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Water Distribution System Using PLC and SCADA

Prof.Rohini.P.Onkare[1], Sneha Randhir Mane[2], Pooja Ramchandra Rakshe[3], Priyanka Suryakant Waghmare[4]

Assistant Professor, Department of Electronics and Telecommunication Engineering, P.V.P.Institute of Technology, Budhgaon, Maharashtra, India[1]

U.G.Scholar, Department of Electronics and Telecommunication Engineering, P.V.P.Institute of Technology, Budhgaon, Maharashtra, India[2,3,4]

ABSTRACT: Water is basic need of human being. Automation provides optimized solution to all problems of distribution of water system. This system has features of SCADA(Supervisory Control And Data Acquisition)system to control and monitor the water supply and in case of power failures to maintain continuity of power supply. Now-a-days water distribution system faces some problems like improper water supply and water leakage. This leakage cause reduction in a pressure of water flowing through the supply line. Due to this consumer gets less amount of water .By, considering above scenario we are trying to find solution for the above problem.

KEYWORDS: PLC, SCADA, Flow Sensor, Level Sensor, Solenoid Valve.

I. INTRODUCTION

Automation plays an important role in the global economic and in daily experience. It reduce human efforts and improve the performance hence we have implemented PLC based water distribution system. The main objective behind selecting this project is to improve the performance of the water distribution system with minimum human efforts. This project explores the SCADA technology and its use for developing automation for monitoring purpose of water distribution for an entire city or village. Earlier the monitoring of the process was done by human which caused error. To reduce this error, automation is developed by using PLC and SCADA. With rapid development in technology, the more focus is on selection of application oriented controllers and tools, hence the concept of proposed system to control application it is combined with PLC.

The present system causes unnecessary loss of water, wastage of water and due to improper handling, water is not properly distributed to the end users. Also the monitoring of the levels. Pressure, flow is done locally. Here we are working on the distribution network of single water tank. Here we are using the analytical instruments which gives the all the information about pressure, flow, and level of water tank. All operations will be carried out by PLC which controls inflow and out flow.The automation control reduces manual interference and proper work of opening and closing of controls valve are carried out by electric actuators.

This system primarily focused on the water crisis in order to make water distributions more efficiently by reducing wastage of water and power. This proposal is made considering water distribution system advanced for both rural and urban areas. This system which insures the balanced distribution of water throughout the city/area. it monitors, controls and protects all the water pumps used for water distribution purpose. It monitors all the storage tanks situated and distributes the water equally to all the areas depending upon the amount of water in the tank.

II. PREVIOUS WORK

The wastage of water is due to many reasons such as human laziness, operator fault, improper handling of water. We can't able to identify the robbery in urban as well as rural drinking water supply. Water flow control is impossible

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and not controlling. Now a days, water storage and distribution system, controlling temperature, pressure and for every stage is measuring and analyzing. In previous system urban water is supplied to the home with help of some human power. Person in charge will go to that place and open the valve for the particular time period, once the time is over again the in charge person will go to the same place. and close the valve. It is the wastage of time. Also the people may take extra water for their personal use with the help of motor. Due to this many people will not receive sufficient water for their use. The water theft prevented only when any public inform the officials about the theft.

III. METHODOLOGY

The main aim of this project is to provide proper water supply to each consumer and to detect the leakage sites. In this project we are working on the distributed network under the area of single water tank. We are going to develop a system in which we can analyze the pressure from different branches of distributed network and compare it with the fixed bench mark .In this way, we are able control and monitoring the whole system.

The block diagram is shown in fig.1. It consist of PLC, level sensors, solenoid valve, flow sensor. The Flow Sensor is used to measure the flow rate of water. Flow sensor contains pin wheel in its. Pin wheel contains six teeth. The pulse output is come from the pin wheel sensors. If the teeth rotate at one time, it will give the pulse output according to the specification of then flow sensors. From the pulse output easily measure the amount of water passed through the pipe. This pulses is converted to voltage with the help of hall effect sensors. Here we are using the level sensor which is used to sense the amount of water level present in the storage tank. The buzzer indicator is connected to the level sensor. It will then connect to the PLC. If the water capacity reaches 100% in the storage tank the buzzer will give the alarm signal. The pump will be turned off with the help of PLC. Once the water is not sufficient in the tank the pump will be turned on. If the water level once attains its 100% the overall system is started.

