxide meters have been introduced by dihydrogen monoxide organizations to quantify the shoppers dihydrogen monoxide consumption. These dihydrogen monoxide meters are perused on a month to month premise by an approved worker and the purchasers bill is registered dependent on the affirmed rates as designated by the quantification of dihydrogen monoxide consumed. Sometimes the client premises are not efficaciously open and utilization gauges must be utilized in calculation of the dihydrogen monoxide bill. This is blunder inclined as exactness can't be ascertained. This technique for manual information accumulating is likewise costly, work concentrated and henceforth wasteful. Keen dihydrogen monoxide frameworks can fill in as culls to surmount the inadequacies of manual metering systems. They are remote sensor systems which can be introduced in a great many family units to accumulate infrequent estimations that are accounted for in genuine time. Dihydrogen monoxide metering is the way toward estimating dihydrogen monoxide use. There are two premise of estimating stream, these are volumetric premise and weight premise. The essential relationship of sectional zone of the pipe and the mundane speed of the stream. Different components that influence fluid stream rate incorporate the fluid's thickness, thickness and the erosion of the fluid in contact with the pipe. Flow sensor predicated dihydrogen monoxide meter exhibits minimal effort, solid, expeditious dihydrogen monoxide meter framework going with subsisting GSM systems. Month to month dihydrogen monoxide use can be sent to city organization office inside part of seconds as instant message by utilizing subsisting GSM arrange. Such metering framework decreases manpower, with higher exactness and less power utilization.

II. Literature Survey

This model has orchestrated and actualized remote sensor arrange for estimating utilities, for example, puissance, dihydrogen monoxide. On account of obstructions of customary meter perusing, for

example, blunders in perusing, incorrectness, outside conditions influencing readings, deferred work we have executed meter perusing framework dependent on most recent Zig-Bee innovation. This framework performs assignments, for example, taking meter perusing, dispersion of bills, sending notification, cutting and reconnection of stream automatically.[1] A programmed remote meter-perusing framework dependent on GSM is introduced in this paper. This paper is valuable to acquire meter perusing when wanted so meter perusers don't have to visit every client for the expended information assortment and to circulate the bill slips. Microcontroller can be utilized to screen and record the meter readings. If there should be an occurrence of a client defaulter, no compelling reason to send an individual of utility to abstract the client sodality. Utility can cut off and reconnect the client sodality by concise message administration (SMS). Moreover, the client can check the status of utilization just by sending a rudimentary SMS demand. In this framework vitality meter readings are being moved by utilizing GSM.[2] Dihydrogen monoxide utility clients likewise have a paramount job in spillage control. It is fundamental that this asset can be caught not just in light of the fact that it is an expanding recherche inventory yet in integration as a result of its inserted vitality and the ozone depleting substance impression it verbalizes with. In spite of the fact that in numerous pieces of the nation dihydrogen monoxide may be viewed as the least sumptuous utility item, dihydrogen monoxide infelicity is still exorbitant to clients and dihydrogen monoxide utilities.[6]

Part of research work has been done for advancing distinctive dihydrogen monoxide stream measurement methods. Luis Castalier et. al (1997) portrays structure and manufacture of a minimal effort dihydrogen monoxide flowmeter which can evaluate up to 9 liter/minute, shunning direct contact of stream with silicon sensors in [2]. Procedures of evaluating dihydrogen monoxide stream rates with the profit of neural systems had withal been proposed. Shiqian Cai and Haluk Toral(1993)

proposed a method of measuring stream rate in Air-Dihydrogen monoxide Horizontal Pipeline with the profit of Neural Networks. In this paper the Kohonen self-arranging highlight map (KSOFM) and the multi-layer back engendering system (MBPN) were applied in a half and half system model to measure the stream pace of individual stages in flat air-dihydrogen monoxide stream [3].

Santhosh KV and BK Roy(2012) proposed a perspicacious stream measurement procedure using Ultrasonic Flow Meter with enhanced neural system. The target of this work incorporates: to prolong the linearity scope of measurement to 100% of the info go, to make the evaluation framework versatile to varieties in pipe distance across, fluid thickness, and fluid temperature, and to accomplish the over two goals by an ideal Artificial Neural Network[4]. Immature Woo Lee et. al(2008) had built up a remote Digital Dihydrogen monoxide Meter with Low Power Consumption for Automatic Meter Reading in which they utilized attractive opening sensors to ascertain the measure of dihydrogen monoxide utilization and they had used ZigBee remote convention to move measure of dihydrogen monoxide utilization to the gateway[5].

