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Review of Water Level Monitoring System

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Abstract- The PLC will be the very efficient to controlling purpose .This different system will be targeted for medium and large industry while marketing it with cheaper cost basically the purpose will be integrated with mechanical part, electronic unit, and electrical unit to make it as one control system. Exclusive of the software programming to control the performance of the water pump. As a result the system would be complex free as the PLC replaces the necessary sequential relay circuit for the motor control. The operation of system may not suit all the industries because some industry not uses water to their process and it may need some adjustment. This adjustment can be overcome according to requirement wanted by doing some editing on the system. The motor is capable of fully water when timer activates and motor run while operation of motor is terminated. A high motor would be more convenient to bring or pull the water constantly. A Programmable Logic Controller, PLC or Programmable Controller is a digital computer used for automation of electromechanical processes. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory. The whole concept is to build an automatic water pump control system. That was basically controlling the system by using the PLC , some other method related to this concept will be the Zigbee, Fuzzy logic, Microcontroller, RF controller, with fully machine which are use in like different method.

Index Terms- PI Controller, PLC, Microcontroller, XBEE,RF Controller. (Separate Index Terms with semicolon).

INTRODUCTION

Water is a precious resource that requires conservation through proper management. It is commonly used for domestic consumption, agriculture and industrial activities. The water storage tank at home, fish tank and man-made water fountain use water. Therefore, proper sensing, monitoring and controlling of available water are essential in preserving this precious resource.

Over the years, various methods on water level sensing, controlling and

monitoring have been proposed. In a water level and controlling system was designed using a microcontroller PIC16F84A, sensor rods, transistors, LED indicators and water pump. In this design, water conductivity was employed to act as part of the sensing circuitry to indicate the water level in the tank. The method is simple and easy to implement. In a water level sensing and controlling system was designed using a Programmable Logic Controller (PLC) with proximity sensors and water Pumps are essential in the water supply field, wooden pumps existed in the 1700s and these were used to empty the bilges of ships.

Provided the hardware to allow the establishment of many New Hampshire public water systems in the very late 1800ser pump. Unlike which uses conductivity rods, this design uses inductive proximity switches. Using a PLC and additional components need to be installed in order to send messages to the GSM modem. This type of sensors provide accurate readings albeit extra cost. In a 555 timer was used to act as a controlling device to trigger the water pump when water level changes between the upper limit and lower limit. This method is similar to in the sense that water conductivity is used as part of the water level sensing circuitry.

HISTORY OF AUTOMATIC CONTROL SYSTEM

Automatic control, particularly the application of feedback, has been fundamental to the development of automation. Its origins lie in the level control, water clocks, and pneumatics/hydraulics of the ancient world. From the 17th century on-wards, systems were designed for temperature control, the mechanical control of mills, and the regulation of steam engines. During the 19th century it became increasingly clear that feedback systems were prone to instability.

A stability cri-tertian was derived independently towards the end of the century by Routh in England and Hurwitz in Switzerland. The 19th century, too, saw the development of servomechanisms, first for ship steering and later for stabilization and autopilots. The invention of aircraft added (literally) a new dimension to the problem. Minorsky's theoretic-cal analysis of ship control in the 1920s clarified the nature of three-term control, also being used for process applications by the 1930s.

Feedback control can be said to have originated with the float valve regulators of the Hellenic and Arab worlds . They were used by the Greeks and Arabs to control such devices as water clocks, oil lamps and wine dispensers, as well as the level of water in tanks. The precise construction of such

systems is still not entirely clear, since the descriptions in the original Greek or Arabic are often vague, and lack illustrations. The best known Greek names are Ktsebios and Philon (third century BC) and Heron (first century AD) who were active in the eastern Mediterranean (Alexandria, Byzantium).

