Automatic Public Water Alerting System and Theft Identification

Mr. G. M. Oorappan[1] Mr. T. Rajesh[2] N. Rahul[3] P. Balaji[4] M. Sridharan[5]
[1,2]Assistant Professor [3,4,5]Student
[1,2,3,4,5]Bannari Amman Institute of Technology, India

Abstract— Now a day's there is a rapid development in urban residential area, whereas in case of water distribution system they are using traditional method, and they won't know the water supply timing and is not atomized. Along with this another problem in the water supply system is that public is using suction pumps to suck the water directly from the home street pipeline. The best way to improve the water distribution system is by using industrial PLC and computer system, which includes all network components like flow sensor, pressure sensor GSM modules, pH sensor etc. The water theft can be best monitored by the pressure variations given by the sensors mounted on the channels. Then the signal is automatically send to control valve for closing the pipe and it also send to government for identifying the theft place. The system includes Remote Terminal Units (RTU), flow transducers and actuators distributed on a wide geographical area, control and power panels for the pump stations etc. The process is controlled by three methods PLC, SCADA, OPC. If any one method get failed then other two methods able to control the process.

Key words: Analysis, Data Acquisition, Monitoring, PLC, SCADA, RTU, Theft Detection, GSM modules

I. INTRODUCTION

In urban infrastructure with the continuous economic growth, the water demand of enterprises is also increasing. The water wastage is due to many reasons such as leakages, mankind laziness, operator error etc. There is also problem of irregularity of water supply. The water supply can be control by using PLC to reduce wastage of water. The monitoring of water resource for these enterprises can prevent the occurrence of stealing water and leaking water effectively. Therefore, the monitoring system of urban water supply has aroused extensive attention in recent years. Urban water supply networks form the link between drinking water supply and drinking water consumers. The water distribution supply systems are crucial part, therefore system must assure the continuity of the water supply distribution, the water quality control, monitoring and control of the technological process parameters, and water theft identification and deal with the restrictions imposed by the water availability, hydrological conditions, the storage capacity of the tanks and water towers and the increasing diversity of water use. The system includes pumping stations, filtering/chemical treatment utilities, storage tanks and towers, the piping distribution network and the central dispatching unit. The complete SCADA system structure includes one or more central PC mainstation that communicates with more PLC's implemented into the pumping stations or RTUs located in control panels throughout the network (pressure and flow measurement or valves remote control). The PLC's handle the direct control of the technological process whereas the central dispatching unit user interface- HMI, the treatment of data is implemented by the central PC station. The reducing of the operating costs and the decrease of the technological water losses is now possible by the implementation of an intelligent control system which offers the support for the optimization of the functional exploitation strategy and the optimization of equipment use. The global online supervision of the water distribution network is realized by the central dispatching operator as well as the remote control of the actuators installed into the most important points of the system. According to the requirements of the water flow condition, the pressure and flow transducers are installed in booster stations or measuring points throughout the network. These electronic devices are connected to the RTUs which transmit the data to the central dispatching station in order to offer the possibility to monitor the system dynamic behavior. The RTUs provide the data acquisition from different sensors and transducers (specific for water pressure, flow, level or chemical components concentration) by the digital and analog modules, insure the preliminary signal treatment and wireless data communication to the dispatching unit. The SCADA system implemented to the central dispatching unit manages the data communication with all the RTUs and PLCs, stores the received data from the measuring point and from the pumping stations and offer to the operator advanced analysis functions as well as the remote control of the main technological parameters.

II. OBJECTIVE

To alerting the water supply time to people and indicating the water theft by people to government using GSM module, PLC, SCADA, OPC.

III. PROBLEM IDENTIFIED

There is no automation plays in this system then also officials won't inform people before the water supplying to the street cause lack of awareness in water distribution process.

And officials don't know who take excess water then others by using pumps. In order to avoid such a problem in this proposed project we are developing control system using PLC and SCADA.

IV. APPROACH

- This system consist of flow transmitter and rotameter for finding the fluid flow rate.
- We use straight line equation for calibrate the flow transmitter output reading (mA) from rotameter reading (LPH).
- Then pH value of water could be find out by using pH water sensor.
- GSM module used to send SMS to people for finding water arrival timing.
- plc, scada, opc controllers will make control action for this system.