Javad Rezanejad Gatabiet. al (2010) built up a helper liquid stream meter in which the progression of an assistant liquid is measured, in lieu of direct evaluation of the fundamental liquid stream. The assistant liquids infused into the primary liquid and with evaluating its peregrinate time between two unique positions, its speed could be determined [6]. Zhang Wenzhaoet. al (2010) had built up a fluid differential weight stream sensor for Straight Pipe. In this framework a weight differentiation between the upstream branch pipe and the downstream pipe is identified and changed over into a voltage signal by the DP sensor. This voltage signal is transmitted to a chip to decide fluid stream rate [7]. Thwe Mu Han, Ohn Mar Myaing(2011) developes Microcontroller-Predicated Dihydrogen monoxide Flow Control System. In this framework, as detecting unit, photograph interrupter and opened plate are accustomed to induce beat train for recurrence

contribution of the microcontroller. This sign is changed over into stream rate by programming program in PIC[8].

III. Theoretical Analysis

WHAT IS A WATER FLOW METER?

A stream meter (or stream sensor) is an instrument used to check quick, nonlinear, mass or volumetric stream pace of a fluid or a gas. While picking flowmeters, one should consider such insignificant elements shared trait of plant staff, their association in arrangement and upkeep, spare parts openness, and interval between frustration history, etc., at the particular plant site. It is furthermore recommended that the cost of the foundation be enrolled basically in the wake of making these steps. One of the most generally perceived stream estimation messes up is the reversal of this plan: instead of picking a sensor which will perform fittingly, an undertaking is made to legitimize the usage of a device since it is increasingly moderate. Those "practical" purchases can be the most costly foundations. This page will help you with bettering understand stream meters, anyway you can moreover address our application engineers at whatever point in case you have any one of a kind stream estimation challenges. There are a couple of water stream meter advances to peruse dependent upon the water estimation application, upkeep requirements, and budgetary terms. These sorts of water stream meters has a marvelous standard of development, unequivocal application ideal conditions, and all around cost-of-proprietorship. The request is: What water stream meter would it be a smart thought for you to choose for your water stream estimation application? According to the table below (i.e., table 1), There are four principal sorts of water stream meters: mechanical water stream meters, vortex volumetric stream meters, ultrasonic stream meters or engaging stream meters.

Table 1: Categorization of flow meters based on various principles

Principle	Types
Differential pressure	Orifice Plate type of meter, Rota Meter, Flow Nozzle, Pitot type Tube, Elbow Tap, Venturi Tube
Positive Displacement	Oval Gear type, Nutating Disc type, Rotary Vane type, Reciprocating Piston
Velocity	Turbine type, Vortex Shedding Electro-magnetic, Ultrasonic Doppler type, Ultrasonic Transit Time type.
Mass	Coriolis , Thermal
Open channel	Weir, Flume

IV. Methodology

A flow meter (or stream sensor) is an instrument used to check immediate, nonlinear, mass or volumetric stream pace of a liquid or a gas. While picking flowmeters, one should consider such insignificant elements shared trait of plant staff, their association in arrangement and upkeep, spare parts openness, and interval between frustration history, etc., at the particular plant site. It is furthermore recommended that the cost of the foundation be enrolled basically in the wake of making these steps. One of the most generally perceived stream estimation messes up is the reversal of this plan: instead of picking a sensor which will perform fittingly, an undertaking is made to legitimize the usage of a device since it is increasingly moderate. Those "practical" purchases can be the most costly foundations. This page will help you with bettering understand stream meters, anyway you can moreover address our application engineers at whatever point in case you have any one of a kind stream estimation challenges.