- **Stability Analysis in the 19th Century**

With the spread of the centrifugal governor in the early 19th century a number of major problems became apparent. First, because of the absence of integral action, the governor could not remove offset: in the terminology of the time it could not *regulate* but only *moderate*. Second, its response to a change in load was slow. A number of attempts were made to overcome these problems: for example, the Siemens chronometric governor effectively introduced integral action through differential gearing, as well as mechanical amplification. Other approaches to the design of an *isochronous* governor (one with no offset) were based on ingenious mechanical constructions, but often encountered problems of stability Nevertheless the 19th century saw steady progress in the development of practical governors for steam en-gines and hydraulic turbines, including spring-loaded designs (which could be made much smaller, and operate at higher speeds) and relay (indirect-acting) governors. By the end of the century governors of various sizes and designs were available for effective regulation in a range of applications, and a number of graphical techniques existed for steady-state design. Few engineers were concerned with the analysis of the dynamics of a feedback system.

Maxwell derived a third-order linear model and the correct conditions for stability in terms of the coefficients of the characteristic equation. able to derive a solution for higher-order models, he expressed the hope that the question would gain the attention of mathematicians. In 1875 the subject for the Cambridge University Adams Prize in mathematics was set as *The criterion of dynamical stability*. One of the examiners was Maxwell himself (prizewinner in 1857) and the 1875 prize (awarded in 1877) was won by Edward James Routh. *Routh* had been interested in dynamical stability for several years, and had already obtained a solution for a fifth-order sys-tem. In the published paper we find derived the Routh version of the renowned Routh–Hurwitz stability criterion

LITEARTURE SURVEY

Today a very important problem is the management of the water resources from all over the world. Water is commonly used in agriculture, industry and in households. In practice are known many types of level control that can be done. But the most common ones are those with overflow control used to prevent exceeding the maximum level that a storage tank can hold and those with fully drain for preventing the pomp to work without liquid. There are cases when the two methods are combined for a maximum use of pumps capacity, for reducing the frequently starts and to reduce working for a short period of time.

Low power control system are based on a specialized sensor are very simple but must take in consideration the pumps power and the power that the sensor can switch. Some types of water level control systems can be enumerated, water level control systems using programmable logic controller and industrial wireless modules for industrial plants, in this system the process variable is the water level from a tank . The Programmable Logic Controller (PLC) starts the pump when the water level is minimum and allows it to run until the water reaches the maximum level

Water level control systems using microcontrollers . This type of system simply starts the pump when the water level is minimum and allows it to run until it is reached the maximum level in the tank. In this system the fluid level sensor is a magnetic field response sensor. A measurement acquisition method for acquiring measurements from magnetic field response sensors is presented.

Water level control systems based on fuzzy logic, water level is controlled using SCADA (supervisory control and data acquisition system). For a nonlinear water-tank level it is necessary to design a gain scheduling controller for a water level control system. This device has more advantages than a classic PI (proportional-integral) controller, for example, a shorter time required to fill the tank. The advantages of a water level control systems are the possibility of maintaining a constant level at a variable filing or draining flow, avoiding shocks that are introduced in the network when the pump is started, the possibility of using a motor of a different power than the maximum one for a longer interval without frequently turn Offs or short functioning. The main disadvantages are the high cost of the level sensors with analogical outputs and of the frequency converter.

METHOD OF WATER LEVEL CONTROLLING

Microcontroller based system

Pumps are essential in the water supply field, wooden pumps existed in the 1700s and these were used to empty the bilges of ships. They were made from bored logs with wooden pistons to create suction. Metal piston type pumps, driven by steam, were developed in the early to mid-1800s but it was not until the advent of electrically driven pumps that water system expansion became feasible on a large scale. Layne Bowler developed the first vertical turbine water pumps in 1894 and Jacuzzi developed the first submersible pumps in the 1920s. These manufacturing developments provided the hardware to allow the establishment of many New Hampshire public water systems in the very late 1800s.

Automatic water pump controller is a series of functions to control the Automatic Water Pump Controller Circuit in a reservoir or water storage. The water level sensor is made with a metal plate mounted on the reservoir or water tank, with a sensor in the short to create the top level and a detection sensor for detecting long again made for the lower level and ground lines connected to the bottom of reservoirs or reservoir.

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 behaviour 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 thanks. We believe 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 we save water for our future.

