ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 2, February 2024

PLC Based Water Level Control System

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ABSTRACT: The objective of our project is to design, develop and monitor "PLC Based Water Level Control System". This work provides with a lot of benefits like low power consumption, low Operational cost, less maintenance, accuracy and many more. This project is based on Automation and is a vast application used in many industries like milk industries, chemical, food, Mineral water and many industrial manufacturers. A prototype has been developed to illustrate the project.

KEY WORDS: PLC, Float Switch Sensor, Ladder Logic, Motor, Relay output, SMPS, Automatic Sensing Operation.

I. INTRODUCTION

The Paper “Automatic fluid level control with an automatic pump control system “is designed to monitor the level of liquid in the tank. The system has an automatic pumping system attached to it so as to refill the tank once the liquid gets to the lower threshold, while offing the pump once the liquid gets to the higher threshold. Sustainability of available water resources in many reasons of the of the world is known dominant issue. This problem is quietly related to poor water allocation, inefficient use 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. More over the common method of level control for home appliance is simply to start the feed pump at a low level and allow it to run until a higher water level is reached in the water tank.

This water level control, controls monitor and maintained the water level in the overhead tank and ensures the continuous flow of water around the clock without the stress of going to switch the pump on or off thereby saving time, energy, water and prevent the pump from over working besides this, the liquid level control system are widely used for monitoring of liquid levels in reservoirs, silos. Proper monitoring is needed to ensure water sustainability is actually being reached with displacement linked to sensing and automation, such a programmatic approach entails PLC based automated water level sensing and controlling. In order to ensure safety in production and quality of products, effectively and timely control of liquid level is necessarily in the previous industry people control liquid level through a fixed liquid level switch. When liquid level is up to certain height, the switch is automatically closed or disconnected to control water level. But now we are controlling the liquid level automatically by using PLC, sensor, motor and valves.

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II. PROBLEM IDENTIFICATION AND PROBLEM STATEMENT

The traditional fluid level control tank had many disadvantages such as; Traditional fluid level must draw the water manually to the tank when there is no water in the tank. The problem of manual control is sometimes people turn off or turn on the valve. For the automatic water level control, if the manual float broken or damages, all the system cannot function properly. There is over flow of in the open container in the industries. Time delay
High cost, less reliable. Difficult to maintained Have large panel The use of manual filling methods results in poor efficiency production and losses through spillage. The research outlines design and development of an automated lowcost water level control system Automation can be described as the advancement by which a system or method is performed without human help.

III. LITERATURE REVIEW

In the past, humans were the main methods for controlling a system as Manual controller. When the operator operates the process to a desired condition, then it carries out the corrective action is said to be manual control[1]. The operator adjusts the output to operate the plant. During start-up, this mode is normally used. More recently electric city has been used for control and early electrical control was based on Conventional control system[2]. Conventional control system consists of electromagnetic relay, timer, and switch etc. Which can be used to control a specify process operation. But if any changed is required in the process, then whole control system has to be changed and rewiring is need[3].

Relays- This relay allows power to switch on and off without a mechanical switch. It is common to use relay to make simple logical control decisions[4]

The development of low-cost computer has brought the most recent revolution. At the outset of industrial revolution, especially during sixties and seventies, relays were used to operate automated machines, and these were interconnected using wires inside the control panel[5]. In some cases, a control panel covered an entire wall. To discover an error in the system much time was needed especially with more complex process Arduino control systems[6].

On top of everything, a lifetime of relay contacts was limited, so some relays had to be replaced. If replacement was required, machine had to be stopped and production too. Also, it could happen that there was not enough room for necessary changes. Control panel was used only for one particular process, and it wasn't easy to adapt to the requirements of a new system. [7]3As far as maintenance, electricians had to be very skill full in finding errors. In short, conventional control panels proved to be very inflexible. As explained above manual or conventional control has some draw backs due to this case, we forced to make automatic control system using PLC[8].

