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RESEARCH ARTICLE

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# DESIGN AND IMPLEMENTATION OF WATER SUPPLY SUPERVISION SYSTEM USING FPGA

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**ABSTRACT**

Water is essential to human life and to the health of the environment. Now a day's water is the one of the demandable resource in the world. Due to the wastage of the water it will reduce the water resources in dam, lake, river etc. The Happening of water wastage is occur in overflowing in dams, reservoirs, tanks etc. If water overflowing occurs means by using the Zigbee and GSM to intimate the message to monitoring areas. The water supply monitoring in urban areas calculation is done with the humidity sensor, IR sensor, Temperature sensor. Our main is to consume the water urban areas to control the water leakage and wastage. This paper proposes the one of the major application of water distribution and monitoring in urban areas by using FPGA Spartan 3AN.

Keywords: IRsensor, Temperature Sensor, Humidity sensor, Zigbee, GSM, FPGA



## I. INTRODUCTION

Water is essential to human life and to the health of the environment. As a valuable natural resource, it comprises marine, estuarine, freshwater (river and lakes) and groundwater environments, across coastal and inland areas. Water has two dimensions that are closely linked – quantity and quality. Water quality is commonly defined by its physical, chemical, biological and aesthetic (appearance and smell) characteristics. Human life can be seriously affected by water quality and wastage. Not only is drinking water a problem. Water pollution and leakage affects rivers, estuaries and a lot of elements that are an important part of human life resources. Some animals, especially fish and shellfish, can retain large quantities of pollutants that are very dangerous to humans. Thus, not only laboratory analysis of water quality are required but field on-line monitoring of water quality, in distributed networks, must be implemented to measure and, if possible, control water parameters. In order to perform the water quality monitoring, different measuring systems including WQ sensors associated with the physical, chemical or biological characteristics were designed and implemented [1][2]. Environmental sensors require frequently calibrations, which imply the development of field calibration units. Several results were obtained by the authors in this area [3] expressed by a WQ sensor calibrator prototype for one or multiple WQ measurement channels including a set of centrifugal pumps and electro valves controlled by an RS232 multifunction I/O board and a Field Point real-time controller. The present article presents a novel solution on water quality sensor calibration characterized by a small

number of pumps and electro valves and low power consumption, embedded digital control of the main calibration actions and analog-to-digital conversion control based on FPGA .Section 1 illustrates water monitoring system. Section 2 illustrates the Details about Sensors.

## II. Proposed System for Water Monitoring System:

### 1. Tank Section

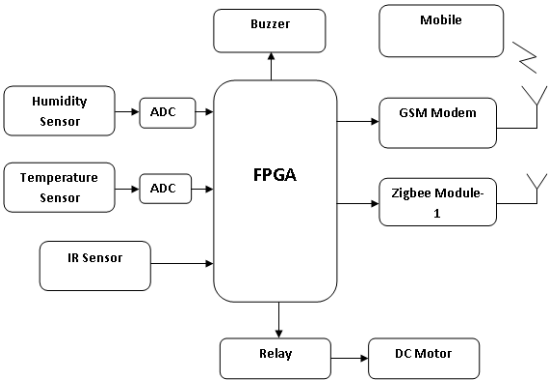


**Figure1:Block Diagram**

### 2. Monitoring Section

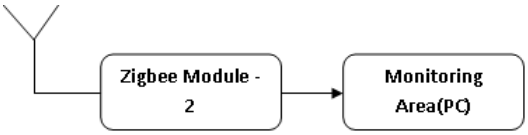


**Figure3:Proposed system for Water Monitoring**

This water monitoring and control system by implementing Supervisory Control and Data Acquisition is mainly to collect the real time parameters and to control if it exceeds they consume excess amount of water. Implementation of this project in a domestic area is to monitor and control the real time water flow to houses, and intimation system along with safe and secure operations. The water supply monitoring in urban areas calculation is done with the infrared sensor. The flow of the water is calculated by this Infra red sensor node. The urban area temperature is calculated by the sensor and providing required water to the urban area based on motor controlling. This project is one of the major applications of the water distribution [3].

The Above intimation will be intimated to the monitoring areas by using the zigbee. The communication utilizes a full duplex communication for data transmission between Zigbee to Zigbee and also intimation is given through the GSM technology.

### 3. Humidity Sensor:

Humidity is the presence of water in air. The amount of water vapour in air can affect human comfort as well as many manufacturing processes in industries. The presence of water vapour also influences various physical, chemical, and biological processes.

Humidity measurement in industries is critical because it may affect the business cost of the product and the health and safety of the personnel. Hence, humidity sensing is very important, especially in the control systems for industrial processes and human comfort. Here we are using a resistive type of humidity sensor.

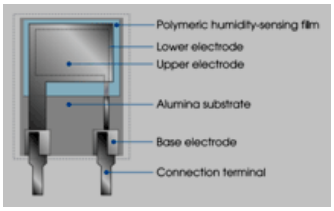


**Figure3:Humidity sensor**

Resistive type humidity sensors pick up changes in the resistance value of the sensor element in response to the change in the humidity.

Basic structure of resistive type humidity sensor from TDK is shown in the previous slide. Thick film conductor of precious metals like gold, ruthenium oxide is printed and calcinated in the shape of the comb to form an electrode. Then a polymeric film is applied on the electrode; the film acts as a humidity sensing film due to the existence of movable ions. Change in impedance occurs due to the change in the number of movable ions.

This change in movable ions causes change in the resistive metal which in turn creates voltage change in the sensor. This will be every minute voltage change.