Zigbee based system

What is Zigbee

Zigbee is an open global standard for wireless technology designed to use low-power digital radio signals for personal area networks. Zigbee operates on the IEEE 802.15.4 specification and is used to create networks that require a low data transfer rate, energy efficiency and secure networking. It is employed in a number of applications such as building automation systems, heating and cooling control and in medical devices. Zigbee is designed to be simpler and less expensive than other personal are network technologies such as Bluetooth. Zigbee is a cost- and energy-efficient wireless network standard. It employs mesh network topology, allowing it provide high reliability and a reasonable range.

Characteristics of Zigbee

- Global operation in the 2.4GHz frequency band according to IEEE 802.15.4
- Regional operation in the 915 MHz (Americas) and 868 MHz (Europe).
- Frequency agile solution operating over 16 channels in the 2.4GHz frequency
- Incorporates power saving mechanisms for all device classes
- Discovery mechanism with full application confirmation

Zigbee logical device types

- There are three categories of nodes in a XBEE system. They are Coordinator, Router and End devices.

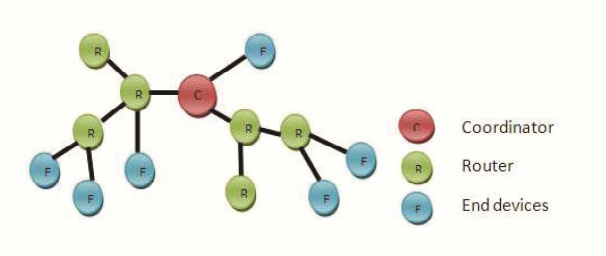


Fig:- Zigbee network

Coordinator

Forms the root of the network tree and might bridge to other networks. There is exactly one coordinator in each network. It is responsible for initiating the network and selecting the network

.**Radio frequency based system**

Sustainability of available water resource in many region of the world is now a dominant issue. This problem is quietly related to poor water allocation, inefficient use, and lack of adequate and integrated water management. Water is commonly used for agriculture, industry, and domestic consumption. Therefore, efficient use and water monitoring are potential constraint for home or office water management system. In the last few decades several monitoring systems integrated with water level detection have been accepted. Measuring water level is an essential task for government and residence perspective. It would be possible to track the actual implementation of such initiatives with integration of various controlling activities. Therefore, water controlling system implementation makes potential significance in home applications.

In this paper we discuss automatic water level sensing and controlling with wireless communication between controllers placed at the tank and the sump. So the system basically operated with two controllers and RF transceiver modules.

There are some literatures that survey water level control and automation systems. Also, there are some papers that overview and compare the current techniques in this area. The paper introduces the notion of water level monitoring and management within the context of electrical conductivity of the water. More specifically, it explains about the microcontroller based water level sensing and controlling in a wired environment. Water Level

management approach would help in reducing the home power consumption and as well as water overflow. Finally, they have proposed a web and cellular based monitoring service protocol that would determine and sense water level globally.

In the next paper the micro controller based wireless, GSM based water level indicator is explained. Paper says that advances in communication technology, made new trends to emerge in monitoring system. The most popular standard for bile phones in the world are Global System for Mobile Communication (GSM). The smart water level indicator is presented by the paper. It discusses about the monitoring system to monitor the changes of water level from time to time and directly send an alert to user via GSM cellular network immediately. This paper comprises of three parts, which is the main part comprising the development of the system that is capable to detect water level using microcontroller. The microcontroller is the „brain" of the system which is responsible of processing network protocol, which comprises of transmitting packets and receiving packets. The second part is the development of the system that can process the data that has been collected based on the deepness of water level.

