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Water Distribution Control System

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***Abstract*— Automation is playing very important role in our life. Water is the basic need of life. Till now the water distribution plants are not fully automated. The proposed work of this project is to synchronize the main water supply pipe with the six sub pipes. In this project we are automating the existing plant by synchronizing the flow of the ESR's using Programmable Logic Controller (PLC) as a primary controller and building Supervisory Control using SCADA.**

***Index Terms*— DP, ESR, FT, PLC, SCADA**

I. INTRODUCTION

In recent years the automation industry has shown remarkable progress but it is never used for smart and proficient water distribution control. The main water delivered to the people; was primarily using manually operated control valves. This manual operation has introduced many problems like unequal water distribution, Irregular pressure drop across pipes which affected the pumping effectiveness.

Water stored in ESR's is supplied to the people by manipulating the control valve. The valves are manually operated. There is no provision for measuring the flow of the water and pressure drop across the pipe. Pressure transmitter will indicate the leakage by measuring the pressure drop. To avoid such problems, the manually operated valves are modified by the motorized operated valves. The addition of flow through sub lines is matched with main flow pipe.PLC is used for flow synchronization and ESR related parameter monitoring. This project will overcome all the problems associated with the manual control system.

A. SYSTEM DESIGN

The proposed system consists of pressure and flow transmitters for measurement and valves as a final control element connected to the system. The transmitters output will be fed to the PLC which accordingly give the control signal to the final control element. The real time state of the system will be visualized on the SCADA.

1) Flow Transmitters (FT):: The flow is measured using electromagnetic flow meter manufactured by Forbes Marshall. Velocity is directly proportional to the flow of the fluid. Thus the electromagnetic flow meter measures the velocity of the flowing water which in turn is directly proportional to flow.

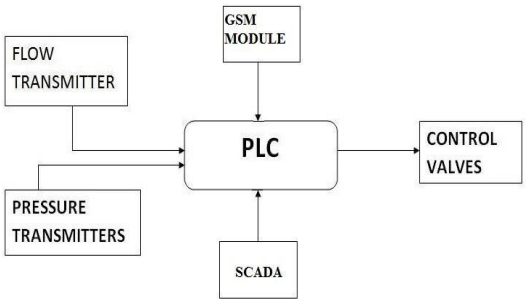

Fig. 1: Block Diagram

2) Pressure Transmitter:: Differential pressure (DP) cell manufactured by SIEMENS is used to measure the pressure. This DP cell works on the principle of pressure differential on either of transmitter and thus the pressure of incoming flow is measured.

3) PLC:: PLC is used for the main function of synchronization. The PLC accepts the input from the FT and compares it with the set point fed into the PLC by SCADA system. The difference between the actual reading and the set point will modulate the final control element to reduce this error to zero. The PLC will work according to the program or logic fed into it by the user. The PLC will generate alarm messages to the fault priorities predefined and will generate a database for analyzing the problems.

4) Control Valves:: The control valves are the final control element. The actual change is carried out by valve. The control signal from the PLC is given to the valve and the valve accordingly takes position to manipulate the flow. The final control element of the system is sluice valve with linear characteristic and having motorized controlled actuators. According to the program logic the valve will throttle and allow the water to flow.

5) SCADA:: The SCADA is used for real time monitoring. The actual system is display on the SCADA. This helps in easy monitoring and controlling of the process by the engineers and operators.

6) Global System for Mobile Communication (GSM):: The GSM module is used to send the messages to the engineers informing about the problem in the system. The message will be send whenever the system is not working properly for e.g.. If the flow is not reaching its set point, indicates the water leakage

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II. WORKING OF PROJECT

The water from the main sump will flow with some pressure into the sub pipes. The Pressure transmitter, Level Transmitter and Flow transmitter are installed on the respective ESR. The ESRs should be filled according to their respective set point and should be coordinated to the main pipe. But all the ESRs are not situated at same height so the level will not be reached i.e. the disturbances will be created. The ESR situated at low height will experience more flow than required due to gravity. So the ESR will not be equally filled in a specified time. These are the problems in synchronizing the ESRs.

This synchronization is to be achieved through PLC. The main valve and the transmitters are connected to the PLC . The SCADA will give the visual appearance on the PC at the main server station. So the main valve will be controlled through PLC. The PLC program will automatically modulate the main valve as required. The transmitters will send the respective readings to the server through PLC. And the PLC will generate a database consisting the flow, level and pressure readings at various instants. This will be helpful for analysing the problems associated with the synchronization.

III. FLOW CHART

This flow chart gives the outline for the programming purpose.

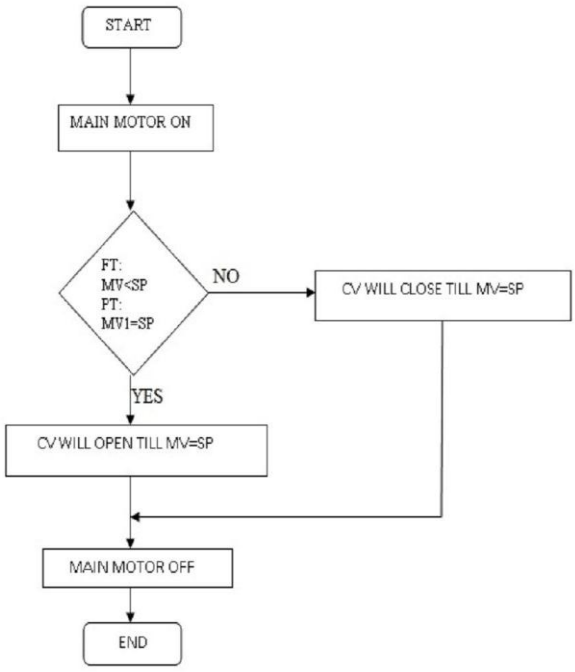

Fig. 2: Flow chart

IV. CONCLUSION

The wastage of water is reduced by this project. All the tanks will be filled according to the set points. This will not cause any water problems in that area. This will reduce the manual interference in the operation of the valves. The database created will help us to analyze the leakage in the lines.

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