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Microcontroller based Automatic Water level Control System

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ABSTRACT: Water scarcity is one of the major problem facing major cities of the world. Major problems regarding that are when either sump or bore well motor is started people forget to switch OFF these motors so water goes waste as well as electricity gets consumed. There is not fix schedule to start and stop motors so there is always problem of unwanted vacancy of water in overhead tank, people are facing such problems at midnight & situation becomes critical. Sumps as well as bore well motor can dry run giving electricity wastage. So overall wastage has been identified as a major culprit; this is one of the motivations for this research, to deploy computing techniques in creating a barrier to wastage in order to not only provide more financial gains and energy saving, but also help the environment and water cycle which in turn ensures that water is saved for our future. This paper presents research in embedding a control system into an automatic water pump controller through the use of different technologies in its design, development, and implementation. The system used microcontroller to automate the process of water pumping in an over-head tank storage system and has the ability to detect the level of water in a tank, switch ON/OFF the pump accordingly and display the status of motor on LED. This research has successfully provided customized solution to society an improvement on existing water level controllers by its use of calibrated circuit to control automatic water level and use of DC instead of AC power thereby eliminating risk of electrocution.

Keywords: sump**,** overhead**,** microcontroller, conductivity, water pump, assembly language, computer simulation, waste

I.INTRODUCTION

It is observed that for large buildings there are number of overhead tanks. Different number of buildings are having overhead tank. They all get filled by centralized sump unit. The person who is operating pumps turns ON/OFF valves when building overhead tank gets overflow. So loss of electricity and water ultimately is a big headache to society. Water scarcity is a major problem that is gripping the major metro cities of the World; the main culprit is not availability but undue wastage. Most of the people who have easy access to resources like water have careless attitude towards this kind of issues but people who face this problem knows the worth of clean drinkable water and water for routine usage such as ISRAIL. The barrier on wastage not only gives us more financial savings, it also helps the environment and water cycle which in turn ensures that water is saved for our future. The solution to this problem is to use an automatic water level controller to avoid the water overflow and wastage. The automatic water level controllers are highly recommended for metro cities or areas where water is supplied through pipelines which are further distributed in homes, hotels, society's etc. Now a day it is becoming necessary for big and small

houses, bungalows, corporate, hospitals and multi storey buildings, especially in metro cities and big towns where there is no fixed time for water supply. In this regard the automatic water level controller reduces the wastage of water by cutting down any further overflow than what is needed.

The automatic water level controller designed here is on the basis of electro mechanical system using the digital technology [1], [2].The level controller can be used with electrical probes or sensors. Here, the magnetic sensors are used along with power supply and motor. The sensor will be inserted inside the tank and motor will pump as the water goes above the sensor in sump tank. The level controller used here is the water sensor which will sense the low and high level of water in the water tank. If the water is above sensor in sump tank, the motor will be started till overhead tank gets full.

Automatic water pump controller is a series of functions to control the Automatic Water Pump Controller Circuit in a reservoir or in the sump tank. The water level sensor is immersed in sump tank at the bottom above 1 foot to create the level detection in sump or underground tank.

In everyday life, there must be some physical elements that need to be controlled in order for them to perform their expected behaviors. A control system therefore can be defined as a device, or set of devices, that manages, commands, directs or regulates the behavior of other device(s) or system(s). Consequently, automatic controlling involves designing a control system to function with minimal or no human interference. Intelligent systems are being used in a wide range of fields including from medical sciences to financial sciences, education, law, and so on. Several of them are embedded in the design of everyday devices.

This paper aimed at presenting our project in embedding a control system into an automatic water pump controller. One of the motivations for this research was the need to bring a solution to the problem of water shortage in various places eliminating the major culprit; waste of water during pumping and dispensing into overhead tanks. It is believed that creating a barrier to wastage will not only provide more financial gains and energy saving, but will also help the environment and water cycle which in turn ensures that water is saved for our future.