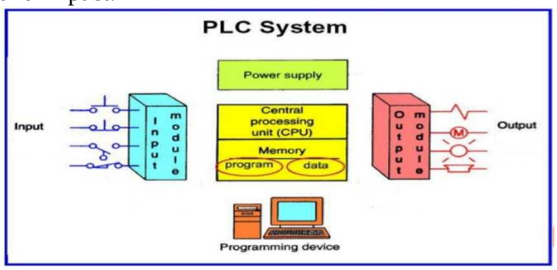
Fuzzy Logy based system

Conventional control approaches are not convenient to solve the complex issues in this highly nonlinear system. Neural networks and fuzzy logic control have emerged over the years and become one of the most active areas of research. There are many works in literature addressed the water level control issues using neural networks and fuzzy logic. Due to its simplicity, fuzzy logic control method became most famous in this application. Fuzzy logic is a form of probabilistic logic or many-valued logic; it deals with approximate reasoning rather than fixed and exact. Unlike traditional binary sets, where variables take either true or false values, fuzzy logic variables have a truth value that ranges in degree between 1 and 0. The truth value may range between completely true and completely false. Thus Fuzzy logic has been extended to handle the concept of partial truth.

Fuzzy logic is a part of artificial intelligence or machine learning which interprets a human's actions. Computers can interpret only true or false values but a human being can reason the degree of truth or degree of falseness. Fuzzy models interpret the human actions and are also called intelligent systems. A fuzzy set is an extension of a crisp set. Crisp sets allow only full membership or no membership at all, whereas fuzzy sets allow partial membership. In a crisp set, membership or non-membership of element x in set A is described by a characteristic function, where and. Fuzzy set theory extends this concept by defining partial membership. A fuzzy set 'A' on a universe of discourse U is characterized by a membership function that takes values in the interval. Fuzzy sets represent commonsense linguistic labels like slow, fast, small, large, heavy, low, medium, high, tall, etc.

PLC based system

A Programmable Logic Controller, PLC or Programmable Controller is a digital computer used for automation of electromechanical processes, unlike general-purpose computers; the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise. The proposed system will control and monitor the liquid level of the tank continuously and will ensure that a sufficient level of water is maintained. e to vibration and impact.



The brain of the whole PLC is the CPU module. This module typically lives in the slot beside the power supply The module that connected an input device, such as panel or sensor, to a programmable logic controller (PLC) a device used to control automated manufacturing processes. The power supply provides isolation necessary the power supply gives the voltage required for electronics module output modules act as link between the CPU and the output devices in the field.

Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory. Four sensors are used to implement the system. These sensors detect the presence of water. The readings of the sensors are used by the PLC to take the required decision. Finally the decision is implemented by the PLC through a relay switch. The ladder logic was implemented in SIMANTIC manager.

The proposed system will control and monitor the liquid level of the tank continuously and will ensure that a sufficient level of water is maintained. This system can be used ubiquitously in industrial application. It can be used to prevent industrial accident by overfilling of any open container, to prevent overfilling of any closed container thereby creating overpressure condition. The high number of the input output port of the PLC will enable this single system to control large number of tanks single handedly. Leakage can also be monitored. Flexible and can be reapplied to control other systems quickly and easily.

Reliable components make these likely to operate for years before failure. The PLC was invented in response to the needs of the American automotive manufacturing industry .Programmable

logic controllers were initially adopted by the automotive industry where software revision replaced the rewiring of hard-wired control panels when production models changed. Before the PLC, control, sequencing, and safety interlock logic for manufacturing automobiles was accomplished using hundreds or thousands of relays, timers, and drum sequencers and dedicated closed controller.

COMPARISON OF DIFFERENT METHODS

Sr.No	Content	PLC	Micro-controllers	Zigbee	Fuzzy Logic
1.	Accuracy	High	Low	High	High
2.	Flexibility	Effective	Moderate	High	Moderate
3.	Life	Long	Short	Long	Long
4.	Maintain ace cost	High	Less	High	High

CONCLUSION

The real time monitoring and controlling system has been developed using PLC and is highly effective, efficient and roboust. The number of input and output are attached to the PLC providing it's expandably and competence.

Have interfacing for inputs and outputs already inside the controller. The review of automated water distribution system with the various controllers and parameters focuses on the entities such as proper supply, red alarm pop-ups, filtration, flow control, supervision using various protocols is concluded with the future aspects of real time implementation in the municipal corporations where scarcity of water is the huge issue.

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