ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

Synchronization of Six Elevated Service Reservoir Using PLC and SCADA

Priya Patil[1], Pradnya Mhetre[2], Gayatri Patil[3], Seema Deoghare[4]

UG Student, Dept. of E&TC Engineering, PCCOE, Pune, Maharashtra, India [1,2,3]

A.P. Dept. of E&TC Engineering, PCCOE, Pune, Maharashtra, India [4]

ABSTRACT: Water is one of the primary needs of human beings. Although we can survive without food but we can't survive without water. The water that we drink must be clean and healthy. Along with clean water sufficient quantity of water must be distributed to everyone. It is primary duty of urban local body (ULB) to supply 135 LPCD(litre per capita per day) to every citizen. In this system we are synchronizing six ESRs (Elevated Service Reservoir) with main tank at Krishnanagar (Pune). The synchronization of ESRs and monitoring of Flow and Level are to be taken by using PLC(Programmable Logic Controller). The status of these actions are monitored by SCADA system at water treatment plant at Nigdi(Pune).

KEYWORDS: ESRs, PLC, Flow meter, Level sensors and SCADA

I.INTRODUCTION

Water distribution to citizens of Pimpri Chinchwad is done at water treatment plant, Nigdi. The water treatment plant performs five actions on water before distributing it to the citizens. Those five actions are Aeration, coagulation, sedimentation, filtering and chlorination. The water purified using these actions is distributed to ESRs of various areas. The ESRs (Elevated Service Reservoir) is huge storage tank. The ESRs are more reliable storage structures than GLRs(Ground Level Reservoir) as they maintain supply even in the event of pump breakdown. They allow simple control of operation of pumps in filling the tank.

In this proposed system, purified water from water treatment plant is supplied to ESR of Krishnanagar .the area covering is considered for the system.Thus six ESRs depending upon the population the bench mark is fixed. Water from ESR of Krishnanagar is further distributed to various ESRs. Among these six ESRs, two are at Neharunagar, two are at Ajmera , one at Kasarwadi and one at Swapnanagar .In earlier system , all valves were operated manually due to which there was leakage of water which lead to improper distribution of water. To overcome this problem, synchronization of all these six ESRs is done with ESR at Krishnanagar.

II.LITERATURE SURVEY

During literature we came across different papers. We referred the 'Synchronization of ESRs with main line using PLC and SCADA',IJETAE Paper by Pooja Dhandare, Pooja Moharir, A.A.Shinde.In this paper they mentioned about automation of existing system using PLC.
We also referred 'PLC and SCADA based automation of ESR',IMPACT Journals'paper by Pratik Gadkari, Sumeet Kulkarni and Santosh Rajgade. This paper gives idea about monitoring and controlling of water distribution system.
Also studied the paper 'Automation –The key to water management',Indepth Instrumentation and process control. We studied components of the system like ultrasonic level sensor and electromagnetic flow meter.

At Water Treatment Plant Synchronization of three elevated service reservoir is already implemented and we are referring that system in our proposed system. The valves were operated manually .Hence we upgraded that system using programmable logic controller.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

III.BLOCK DIAGRAM

The block diagram of the system is as shown in figure 1.It gives the idea of the synchronization of system. Flow meter take the reading of flow of water. and level of water is also detects by ultrasonic level sensor. In this system, ultrasonic level sensor is used because , basically ultrasonic level sensor is used where physical contact is not possible. This information is given to PLC and according to the set bench mark output signal is given to control valve from PLC and hence synchronization is done. Data from PLC is given to SCADA system via GPRS. The block diagram of the system as follows:

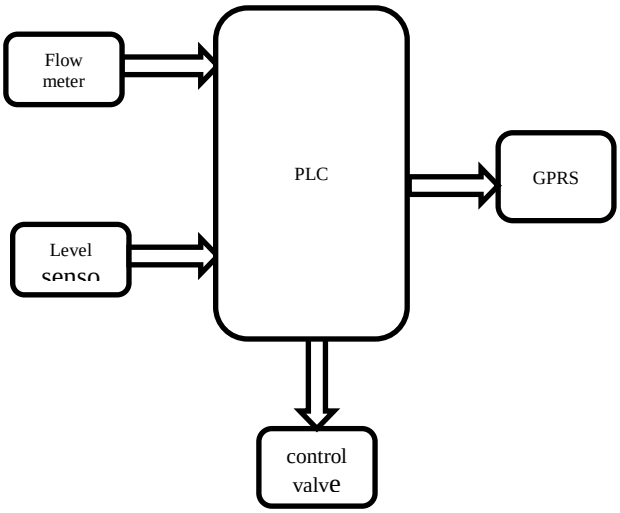


Fig. 1 Block Diagram of the system.

