

Design & Implementation of intelligent water supply management system based on Plc & Scada

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ABSTRACT

Previously water supply system was designed on the basis of wireless monitoring. In this paper, in order to manage & used city of water resource reasonably, a wireless monitoring system for urban motor supply based on ARM7 Microprocessor is designed. This system uses ARM7 microprocessor of low power & high performance as main chip, and design software with microcontroller/OS-2 RTOS based on the data radio & graphical interface to achieve remote real time monitoring for water consumption of enterprises.

In this project, we are going to create a water supply system which will maintain regularity in water supply, equal amount of water supply to every area under system, detects leakages in supply pipelines, prevents misuses like motor connections in supply line, detects smoke in case of explosive conditions & fulfills water supply demand for the same. Hence, it effectively saves large amount of water. We are using various control & safety valves, proximity sensors, level sensors, smoke detectors etc for the system. This system is designed & controlled by PLC hence, fully automatic system.

1. INTRODUCTION

In day to day life, there is problem of shortage of water. And it is because of wastage of water. The wastage of water is due to many causes such as leakages, mankind laziness, operator error etc. There is also problem of irregulation of water supply i.e. the time of water supply is not fix. So the public problem may increase.

This can be avoided by implementing the automation in this controlling of water supply. Such type of problem can be reduced by using PLC controlling in water supply system. We can control the various valves which is use in pipeline by using PLC. So the irregulation problem can be reduced. It is also possible the detecting the less pressure due to connecting pump so that this may be helpful to restrict the uses of pumps in main supply line. The wasting of water is more due to leakage of pipeline. By using PLC we can detect the location of leakage in pipeline. This is effectively saves the more water.

So the main objective behind designing this system is to reduce water wastage by considerable amount & proper utilization of it for domestic purpose. It is fully automatic system but in our India it is not implemented. But it is possible to implement such system to reduce the wastage of water.

2. DESCRIPTION

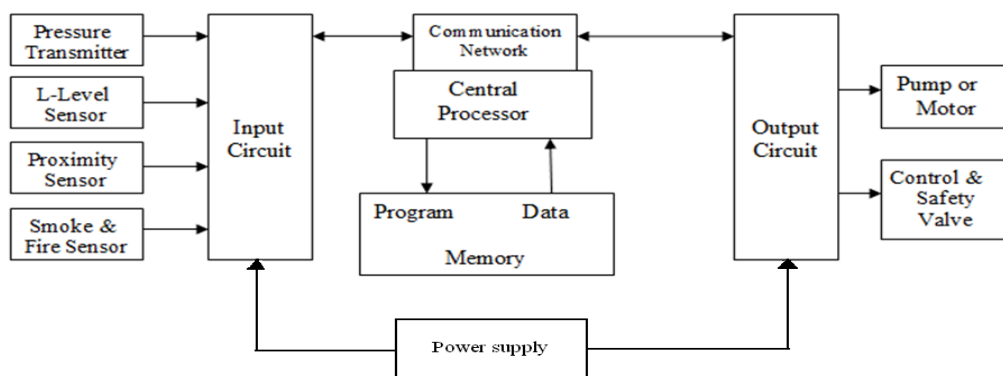


Fig -1: Block diagram of plc based water supply management

Block diagram of the proposed system is as shown in fig 1. It consists of,

- Input devices(proximity sensor,flame detector)
- Plc & scada(controller)
- Output devices(solenoid valve)

The proposed system is an integration of various components as mentioned above. Each component plays crucial role to work system satisfactorily. The system uses proximity sensor & solenoid valve for leakage detection .so by doing some mechanical adjustment system get controlled

2.1 Proximity for leakage & pump connection detection:

A valve that is opened or closed by an electromagnet. This action is achieved by the movement of a magnetic plunger to seal off or open a port when voltages applied. In a direct-acting solenoid valve, the seat seal is attached to the solenoid core. In the de-energized condition, a seat orifice is closed, which opens when the valve is energized.

2.2 Direct acting solenoid valve:

The heat exchanger block provides the actual cooling effect entering in jacket. It is designed in accordance with load demanded and compressor specifications. The refrigerant entering inside the jacket is passed through the heat exchanger device where, it fulfills the cooling requirements of bike rider.

2.3 PLC (Programmable Logic Controller) & SCADA(Supervisory Control And Data Acquisition)-

Features of Micrologix-1000:

- Available in 10-point, 16-point or 32-point digital I/O version.
- Analog version available with 20 digital I/O points, 4 analog inputs and 1 analog output.
- Includes built-in EEPROM memory no need for battery backup or separate memory module.
- Supports simply connectivity through RS-232 communication channel to PC
- Includes build-in high speed counter.