II.**RELATED WORKS**

Number of commercial companies in market providing solution for single sump or bore motor but no one is giving customized solution. Customized solution means when water in sump tank goes below the defined level and then only bore will be started. So people believe that water level management approach would help in reducing the power consumption and as well as water overflow. Proposed system is microcontroller based water level sensing and controlling in a wired and wireless environment. The proposed system was flexible, economical and easily configurable system designed on a low cost P89V51RD2 microcontroller and finally, proposed a web and cellular based monitoring service protocol to determine and sense water level globally.

A controller based automatic plant irrigation system was designed by Gunturi (2013). The main aim of the research was to provide automatic irrigation to the plants

with a system that operates with less manpower. This in turn helps to save funds and water. The researcher programmed the 8051 microcontroller as giving the pulse signal to the sprinkler, and this was used to control the entire system. Temperature sensor and humidity sensor were connected to internal ports of the microcontroller via a comparator, and whenever there is a change in temperature and humidity of the surroundings these sensors senses the change in temperature and humidity and gives an interrupt signal to the micro-controller and thus the sprinkler is activated.[4]

It was the position of a paper by Hodgson and Walter that based on real world systems as the benchmark, using optimization software in place of traditional design techniques results in significant cost savings. The researchers discussed the potentials of modern optimization technology to the pumping industry and presented examples of cost-saving design experiences. [5]

Khyatee, Sycon analyzed this existing water-pumping system and discovered that they have a high power-consuming process and needs more manual power. They proposed a sensor network based intelligent control system for power economy and efficient sump/bore motor health monitoring. Several basic sensors were used for sump tank water level data sensing, and the sensed data was given to the controller which processed the sump tank data and it was given to the water pump control unit which controls the process accordingly. If any abnormality is detected then the maintenance manager can be notified through a sms via the GSM. [7]

III. MATERIALS AND METHODS

In this work, the automatic water level monitor is proposed which consists of the following major units: sensors, Instrumentation circuit, microcontroller, display unit, and the pump and the core work of detecting the level of water is done by float sensor. The diagram below describes the flow of operations in the system as well as their inter -operability (Fig.1).

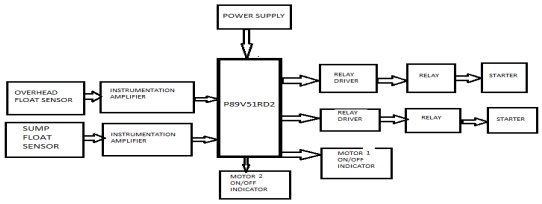

Fig (1) Block diagram of proposed control system

Magnetic float sensors are used as water level sensors. When water touches the float sensor in sump tank positioned at a 20% level from bottom, discontinuity is provided to instrumentation circuit, instrumentation circuit converts it in to digital level change means logic 1 at port p1.0. Sump motor is started by microcontroller with status indicator through relay for sump motor. After every 10 minutes it checks for sump tank if water is above sensor in sump tank then it continues to run tank motor with Continuously checks to overhead tank for full. When overhead tank gets full it stops for 4 hours. After 4 hours it again checks sensor in sump tank if water is not above sensor in the sump tank then it runs bore well motor and continuously checks for overhead tank sensor and sump tank sensor. That means it gives first priority to water in sump tank (corporation water).

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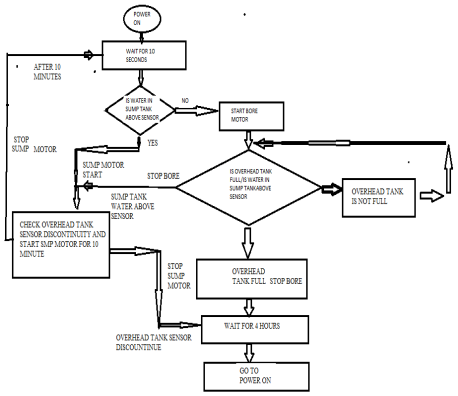

Fig (2) flowchart of proposed controller

Fig. (2) Shows the flowchart of proposed controller. When power supply turned ON then system waits for 10 seconds. First it checks for water level above the sensor in sump tank (1 foot above motor), if yes then it starts the sump motor for 10 minutes within this it continuously checks for overhead tank, if overhead tank full then stop sump motor. If not overhead tank full and 10 minutes completed again it check water level above the sensor in sump tank (1 foot above motor), if yes then repeat and if no stops sump motor, start bore motor.