IV. METHODOLOGY

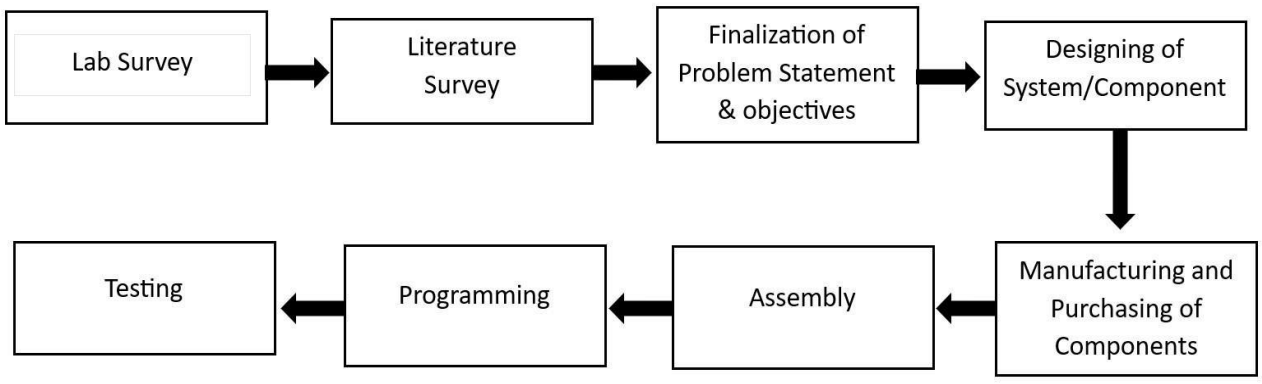

Fig. 4: Methodology

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V. COMPONENTS

- **Programmable Logic Controller (PLC)**
- **Float Switch Sensors**
- **Submersible Pump**

1. Programmable Logic Controller (PLC):

Programmable logic controller (PLC) is a control system using electronic operations. Its easy storing procedures, handy extending principles, functions of sequential/position control, timed counting and input/output control are widely applied to the field of industrial automation control. Delta's DVP Series: Highspeed and Reliable

Fig 5.1: Programmable Logic Controller

2. Float Switch Sensor:

Float switches are used to detect the level of a liquid in a tank. The switch floats on top of the surface and acts as a mechanical switch, going up or down depending on the liquid level. Maximum Load: 50 Wax Switching Voltage: 100V DC Minimum Voltage: 250V DC Maximum Switching Current: 0.5 Amax Load Current: 1.0 Max Contact Resistance:

0.4 Tamp Rating: -20~ 80 degree.

Fig. 5.2: Float Switch Sensor.

3. Submersible Pump:

A submersible pump (or electric submersible pump (ESP)) is a device which has a hermetically sealed motor close coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of thistype of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between the pump and the fluid surface. Maximum Pressure .48MPFlow Rate3.5 L/Minable Length (cm)28Weight (gm) 80 Shipment Weight0.5 kg Shipment Dimensions 9 6 5 cm Cable Length: 30.5(cm)