V. EXISTING SYSTEM

The water wastage is due to many reasons such as leakages, mankind laziness, operator error etc. There is also problem of irregularity of water supply i.e. he schedule of water supply is not fixed. Now-a-days, water storage and distribution system, monitoring temperature, pressure and for every stage for measuring and analyzing. We can't able to identify the theft in urban drinking water supply. Water flow control is impossible. The water supply systems are part of the urban infrastructure which must assure the continuity of the water distribution, the water quality control and the monitoring. In existing system, urban water is supplied to the home with the help of some man power. The person in charge will go to the place and then open the valve to that particular area. Once the time is over the person will go again to that place and close the valve. This type of operation needs man power. This is waste of time to go to that place and comeback often. Also the people may take excess water for their personal use with the help of motor or some other equipment. Due to this many people will not receive sufficient water for their use. Water is the basic needs of the humans. The theft can be prevented only when any public inform the officials about the theft. But the possibility of public is informing to higher officers are rare.

VI. PUMPING STATION AND DISTRIBUTION SYSTEM

This system has three different sensors. It used for tank level detection; one is at bottom of tank, second will be positioned at middle position of tank and third will be kept at the top of tank. If water level detector detects a level at low or mid-level, PLC will turn on pump station motor. We consider water supply department has two motors in pump station, one is for regular use and another is for emergency purpose. Using developed system both the motors will be included in the system and controlled as per need using PLC. Current status of the entire sensor will be displayed on PC. GUI has been designed by SCADA software. The optimization module facilitates the move to the preventive or predictive exploitation of the water resources and storage capacities based on intelligent control algorithms. They represent the support for electrical energy cost optimization by real time monitoring the pumping schedule and the on/off electric drive transient load reducing, maintenance planning based on the functional wear and loading. The technological equipment installed in the pumping stations are controlled by a PLC based equipment which sense all the parameters (pressure, flow, reservoirs water level, free and residual chlorine , pH) and the electrical parameters for all the electric drives.

The pumping functioning module implemented in the PLC includes a schedule optimization tool based on the following criteria:

- The hourly electrical energy tariffs,
- The water demand dynamic and constraints, inflows,
- Statistical records regarding the water demand.

Conventional water distribution system comprises mechanical valves to distribute water. Since process is controlled manually, it requires more time and man power, with significant amount of wastage of water. Solenoid controlled valves will be incorporated to avoid wastage of water. Selection of solenoid valve depends upon size of water supply pipe and pressure of the water.

VII. PROPOSED SYSTEM

The proposed automated urban water supply system consists of plc and scada system, and level sensors pressure transmitter, proximity sensors for water theft detection, smoke detector, pumping system and electronics valve. Programmable logic controller is the heart of automated water supply system. plc has been help in controlling pump station motor contactors, motor. plc programming is done using ladder diagram language. Ladder diagram is specialized schematic language commonly used to document industrial control logic systems. The real time data displayed on SCADA.

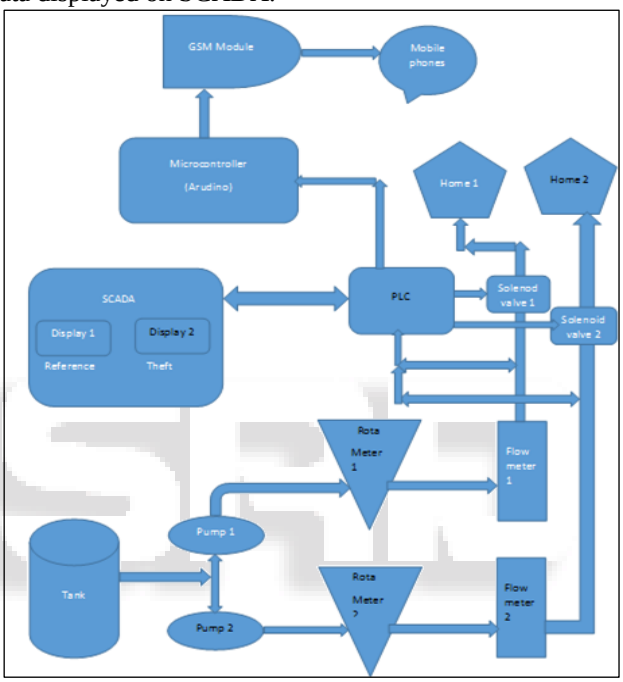

Fig. 1: Block Diagram

A. *Hardware Specifications*

1) Power supply:

This can be built into the plc or be an external unit. common voltage levels required by the plc are 24vdc , 120vac, 220vac.