2.4 Scada process view:

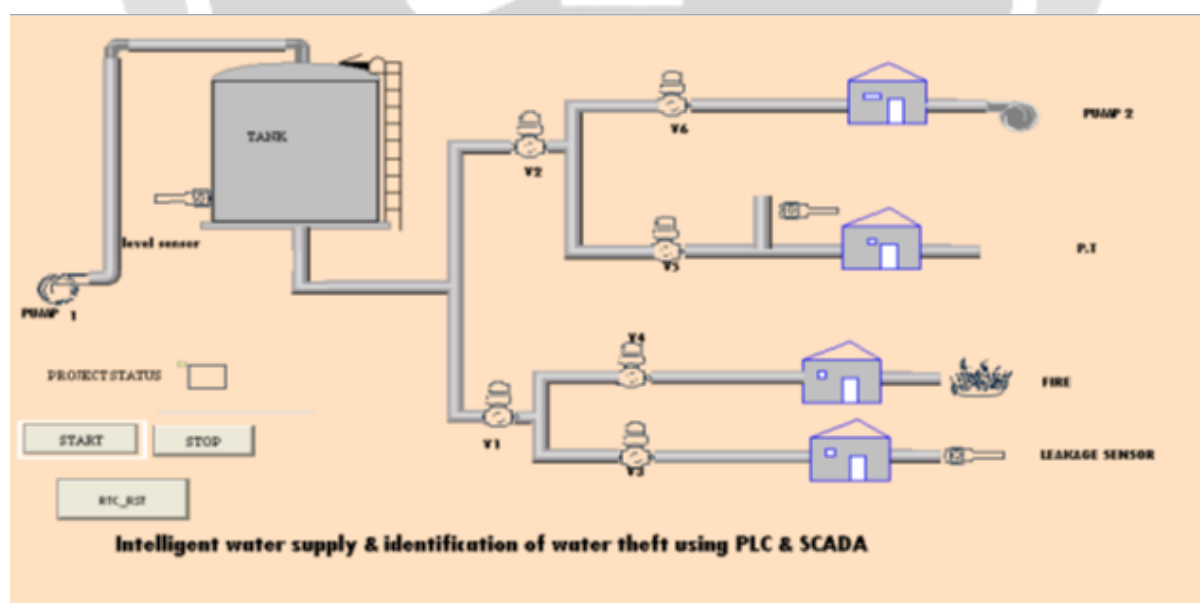


Fig.2 Scada view of propose system

3. Algorithm:

1. Start.
2. Check for PB pressed or not. If not pressed, wait for PB to press.
3. Initialize the program.
4. Check time & turn ON Master control valve of the system.
5. Again, check for timing & accordingly turn ON sub-valves for the supply lines.

6. Automatically turn OFF sub-valves as per prescribed durations.
7. Monitoring for various situations like Pipe Leakages, Pump (Motor) connections in supply lines, Water level of tank & critical explosive conditions.
8. Take respective action as per intended.
9. Stop.

4. Observation:

1. As soon as water level in tank goes below low level sensor's limit, all the supply lines are blocked & pump turns on immediately, to fill tank.
2. Since, flow rate in one supply line is reduced & level in hanged vertical pipe also decreases beyond set point limit, this implies pump connection indication in other line.
3. Also, smoke caused by the occurrence of explosive condition is detected by smoke detector & system will take respective action as mentioned.
4. As water flow in supply line is vanished because of leakages, proximity sensor immediately identifies it & system will block water flow of that line.

5. Advantages:

1. It reduces the water wastage in very effective manner.
2. Equally distribution of water supply can be possible.
3. Regularity and supply time is equally maintained.
4. Easy for maintenance.
5. Reduces the human efforts.

6. Conclusion :

With the help of PLC and SCADA monitoring of water supply becomes easy and possible. Possibility of water wastages can be reduced easily using PLC.

There is no requirement of extra human power for operating valves manually. Due to this human errors can be reduced and operating valves at timely can be achieved using PLC.

7. Future scope :

- 1) In addition to water supply, we can attach water billing machine system to this system. Hence, it is easy for consumers to get their water bills on the spot.
- 2) In industrial environment, we can add water cock damage detectors to prevent water loss.

8. References:

- [1] Mircea Dobriceanu (2008): "SCADA system for monitoring water supply networks", Romania.
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