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Fig. 5.3: Submersible Pump

VI. EXPERIMENTAL SETUP

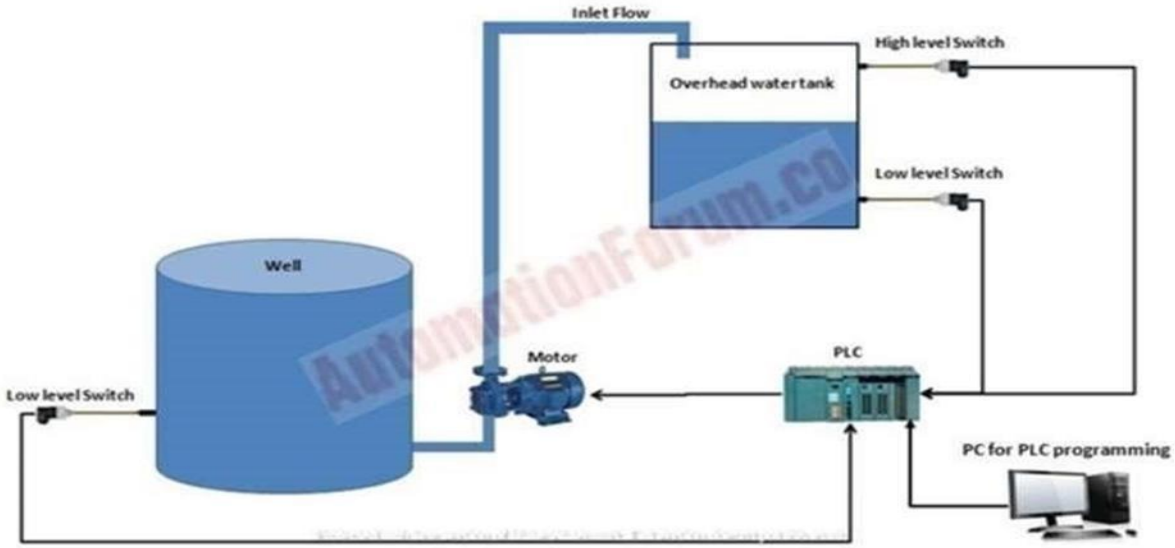

Fig. 6.1: Setup Diagram

Construction

PLC Based Water Level Control System Consist of Programmable Logic Controller (PLC) which is the main component of this system. It also consists two tanks which has water in it, one tank is placed at certain height from the ground level for ex. Overhead tank used in houses for daily need purposes, second tank is the main tank or also called as ground tank. There is use of three float switch sensors which are placed in both tanks use to detect the fluid level in our overhead tank as well as ground/main tank. It also has a submersible water circulating pump which is placed in the main/ground tank

Working

This system is design in such a way that it is operated in following two conditions

1. When Quantity of water in the main/ground tank is sufficient to fill the overhead tank:

At first as the water level gets reduces in the overhead tank, the high-level float switch & low-level float switch head downward as a result as per the internal mechanism of low-level float switch the circuit gets completed and the sensing of water is done and then this signal is passed to PLC, as per the logic programmed set to PLC processed and passed the output signal to water circulating pump. And the pump gets started and circulation of water from main/ground tank is on to fill the upper head tank as the water supply is on the water gets filled and the level of water

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in upper head tank gets increases, as the water level reaches to the high level the float switch heads upward and the circuit gets braked and and the circulation of water is stopped as the water circulating pump stops

2. When Quantity of water is less to fill up the upper head tank completely

As there is insufficient quantity of water in the ground/main tank it is not possible to fill the upper head tank fully with that sufficient water in ground tank.

Initially when the water level in the ground/main tank is very low which is not sufficient to fill the upper head tank as the level is low the float switch in the ground/main tank will heads downward, the circuit get brake and there is no supply of current through it

As a result, the water pump remains off and there is no supply of water through the ground/main tank unless the quantity of water in the ground/main tank gets enough to fill the upper head tank completely This condition helps to avoid the dry run of the pump