If water level is below the sensor in sump tank (1 foot above motor) then start the bore motor and wait till overhead tank gets full, after full wait for 4 hours(variable time), again reset.

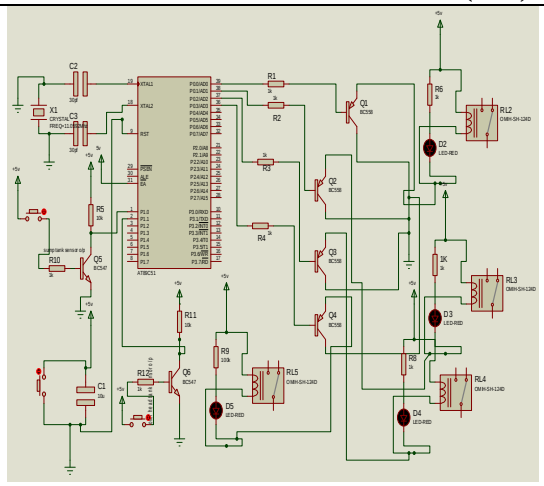

Fig (3) circuit diagram of proposed controller

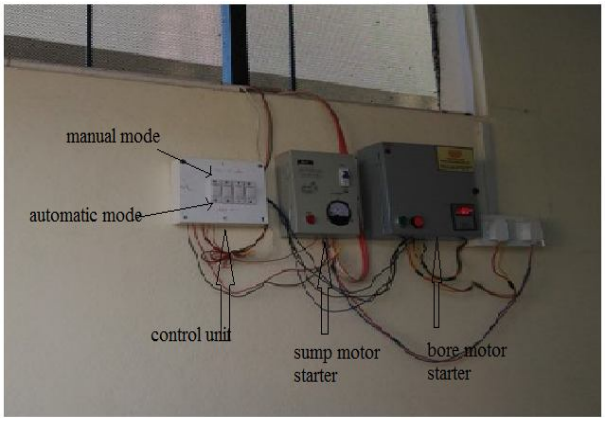

Fig (4) Image of mounted system

IV. **RESULTS AND DISCUSSION**

In this work, the microcontroller for the automatic water level monitor and control with feedback, having passed the necessary tests with the other components interfaced to it, is hereby presented. With this implemented system, it is possible to monitor the water level in number of an over-head tanks, switch ON the water pump

when the overhead tank is empty and switch OFF the same pump when the tank is full without any need for human intervention. By this the issue of water wastage is eliminated and abrupt cut-off of water supply is equally also eliminated.

As already highlighted in the previous sections, the microcontroller is the heart of this project work, as all the control signals pass through and are processed by the microcontroller. The LED and RELAY was interfaced to the microcontroller in order to display the status of the system as it operates. The RELAY are connected to port 0 of the microcontroller

The simulated software algorithm began with flow-chart (Fig.2) and finally the assembly language program, which **is converted to its machine code (HEX file) and written to the microcontroller's internal ROM for the appropriate** controlling of the device. The circuit diagram of the system is shown in fig. (3) & image of system mounted is shown in fig. (4).

V. SUMMARY AND CONCLUSION

Automatic water pump control system employs the use of different technologies in its design, development, and implementation. The system used microcontroller to automate the process of water pumping in an over-head tank storage system and has the ability to detect the level of water in a tank, switch ON/OF the pump accordingly and display the status of motor on an LED with relay. This research has successfully provided an improvement on existing water level controllers by its use of customized circuit to control the water level and use of DC instead of AC power thereby eliminating risk of electrocution.

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