PLC Based Automatic Dam Shutter Control Using Water Level Sensing

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Abstract- *This paper based on controlling the process variable parameters such as level with real time implementation of gate controlling through DC motor using Programmable Logic Controller. In our proposed system, a programmable logic controller is used as an compact computer playing the major role of a control devices and switches provide incoming signals to the control unit. The system design is provided with two levels in which the one level in upper and one level in the lower outputs the ladder logic is actuated. This work uses PLC of DELTA DVP-SE series inbuilt with 8 digital inputs and provides 4 potential free outputs to control the miniaturized process depicted in the work..*

I. INTRODUCTION

In Our India approximately there are 3200 dam present. In Gujarat, 202 dams are there out of them 95 dams have gates. Approximately, these dams cover 1,70,000 sq.km area for collecting water. There is also 2067.68 km long and complex canal network through which about 10 lakes hectares land gets water for irrigation and drinking purpose. The farmers are mostly dependent on rain and after that bore-well water for their crops. Recently, all the farmers use in flood irrigation system for planting their crops which needs more water. As we know, water is gradually becoming one of the most valuable natural resources. As the solution to problem we are developing this project to develop a PLC based system which detects or senses the water level in dam and thereby control the movement of gates automatically. Automation is use of various control systems for operating equipment in industries such as machinery, processes in factories.

The biggest benefit of automation is that it is saves labor work; it is also used to save energy and manpower to improve quality, accuracy and precision , reliability.

II. SYSTEMDEVELOPMENT

In this system we developed the overall method in many ways. First one is that the targeted devices can be controlled by PLC (Programmable Logic Controller).

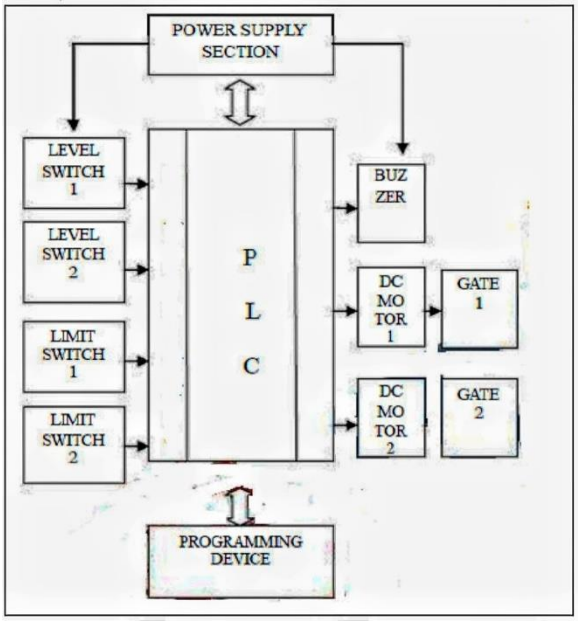


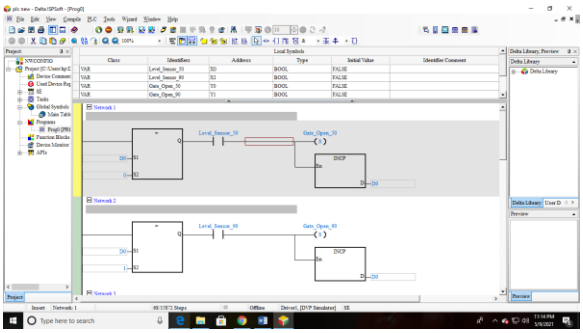
Fig.1 Block diagram of system using PLC

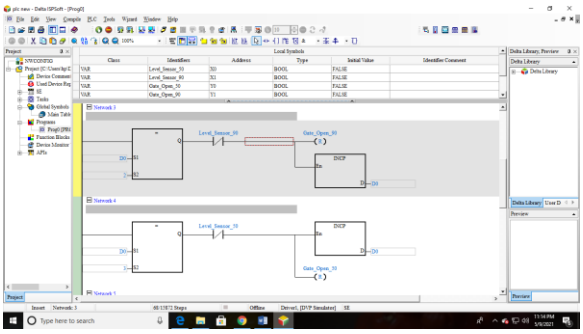
III. IMPLEMENTATION OF PROPOSED SYSTEM

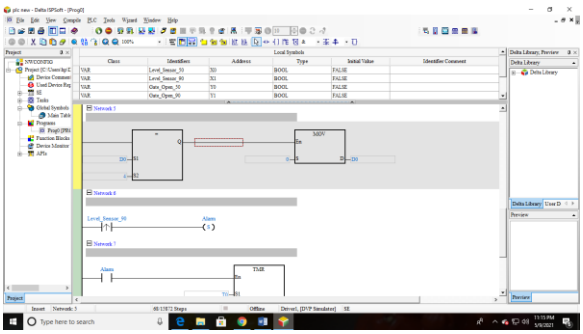
In this section the method that we have developed to implement the system has been explained. There are various components we have used to implement this system. The whole system is divided into different sections and each are explained separately.

