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PLC BASED AUTOMATIC DRINKING WATER SUPPLY FOR PUBLIC SERVICE

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Abstract-Nowadays, the availability of drinking water has become a very big problem in India because of the huge increase in the population and a wide expansion of urban areas. Due to the huge population the handling and distribution of water is quite difficult . To overcome this problems, we propose a automatic drinking water supply for public service using PLC, which helps in distributing the water automatically according to the needs of different areas and can control the wastage of water. The system consists of a float meter that measures water level in the tank, the float sensor to determine the water level in the tank. Motor is automatically turned on and turned off based on the water level in the tank. The proposed work is simulated using PLC firmware Indraworks Engineering.

I. Introduction

Water is a basic need of human being. Water distribution is one of the most important process. Nowadays water distribution system faces so many problems like water leakage, improper water supply, human laziness and operator fault etc. In existing distribution system water is supplied to the residencies with the help of human power. The person have to go the place and open the valve, once the time is completed the person will go again to that place and close the valve. This operation takes a lot of time. Also the people may take extra water for their personal and domestic usage. Due to this problem many people not get the sufficient water for their usage .The main aim of proposed work is to provide optimum water supply to public or a household. In our idea we are using PLC for distribution of water to the public in efficient manner.PLC programming is done using a ladder diagram language. It is used for operating a solenoid valve, float meter and flow sensor. All this operation done through ladder diagram.

Some of the related works are as follows. In TruptiPatil *et al.*[1], demonstrate the system uses ARM 11 microprocessor of low power and high performance as the main chip. System will use ZigBee and GSM through GPRS system for communication protocol. The ZigBee has a advantage of high speed data rate, low powered and low cost. GSM network with its vast coverage in most countries is becoming popular as a medium for machine to machine applications which utilize the GSM network to send its water usage reading using short message service back to the energy provider wirelessly.

In Prashantpalkar *et al.* [2], proposes the way to improve the water distribution system is by using industrial PLC and PC system, which includes all network components like flow sensor, GSM modules, pH sensor etc. The system includes Remote Terminal Units (RTU), flow transducers and actuators, control and power panels for the pump stations etc. Reliable instrumentation connected to PLC or RTU assure real time monitoring of the main technological parameters of large water distribution networks. The data acquired of SCADA system (Supervisory Control and Data Acquisition) represent the support for optimization of the process and data- driven Decision Support System (DSS).

In HassaanTh.H.Thabet *et al.* [3], Most of the Middle East countries suffer from water shortage due to bad and old designs in water supply systems. An automatic regulation water supply system based on PLC (Programmable Logic Controller) & VFD (Variable Frequency Drive) is presented. Authors explain water supply systems energy conservation principle of a pump with speed control according to disturbances. This system can supply water to the building with constant pressure and save energy efficiency.

In Sukhumar *et al.* [4] portrays solar energy is used as alternate renewable energy and is directly utilized as dc supply for handling dc machines. The DC power is further converted to AC with the help of inverter. For the implementation of the system Embedded controller is used and simulation is done by Keil C µ Vision 4 software is applied for different mode of operations. In order to reduce the wastage of power, this system provides a solution to operate efficiently into different modes. Some of the limitations of existing system are: wastage of water, leakages in system, partiality water distribution, and manpower usage. some of the objectives of this work are as follows. minimizing the human errors, saving the water, minimizing the man power required etc. Rest of the paper is organized is as follows. Section 2 presents the proposed work. Section 3 presents simulation and result. Section 4 presents the conclusion of the paper.

II. Proposed Work

Figure 1 presents the proposed block diagram, which comprises of overhead tank, PLC, float meter, solenoid value, and leakage sensor.

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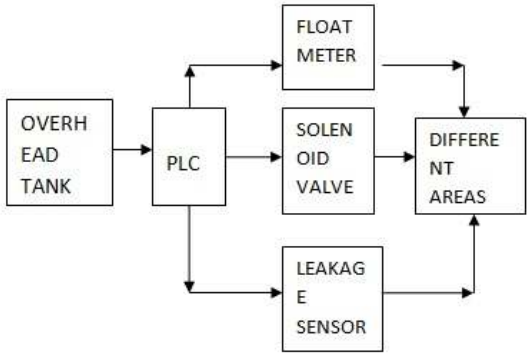

Figure 1: Proposed Block Diagram

The overhead tank consists of two float sensors placed in the tank at upper and lower end of the tank. We can measure the water level using the sensor attached to the storage tank. When water is decreased below 85% the motor is on. the pump section is connected to PLC. If the level attains the set value, overall system is started. The flow rate is measured from flow sensor. Float meter is used to indicate the outlet valve is open or closed. Solenoid valve is a two port valve. It will be used to turn on and off condition . If the water level in the storage tank is reached 85% main solenoid valve is automatically turned on. If the valve attains the set point the solenoid valve is turned off. Leakage sensor is placed in the water distribution pipeline in order to find out the leakage in water distribution pipe. some of the advantages of this proposed work are as follows. Automatic distribution of water, more amount of water can be saved, water leakage can be controlled, reduces lots of man power required.