In order to read this voltage change a comparator LM358 is used in the Humidity sensor board. The comparator continuously checks the humidity sensor voltage with the reference voltage. If the sensor voltage exceeds the reference voltage then the comparator gives digital logic output ( high

or low). An led indication will be given in the kit for user identification [4].

**4. Temperature Sensor:**

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.


**Figure4:LM35**

The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

**5. IR Sensor:**

Pressure variations have no effects on the zero of the signal but the sensitivity is directly proportional to the pressure. Knowing this sensitivity, it is necessary to avoid pressure alterations at gas entrance. Fast temperature changes may also causes unbalances but, through a proper design, the effect may be minimised.

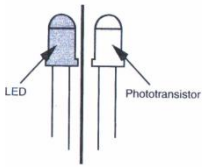


**Figure5:Infrared Sensor**

The source of light is usually pulsating as sensors require a modulated signal. The reference sensor is usually positioned in a IR band not influenced by the presence of the gas. The sensor may be photovoltaic, photoconductive or pyroelectric. Some optical element may be inserted at the end of the optical path to protect the sensitive part from corrosion [6].

**6. Zigbee:**

The XBee/XBee-PRO RF Modules are designed to operate within the ZigBee protocol and support the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of data between remote devices. The modules operate within the ISM 2.4 GHz frequency band and are compatible with the following:

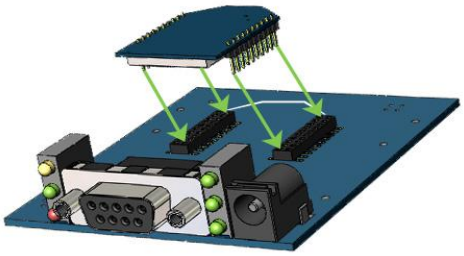

**Figure6:Zigbee**

The XBee modules were designed to mount into a receptacle (socket) and therefore do not require any soldering when mounting it to a board. The XBee-PRO Development Kits contain RS- 232 and USB interface boards which use two 20-pin receptacles to receive modules [5].

**7. GSM Modem**

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create

a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating a 900 MHz [7, 8].

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate [9, 10].

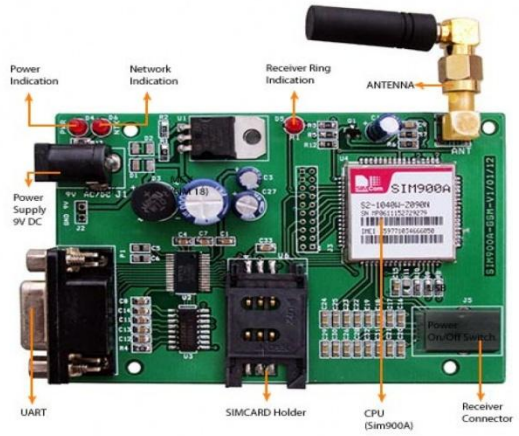


**Figure7:GSM Modem**

Computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands.GSM modems support an extended set of AT commands

- **Reading, writing and deleting SMS messages.**
- **Sending SMS messages.**
- **Monitoring the signal strength.**
- **Monitoring the charging status and charge level of the battery.**
- **Reading, writing and searching phone book entries.**
- **Output:**

## III. Conclusion

Since the system began to be implemented in 2009 by Hunan Huayi electronic engineering limited liability company, has been basically completed in 2010, the system has been put into use on field. The running results show that the system can save energy and cost for the waterworks, guarantee the security of water supply system, improve the quality of water, and achieve the goal of reducing the overall efficiency of human consumption, material consumption and water consumption, which also show the system having a wide range of promotional significance.

**References**

[1]. Qifei Wang, Mingqiang Chao, Design of remote monitoring system for urban water supply networks, electronic quality, volume of testing technology and automation. 2012.30-32. (in Chinese)

[2]. Dongsheng Wang, Design of Real-time Monitoring of Water Resources System in Northern Jiangsu, automation in water resources and hydrology. 2003 (3).30-31. (in Chinese)

[3]. Changjiang Ren, Guoqiang Li, Design of water supply of comprehensive scheduling system, communication of Science and Technology. 2010-11 (below).67-68. (in Chinese)

[4]. Gaozhao Ding, Real-time remote monitoring system of water supply networks, information technology and control. 2012. 214-215. (in Chinese)

[5]. Juan Liu, Chun Fu, Investigating Summary of Optimization Scheduling for Urban Water Supply System , Municipal Engineering Technology. 2009.37-40. (in Chinese).

[6]. Eichler, Stefan, et al. "Composition and dynamics of bacterial communities of a drinking water supply system as assessed by RNA-and DNA-based 16S rRNA gene fingerprinting." *Applied and environmental microbiology* 72.3 (2006): 1858-1872.

[7]. Vörösmarty, Charles J., et al. "Global water resources: vulnerability from climate

change and population growth." *science* 289.5477 (2000): 284-288.

[8]. "Water supply systems." U.S. Patent 3,175,578, issued March 30, 1965.

[9]. Roy, Bernard, Roman Slowinski, and Wiktor Treichel. "MULTICRITERIA PROGRAMMING OF WATER SUPPLY SYSTEMS FOR RURAL AREAS1."*JAWRA Journal of the American Water Resources Association* 28.1 (1992): 13-31.

[10]. Ostfeld, Avi, and Uri Shamir. "Design of optimal reliable multiquality water-supply systems." *Journal of Water Resources Planning and Management*122.5 (1996): 322-333.