1. Flow Meter: Flow of water is measured using flow meter manufactured by Krohne Marshall which is electromagnetic flow meter. Flow of water is measured.
2. Level Sensor: In this system ultrasonic level sensor (SBEM) is used. Ultrasonic level sensor is basically used where physical contact is not possible.
3. PLC: It is the heart of the system. It controls the overall operations of the system. MESSUNG is a manufactures of world class PLC's indigenously. Use of PLC's are stressed for the following reasons:
    a. Service availability is excellence
    b. Maintenance required is less.
    c. Spare part cost is less and readily available.

IV. FUNCTIONAL DIAGRAM

The functional diagram of the system is as shown in figure 2. It gives the idea of location of synchronization of all ESRs with main ESR. This diagram consists of location of all six ESRs and main sump also. In this ,1st and 2nd ESRs are at Ajmera .3rd ESR is at Swapanagar. 4th and 5th are located at Neharunagar, While 6th is at Kasarwadi. F is the Flow meter installed at outlet of Krishananagar ESR.

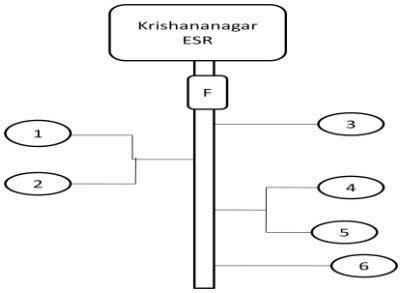


Fig 2. Functional Diagram

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

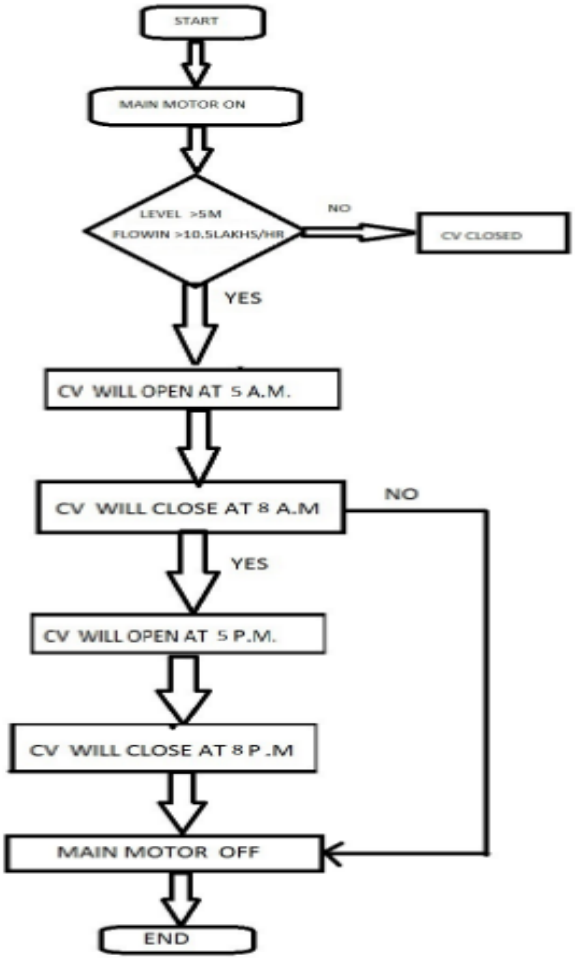
(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

V. FLOW CHART

The flow chart describes how the flow of synchronization of ESRs is done. This also indicate the working of control valve and timing at which ESR will filled. In this flowchart ,condition of both flow and level of water are mentioned . and accordingly motor will be on and off. Flow chart is as shown in figure.