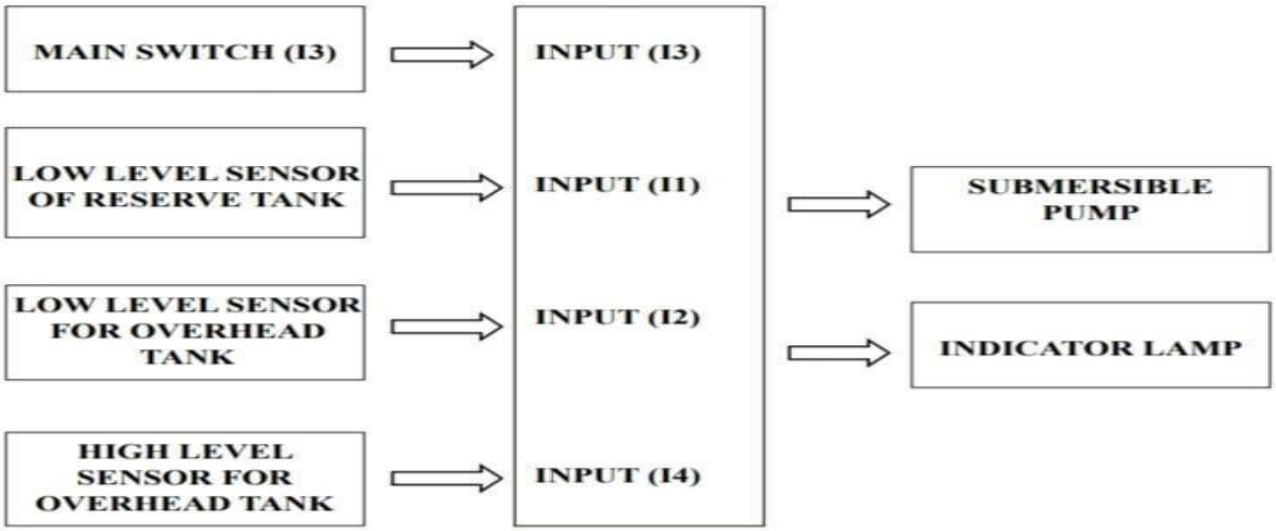

Fig. 6.2: System overview

LADDER LOGIC PROGRAMMING

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 11, Issue 2, February 2024

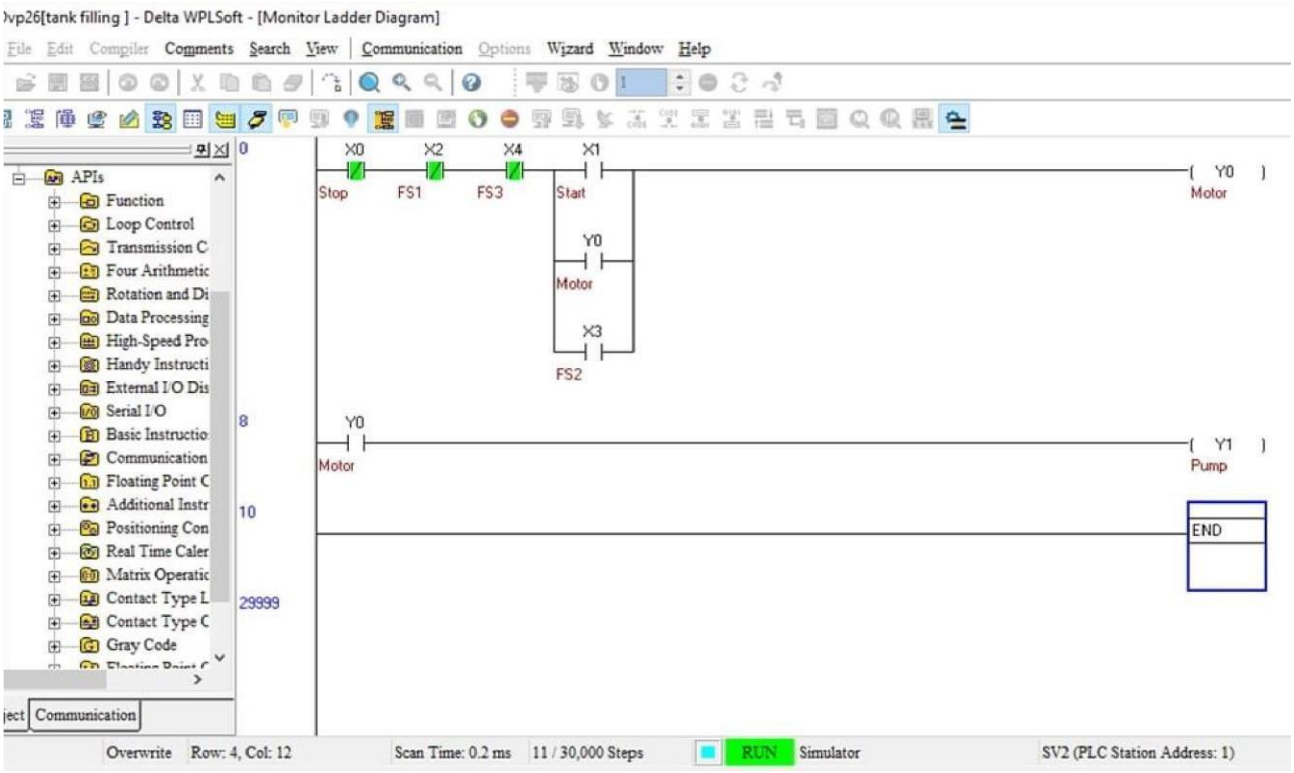

Fig. 6.3: Ladder Logic Programming

VII. CONCLUSION

This proposed an optimized wireless automatic control technology using a programmable logic controller a long with a wireless communication network

A prototype system is designed and built. The power consumption and cost are minimized for the proposed implemented technology. The process control is successfully tested and evaluated to demonstrate the reliable, robust and accuracy of the proposed method. This remote-control process verifies the use of wireless control network in industrial type environment.

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