

Water level monitoring by using PLC

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Abstract- In the Present scenario, availability of drinking water is very huge problem in many states including Tamilnadu. Many people have been suffering a lot to bring water in time. The monitoring of water can prevent the occurrence of stealing and leaking of water effectively for the household. This paper portrays about the PLC based automatic corporation water level monitoring & distribution system, which helps us to the water level monitoring automatically according to the needs of the particular locality. In traditional system there is no proper method followed for the distribution & monitoring of water. The embedded controller is already pre-programmed to do the operations and results are shown in ladder diagram using codesys software. The readings of the sensors are used by the PLC to take the required decision. In order to make the system more efficient and pollution free, solar energy is used as an alternative source for power supply operation of the PLC unit.

Keywords:- PLC, codeys, level sensor.

INTRODUCTION

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. In our project we used Snider NG 16DL PLC , al has effectively design bottle filling plant using PLC , al gives a proposed system that efficiently controls a cement factory using PLC.A Centralized PLC Automation Control in Painting Line of Steel Plant and Our Proposed system can be divided into three main modules- sensing, decision making and implementation.

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 codesys . 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. Computational abilities allow more sophisticated control.

Trouble shooting aids make programming easier and reduce downtime.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 controllers.

LITERATURE 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 pump 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. Audio visual alarms at desired levels can be used in the system. - Water level control systems using a wireless fluid level measurement technique. In this

system the fluid level sensor is a magnetic field response sensor. 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 filling 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. For drinking water storage tanks are used low power automated systems controlled by a single sensor powered on continuous current at a low voltage where as actuators are used optical sensors. Such system can be used for obtaining an error signal depending on the water level in the tank. A water level control system design must also take in consideration the cost of the system devices

HARDWARE ASSEMBLY

Component of the system

Level sensor

Relay and motor

PLC(programmable Logic Controller)

These are the four main modules of the system. The level sensor communicates the present level of the tank to the PLC. The PLC decides whether to turn the motor ON or OFF.

Level Sensor

Inductive proximity sensors were used to detect the presence of water in the tank. These sensors detect magnetic loss due to eddy currents that are generated on a conductive surface by an external magnetic field. An AC magnetic field is generated on the detection coil, and changes in the impedance due to eddy currents generated on an object are detected. When the object enters this electromagnetic field which appears at the active face of the switch, the field gets reduced and the switch turns ON or OFF. The main advantage of this sensor is that it can sense the object with touching it, so this sensor can be fixed inside the water tank.

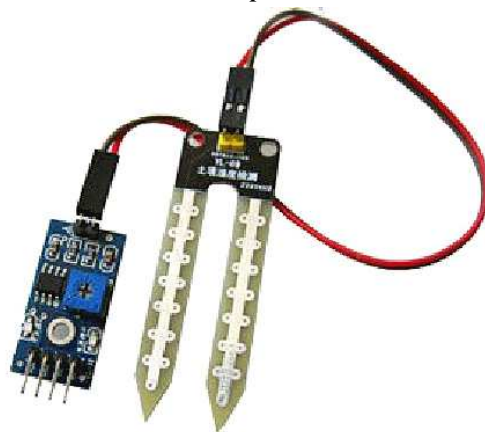


Figure:Level sensor

Relay and motor

A relay is an electrically operated switch. The relay considered in our system uses an electromagnet to operate a switching mechanism mechanically. Any compatible relay can be used with our system. The motor on the other hand was used to pump the water from the underground tank to the overhead tank. The relay converts the DC output of the PLC into a signal compatible to effectively control the motor .

PLC (Programmable Logic Controller)

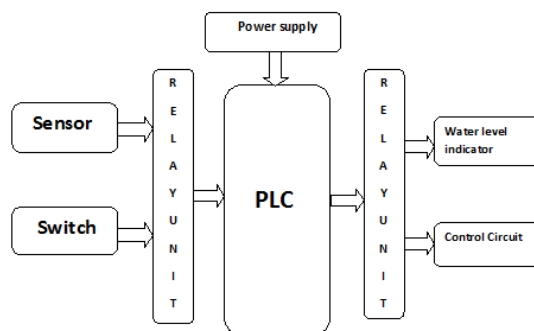


Figure:-Block Diagram of system.