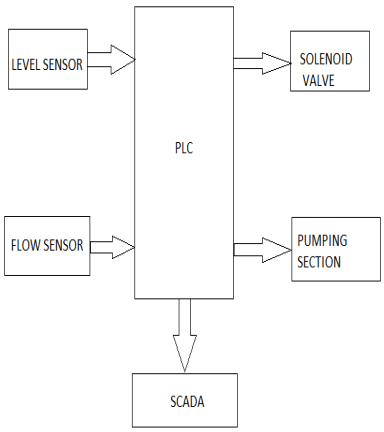

Fig.1.Block Diagram

Solenoid valve is two port valve. It will be used to turn on and off condition. In this project three solenoid valve are used. 230 volt supply is given to the main solenoid valve and other two connect to the main solenoid valve. PLC output is connected to the solenoid valve with the help of RS232 cable. The output from the PLC in the range of 24 volt DC. So it is necessary to give switch function using relay to on and off the solenoid valve. If the water level in the storage tank is reached the 100%, main solenoid valve is automatically turned on. The set point is fixed for solenoid valve 2 and solenoid valve 3. If anyone one of its valve or both the valve attains the set point the solenoid valve is turned off. The valve will be turned on after 24 hours later. Normally closed solenoid valve is used to control the flow rate.

Computer software system integrates an SCADA application program specifically developed for water distribution management. The dispatching unit SCADA system elaborates daily, monthly, yearly diagrams, tables and reports

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related to the operator requested parameters. The system store the acquired data in a specific data base for later use analysis and retrieving. Programming logic controller is the heart of the automated water supply system. PLC helps in controlling pump station, motor contactors, stirrer motors, and distributed valves as well as to measure pressure transmitter of the water. PLC programming is done using Ladder Diagram Language. Ladder diagram is specialized schematic language commonly used to document industrial control logic systems.

IV. PROPOSED SYSTEM

The layout of the proposed system is shown in fig.2. The overall distribution process is monitored in PC. Pumping section is connected to the PLC. If the water level below the set point the pump is automatically on with help of PLC. Checking the level in storage tank is the first process. If the level attains the set point overall system is started. The water is flow through the pump when the main solenoid valve opens. The flow rate is measured with the help of pulse output from the flow sensors. The people can get water until the set point reaches. Once the water usages attains the set point the particular solenoid valve is automatically closed.

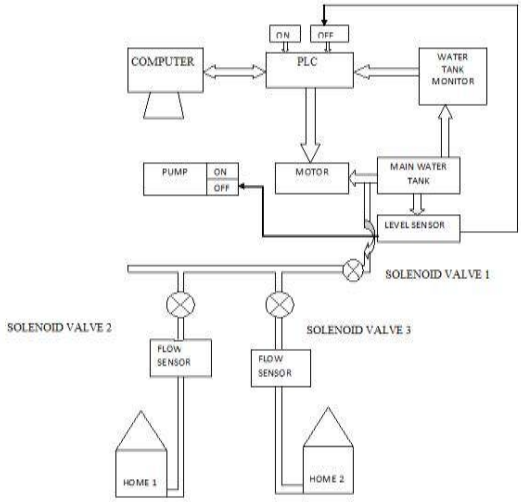

Fig.2.Proposed System

In pumping section there are three solenoid valve. One is main solenoid valve and other two are connected to the main. Once the main solenoid valve gets opened the water flow through the pump. The water level in the storage tank gets decreased. We can measure the water level using the sensor attached to the storage tank. When the water decreased below 100% the pump is on.

V. FLOW CHART

Fig.3. shows the flowchart. Flowchart is the collection of steps which shows the step by step process. First initialize the all parameters and then check the water level. If water level is below the 100% then motor is turned ON otherwise it is in OFF condition.