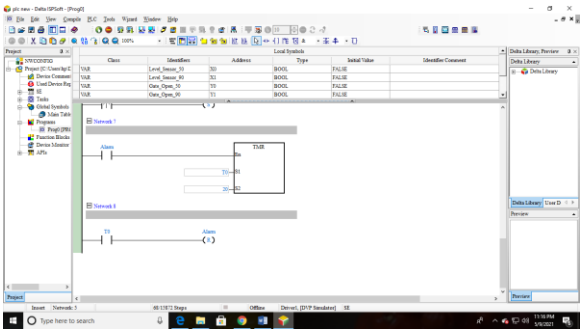
A. PROGRAMMABLE LOGIC CONTROLLER(PLC)

This is heart of our proposed system which controls the entire operation of system. This compact DELTA PLC, economical programmable controllers offer several I/O configurations. In this PLC , there are 8 input and 4 output are available. These PLCs were programmed in "ladder logic", which strongly defines a schematic diagram of relay logic. Ladder logic is a programming languages, that represents a program by a graphical diagram based on the circuit diagrams of relay logic circuit. It is primarily used to develop software for programmable logic controllers (PLCs) used in industrial control applications. In our system, screenshot of programming are as follows









B. SENSING ELEMENT

Sensing element in our proposed system is the ball float type which attached to the level sensor. Whenever the water level increases the ball will keep floating above the water level. Whenever the desired level is achieved then level switch will trigger the input of PLC which controls the action of opening and closing of gates.

C. GATE CONTROL

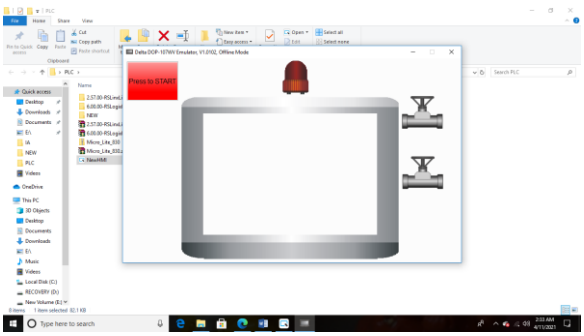
In gate control assembly there are two gates used in our proposed system. One gate is used for 50% level of water in dam which depends on water level detected by level switch 1. And another gate is used for extreme high level or 90% level of water in dam which depends on level switch 2. The opening and closing of gates is achieved by the dc motor, the motor shaft is connected with the geared belt or wire which is placed on gate assembly.

D. LED AND BUZZER

The LED and buzzer are used for security purpose to alert the people about flood. When the water level increases above the extreme high level at the same time buzzing sound will be produced by the buzzer.

E .HMI

For HMI(Human Machine Interface) software used is DOPSoft 4.00.08. It is used for collecting the data from sensors and devices located at remote site and display on computer at control site for monitoring and controlling. In our project we are using DOPSoft for graphical representation of motor control operation during opening and closing of gates.



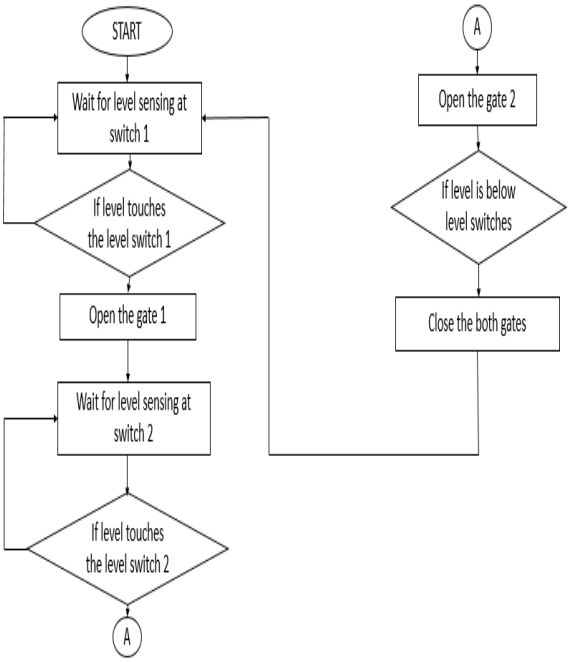
IV. DESCRIPTION OF MODULE

A programmable logic controller (PLC) or programmable controller is a digital computer or industrial computer used for automation of electromechanical processes of such devices, this control of machinery on factory assembly lines, amusement rides. PLCs are used in many industries, sites and machines. 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.

Here the PLC used is of Delta DVP SE series which is most complete network type slim PLC in the industry.

In this module, there is built-in mini USB ,also can be connected using Ethernet and 2 RS-485 ports.It has program capacity of 12000 steps. Also it has built in Ethernet which supports MODBUS TCP and Ethernet/IP.

V. FLOWCHART



VI. FUTURE SCOPE

1. To enhance the sophistication of this process we can make use of level transmitter and standalone PID controller. This system is opening and closing with in particular stages of gates.
2. The level transmitter can be used of RFID devices for wireless communication along with the PLC. In this system we are use also GPS (Global position system), are indicating for particular person will receiving message and alert through mobile.

VII. CONCLUSION

In this paper, it represents an automatic controlling of a DC motor using PLC and HMI. This System model of a PLC based Dam automation system which is the completely automated can control the level of the dam gates using backup of the water. Thus using PLC and HMI the level of water in the dam is controlled effectively there by opening and closing the gates of the dam whenever the level increases. Therefore the use of Programmable logic control has opened doors for a level of automation Dam system and HMI also monitoring the entire plant and stored the entire information about opening and closing of the gate .

REFRENCES

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