This serves as the main control unit of the system. The ladder logic is prewritten on a non-volatile memory. The ladder logic was implemented in codesys manager. On basis of this logic the PLC takes its decisions. In our project snider 16DL 1000 was used. The 1000 enables space-saving and modular configurations. In a single-tiered configuration, 16DL1000 can support 40 I/O, and in multi-tiered configurations up to 80 I/O. In distributed configurations with PROFIBUS DP, 65536 I/O connections are possible (up to 125 stations, such as ET 200M via IM 153) . The slots are freely addressable, that is, there are no slot rules. So a single 16DL1000 if deployed in an industry can automate and monitor a large number of tanks. The PLC was interfaced by to the computer via IM. Proximity Sensor internal diagram, that is, there are no slot rules. So a single S7-300 if deployed in an industry computer via Induction Motor.

Working of System

The block diagram of the showing an actual working of the system .It consisting mainly sensor, relay, motor and PLC. In this system we use four sensor that to detect the level of water it place to the particular level this sensor fitted to the four different level that is 25% , 50%, 75%, and 100% in the water tank all this are the input sensor . Initially the level of water tank is 25% then that time motor is automatically on and it can be continuously on, to the level of 100% then once the water level touch the 100% level it can be automatically off then other two sensor is place to the level of 50% and 75% in the tank the water is touch this level the output indicator LED should be on.

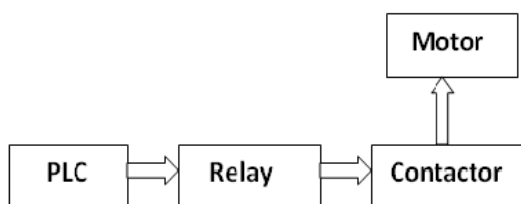
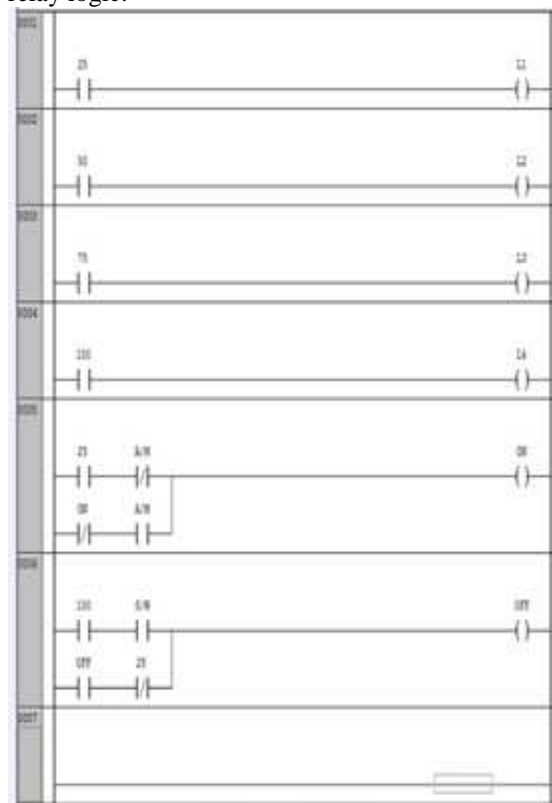


Figure:- Mechanism of Motor ON-OFF

Ladder Diagram

The Ladder programming for the snider NG16DL was done in codesys manager symbol used in the ladder logic is shown figure. Ladder logic is the main programming method used for PLCs. As mentioned before, ladder logic has been developed to relay logic.



The decision to use the relay logic diagrams was a strategic one. By selecting ladder logic as the main programming method, the amount of retraining needed for engineers and trades people was

greatly reduced .Modern control systems still include relays, but these are rarely used for logic. primary programming language for PLC.visual and graphical language unlike textual high level, such as c and c++.Derived from relay logic diagram.

There are no of symbol used in ladder logic system, Normally Open contact, Normally closed contact, output instruction.

CONCLUSION

The proposed method of automatic water distribution and monitoring system can reduce the water resources substantially and make the water level monitoring more effective and convenient to the public. Our research idea specifically designed for distributing and monitoring the water equally according to the utility of the public needs and monitors the water distribution without any man power. This method is possible to solve the problems of traditional methods of corporation water distribution system. We hope the proposed idea can make a great change in the corporation water distribution system and can give the benefit to the government by reducing the wastage of water, manpower and time consumption. More over the system uses solar energy as an alternate energy for the power supply, which is pollution free, and reduces global warming.

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