FLOW CHART DESCRIPTION**:** Initially after START the decision for mode selection is made. Then motor will be on. Now it will check for the condition of both flow as well as for level. If both conditions get satisfied then only control valve will be on otherwise control valve will be closed until both conditions get satisfied. Once both conditions get satisfied then control valve will be open at 5 am. And will be close at 8 am if control valve is close at 8 am then again it will open at 5 pm and will be close at 8 pm .then motor will be off.



VI.RESULTS

In this system monitoring of flow and level is done and analysis is as shown in figures.

A. Graph of flow meter readings is shown in fig 4.
B. This shows that flow of water of all six ESRs of different location are synchronized with main sump at Krishnanagar.
C. Thus earlier problem of improper distribution of water is avoided and citizen satisfaction is achieved.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

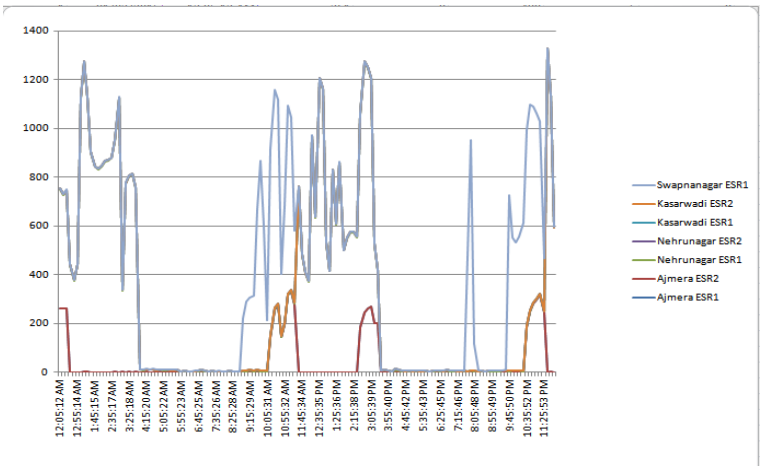


Fig 4. Graph of flow of water

D. Graph of level sensor readings is shown in fig 5.
This shows that level of water of all six ESRs are synchronized with main feeder sump.

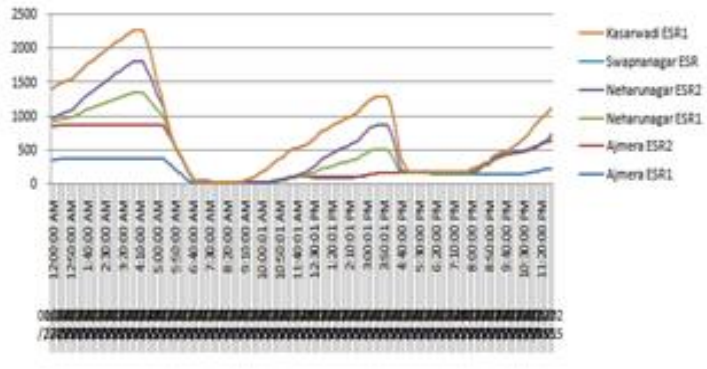


Fig 5.Graph of level of water

VII.CONCLUSION

We have implemented the automation of water distribution system using PLC and results are visualized on SCADA system. The problems of earlier system like leakage of water and improper distribution are overcome. In this system we have set the bench marks of flow and level and accordingly water is distributed making the system more efficient.

REFERENCES

[1]Pratik Gadkari,Sumeet Kulkarni,Santosh Rajgade, "PLC AND BASED AUTOMATION OF ELEVATEDSERVICE RESERVOIR",IMPACT:International Journal of Research In Engineering And Technology", Volume 2,Issue 4,April 2014,137-14
[2] Philip L.Skousen,Valve Handbook,2nd edition,Mc Graw Hill Handbook,ISBN 0-07-143773-8
[3] Stuart A.Boyer, "SCADA Supervisory Control Data Acquistion",ISA ,4th edition, ISBN 978—1-936007-09-7.
[4] THOMAS a.Hughes,Programmable Controllers,2nd edition,ISA,ISBN 1-55617-610-4
[5] Pooja Dhandare,Pooja Moharir,A.A.Shinde,'Synchronization of ESRs with main line using PLC and SCADA', International Journal of Emerging Technology And Advanced Engineering(IJETAE),Volume 4,Issue 4, April 2014,ISSN 2250-2459