2) Control valve:

- Type:10.33/A4.35
- Spring Range:0.2-1 kg
- Max.Pressure:35 psi

3) Valve positioner:

- Supply:1.5 kg/cm2
- signal:20 psi

4) Rotameter:

- flow rate:0-600lph

5) Flow transmitter:

- Max.pressure:15 psi
- Output pressure:3-15 psi

6) Reservoir Tank:

- height:60cm
- Shape: rectangular

7) Pump:
- RPM:2780
- Power:370W/0.5hp
- Voltage:230V

8) Solenoid valve:
- Volts:220V
- Pipe Size:3/4”

9) GSM Module:
- SIM900 Quad-band GSM
- Input Voltage : 5V to 12V DC

10) Arduino Uno:
- 6 analog inputs
- 16 MHz quartz crystal
- Operating Voltage: 5V.
- Digital I/O Pins: 14 (of which 6 provide PWM output)

B. Scada Script

```
IF switch == 1 THEN pump = 1;ENDIF;
IF switch == 0 THEN pump = 0;ENDIF;
IF pump == 1 AND r1&lt;=1500 THEN
r1 = r1 + 10;
ft=(r1*16/1500)+4;
ENDIF;
IF pump == 1 AND r1&gt;1500 THEN
r1 = 1500;
ft=(r1*16/1500)+4;
ENDIF;
IF pump == 0 AND r1&gt;0 THEN
r1 = r1 - 100;
ft=(r1*16/1500)+4;
ENDIF;
```

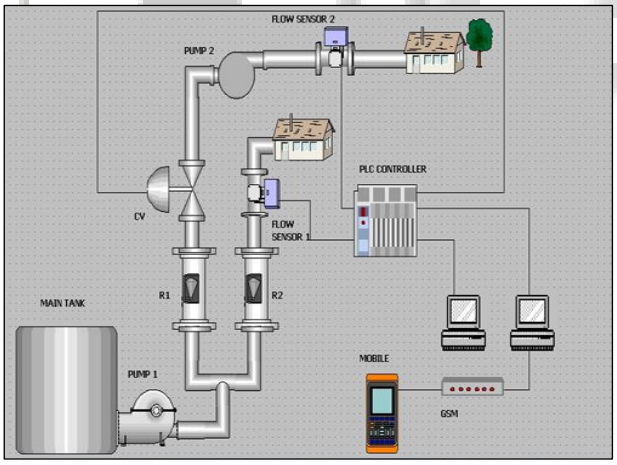

Fig. 2: Scada View

VIII. CONCLUSION

The automated system implemented into the water distribution network insures the update of the refurbished water supply urban utilities; it offers new ways of monitoring and optimized exploitation of the water resources and technological equipment. The informatics SCADA system by its wide geographical area distributed intelligent components allows. The overall supervision and remote control of all the water network equipment and the management of the water flow according to the users demand, the available water volume related with the reservoirs level and capacities including correction determined by the pressure in the key points of the network, Measurement data reliability by the global monitoring of the network in the central dispatching unit, Continuity of the water distribution and protection of the water quality; decrease of the water resources losses; water leakages detection done by the online consumption monitoring or pressure drop, The real time operator alarm information triggered by any equipment failure in the distribution system.

REFERENCE

[1] Gouthaman.J, Bharathwajanprabhu.R & Srikanth.A, “Automated urban drinking water supply control and water theft identification system”, Proceeding of the 2011 IEEE Students' Technology Symposium 14-16 January, 2011, IIT Kharagpur.
[2] Stancil, Stoian, and kovacs “Urban water supply distributed system”, Vol.3, pp.316-321, May.2008.
[3] G. Badea, “Instalatii sanitare”, Editura RISOPRINT, Cluj Napoca, vol.5, pp-38-56, 2005.
[4] G. Badea, “Instalatii de aliment are cu apa, canalizare, sanitare si de gaze”, Litografia Universitatii Tehnice, Cluj Napoca, pp-62-104, 1982.
[5] ProMinent Group, “Process Overview Water Supply”,vol.1,pp.26-43,2007.
[6] Westermo Handbook 5.0, “Industrial data communication theoretical and general application “,pp 64-9