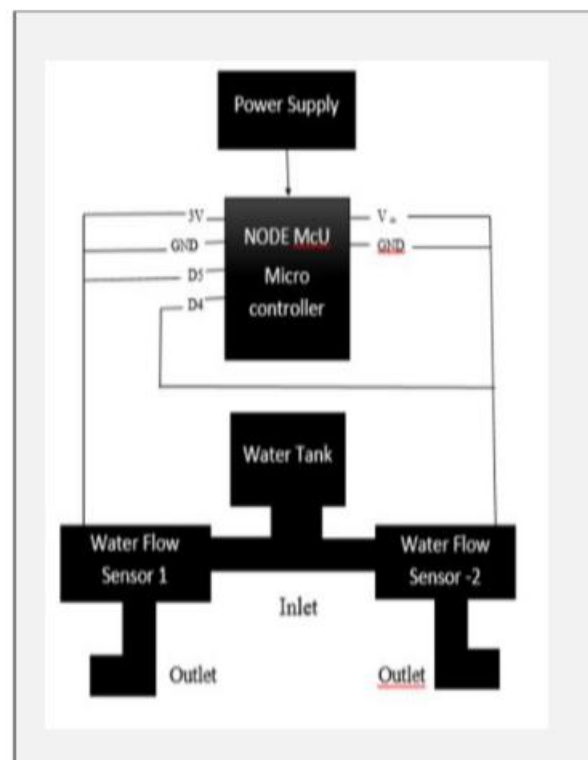


Figure 1: Flow chart of the system

As per the figure 1, There are a couple of water stream meter advances to peruse dependent upon the water estimation application, upkeep requirements, and budgetary terms. All of these sorts of water stream meters has a phenomenal standard of movement, unequivocal application favorable circumstances, and all around cost-of-ownership. The request is: What water stream meter would it be a smart thought for you to choose for your water stream estimation application? There are four fundamental sorts of water stream meters: mechanical water stream meters, vortex volumetric stream meters, ultrasonic stream meters or appealing stream meters.

V. RESULTS

The table 2 lists reading of water flow rate with different multiplication factors with and without sensor.

Table 2: Calibration of sensor and observed readings

Multiplication factor	Observed reading with sensor (Litre per minute)	Actual reading (Litre per minute)
1.5	19	20
1.6	18	20
1.7	20	20
1.8	23	20
1.9	24	20
2.0	25	20

As in table 2 with the increase in multiplication factor the readings shown by the sensor degrade as compared to actual readings and a point comes where it becomes close to the actual value that is the rate at which the water actually flows as measured without the sensor.

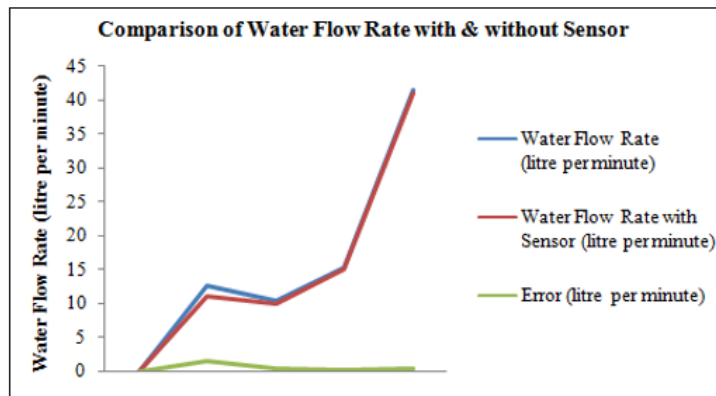


Figure 3: Comparison of water flow rate with and without sensor

VI. Conclusion

Based on examination and structure, the framework gives a brilliant water meter with eco-accommodating and vitality productive framework. As the brilliant water meters are digitized and mechanized, high precision is kept up by diminishing human endeavors. Water burglary can be stayed away from since there are no mechanical parts that can be exposed to tamper. A stream sensor based water metering framework was utilized for robotized charging, dispensing with the disadvantages of conventional water metering frameworks. Further, different houses in a building could utilize separate end hubs with a typical passage interfacing with the web for exact charging in light of individual utilization of houses. An examination of water utilization through different outlets in a house was given so as to teach inhabitants on chopping down inefficient utilization. This paper shows the fruitful usage of a web based way to deal with screen water supply and utilization on an ongoing premise.

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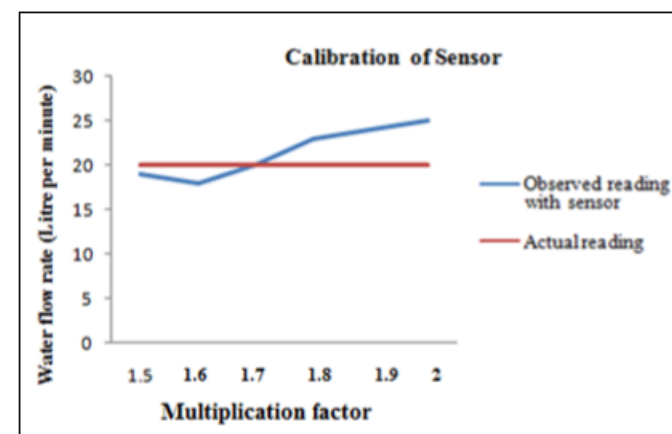


Figure 2: Calibration of water flow rate with sensor

Figure 2 shows the graph of calibration of sensor which indicates that the actual reading we have observed with our sensor is a little bit deviates from original due to air present.

Table 3: Comparison between standard and experimental analysis

Water Flow Rate (litre per minute)	Water Flow Rate with Sensor (litre per minute)	Error (litre per minute)
12.52	11	1.52
10.50	10	0.50
15.28	15	0.28
41.40	41	0.41

Readings are taken with different volume of water. It is observed that the readings taken with our system is approximately equal to the actual readings. As we can see that in table 3 and the graph figure 3

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