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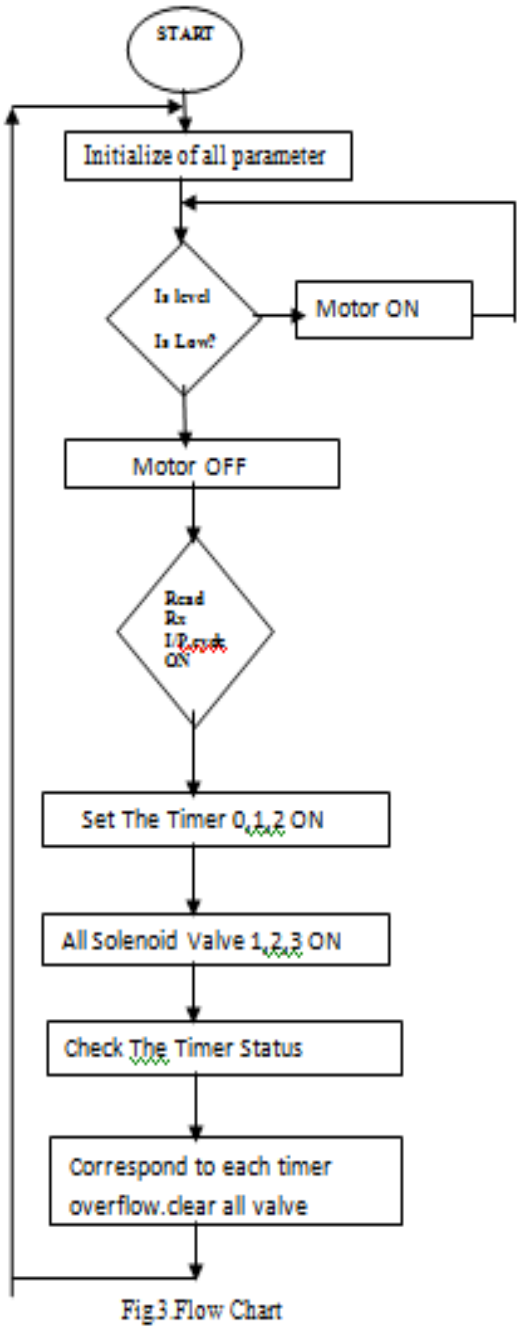

Fig 3 Flow Chart

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VI. RESULT

Fig.4.shows the HMI display i.e. human machine interface display is interfaced with PLC panel. It displays all the information of level, pressure, total flow and flow rate.

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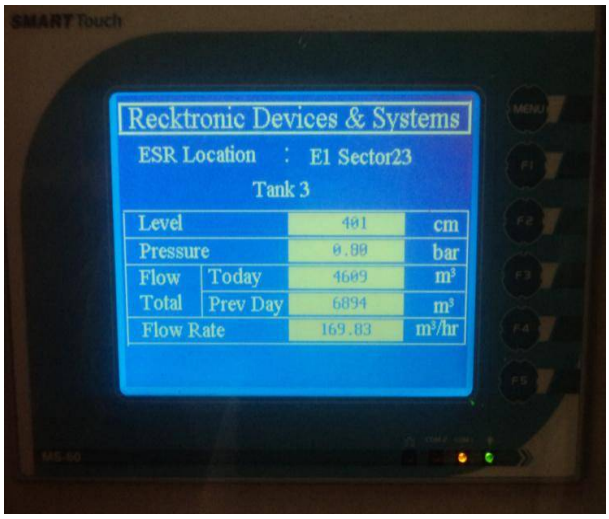

Fig.4 Result

VII. CONCLUSION AND FUTURE WORK

This system insures to avoid wastage of water and reduce the time as well as it also control and monitor the water supply Due to SCADA it is possible to monitor and control whole system from main control units. It is monitoring all time without man power. The displaying data based can be enlarged throughout the year, month and daily report in central PC.

In future work this system can be modified as, it will detect the exact location of pressure drop.In future this system can be used in agriculture field to supply the water properly for required area to meet own conditions effectively.

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BIOGRAPHY

Prof.Rohini P. Onkare. BE and ME degree in Electronics and E&TC from the W.C.E. Sangli and K.I.T. College of engineering Kolhapur, Maharashtra respectively. Currently working as Assistant Professor in E&Tc department of P.V.P.I.T. College of Engg. Budhgaon, Sangli(M.S.)

Sneha Mane BE (E&TC) P.V.P.I.T, Budhgaon, Sangli(M.S.)

Pooja Rakshe BE (E&TC) P.V.P.I.T, Budhgaon, Sangli(M.S.)

Priyanka Waghmare BE (E&TC) P.V.P.I.T, Budhgaon, Sangli(M.S.)