III .Simulation And Results

The PLC is an industrial computer. It is capable of storing instructions to implement control functions such as sequencing, timing, counting, arithmetic, data manipulation and communication. The I/O interfaces provide the connection between the PLC and the information providers (inputs like pushbuttons, sensors) and the controllable devices (outputs like valves, relays, lamps). PLCs are specifically designed to survive the harsh conditions of the industrial environment. A well designed PLC can be placed in an area with substantial amounts of electrical noise, electromagnetic interference, mechanical vibration, and non condensing humidity. The hardware interfaces for connecting field devices are actually part of the PLC itself and are easily connected. There are different types of PLC like Indra Logic L10, L20, and L25 etc. Indra Logic L20 PLC has been used. The proposed ITCS system consist of PLC (LM-10) with RS232 serial communication, compact flash card, on board I/O (DI8 /DO8) and power supply, Sensors (IR). RS 232 is a standard for serial communication transmission of the data. It is used to connect external devices like motor controllers etc to the PLC. Compact Flash Card has 3 partitions. First part is for firmware or OS, second part is for program and data memory and third part can be used as a pen drive. It is the memory of PLC. The power supply of 24 V DC for CPU, Onboard I/Os, inline module.

Simulation Input And Output

Input: Top and bottom float sensor

Input: motor

Input: measurement of pressure

Input: leakage sensor

Output: areas(4)

Simulation Procedure

1. RUNG01 there are two float sensors which are placed in a tank to measure a water level in the tank. when two sensors are high, water distribution process is started.

2. RUNG02 and RUNG03 the motor is turned on to measure the pressure level of the water and the leakage sensor will sense the leakage of water in the pipe.

3. RUNG04 consider all four areas and a pulse timer where area1 will be open and rest of other areas will be closed so that the water is distributed to area1 only

4.RUNG05,RUNG06,RUNG07,RUNG08,RUNG09and RUNG10 repeat the above steps for area2,area3 and area4.

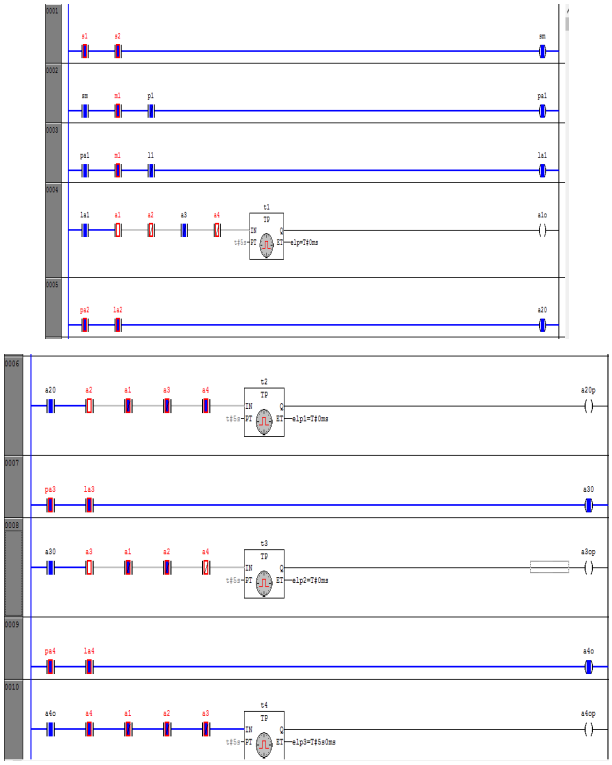

Figure 2:Ladder Diagram

IV. Conclusion

The automation of water distribution system eliminates not only water wastage but also provides continuous water flow according to the set point. This project is automatic so it reduces lots of man power. The automatic water distribution system ensures to avoid wastage of water and reduces time. So that people could get equal share of water. This proposed system is cost effective.

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