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 Volume 8, Special Issue 1, March 2019

A Two Days National Conference on Emerging Trends in Electronic and Instrumentation Engineering (NCETEIE 19)

12th & 13th March 2k19

Organized by

Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

Borewell Management for Maintaining Eco-System

S. Sujatha[1], B .Balaji[2], M.Ajithkumar[2]

Head of Department, Department of EIE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India [1]

UG Student, Department of EIE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India [2]

ABSRTACT: In India, demand for water has increased due to population growth and the competition induced by economic aspirations for development activities. Despite abundant rainfall, a few crucial issues for the water crisis are unregulated water extraction, worsening water quality, inefficient management and implementation of the regulations, lack of an ethical framework, and so on. Over 70% of the surface water is polluted and is unsafe for drinking and farming.Deep drilling of bore well will heat the earth. It willmake the evaporation level of earth will be very high. It will directly affect farming. So water source should be used in the limited level. This paper proposes, the development of bore well management system based on supervisory control and data acquisition (SCADA) and programmable logic control (PLC) with water level measurement based on ultrasonic level sensing.

KEYWORDS: Level sensor, SCADA,PLC, borewellmonitoring.

I.INTRODUCTION

Groundwater is water that is found below the surface of the earth in the small cracks and spaces found in the rocks and sand underground. Groundwater originally comesfrom rain that has soaked into the ground over large areas, and is stored underground like a large sponge filled with water. Naturally, springs are found where this underground water overflows onto the surface of the earth. Boreholes are holes drilled deep into the rock formations below the earth's surface. By using a pump installed inside a borehole, water can be pumped from this underground sponge for people to use as shown in figure 1.1[8].

With the current awareness and concern over the environment there are increasing demands for the monitoring and control of the planets water. One of the most common methods is by the use of deep wells drilled into aquifers. Some of these may be many thousands of feet below the apparent although most are only a few hundred feet. Such wells can be purely for water checking or considered as production, where water is pumped out for human or Industrial consumption. The level measurement can lead to valuable information regarding the capabilities of the well, changes in gradients or flow direction and the aquifer condition. The cost to instrument a well can vary from a few thousand to tens of thousands of dollars depending on the measurements required. The initial cost of actually drilling the well is one thing but installing and extracting the instrumentation remains an additional cost often requiring special equipment. Therefore the ease of changing measuring instruments is important but long term reliability is even more so [10].

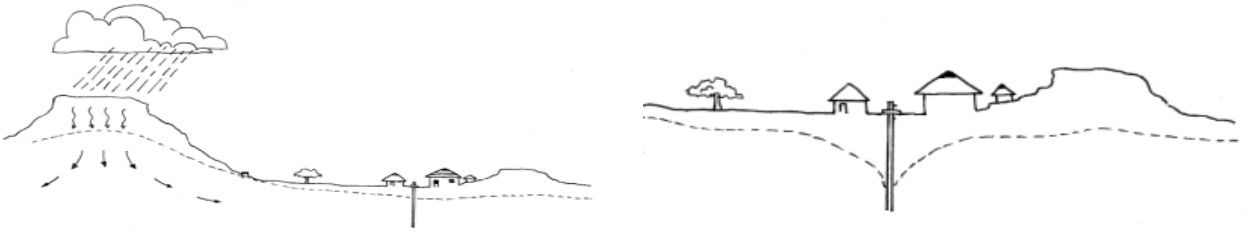

Fig.1.1 Groundwater levels before and during pumping

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 Volume 8, Special Issue 1, March 2019

A Two Days National Conference on Emerging Trends in Electronic and Instrumentation Engineering (NCETEIE 19)

12th & 13th March 2k19

Organized by

Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

We monitor groundwater by recording how much water we have used and by recording the level of the water under the ground. The purpose of monitoring groundwater is to be able to know how much water is available for use and if it is suitable for drinking[8].

The objective of the Modular Borehole Monitoring (MBM) Program was to develop a robust suite of well-based tools optimized for subsurface monitoring of CO_2 that could meet the needs of a comprehensive well-based monitoring program. It should have enough flexibility to be easily reconfigured for various reservoir geometries and geologies. The MBM Program sought to provide storage operators with a turn-key fully engineered design that incorporated key technologies, function over the decades long time-span necessary for post-closure reservoir monitoring, and meet industry acceptable risk profiles for deep-well installations[9]. In this paper, SCADA based bore well management system is designed. PLC will be used to control the monitoring process of water level and pumping time. The water level measurement is done through ultrasonic sensors.
The second chapter of this paper describes the Bore –well monitoring system. The third chapter deals with implementation scheme of monitoring system. The fourth chapter discusses the result and fifth chapter says about conclusion.

II. BORE –WELL MONITORING SYSTEM

The main concept for this paper is to protect the ground water level, and to stop over usage of bore well. The proposed method of having is designing a centralized bore-well water management governing system as shown in figure 2.1.This system would govern the usage and need of water for the specific area and it provides accordingly. So in this project,it is devised that, the user are into two types as Residence and agricultural. Hence, it proposes to calculate number of people for the specific residencies and Acre of land for agriculture.
Based on the availability of ground water and requirement, the governing system will provide the water supply. When water level goes beyond the deep level, treeswill dry, because of the evaporation effect. Sothis proposed system have the check point as that, the water supply will not occur if the water level decreases to certain level. This would ensure the ground water level management based on places and crust layer qualityand also would save from evaporation. Based on the data's of the population strength, farming requirement andavailability of ground water, the control system will give the signal for the pump to supply water. And secondary main concept of this paper is avoiding evaporation,which bring Saline to water cause and drought.

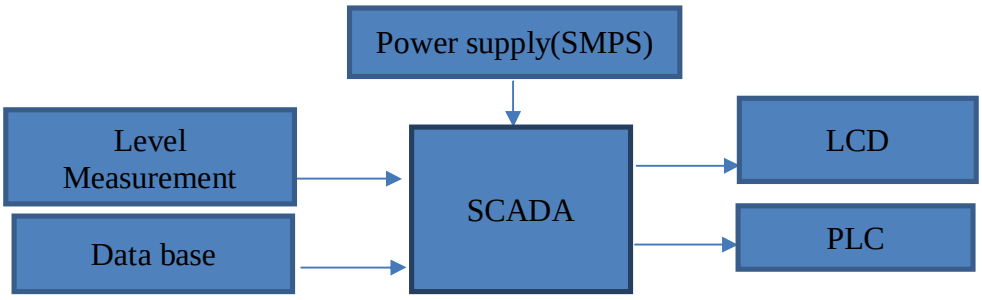

Fig 2.1 Block diagram of Bore-well Monitoring system

III. DESIGN OF BORE-WELL GOVERNING SYSTEM

In this paper, the governing system is designed by using SCADA through PLC as shown in figure 3.1. The level measurement is done through ultrasonic sensor.

Here the SCADA –KEPServerEX is used for monitoring system design. It is more than an OPC server—it's a connectivity platform for industrial automation and IoT. The Kepware's library supports more than 150 device drivers, client drivers, and advanced plug-ins to fit the communication requirements unique to the industrial control system. A suite is aassemblage of drivers and advanced plug-ins for KEPServerEX. These products have been bundled into suites

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 Volume 8, Special Issue 1, March 2019

A Two Days National Conference on Emerging Trends in Electronic and Instrumentation Engineering (NCETEIE 19)

12th & 13th March 2k19

Organized by

Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

by vertical industry, device manufacturer, or industrial application for the convenience of thecustomersaccess with safely and secure.

In this paper, Delta's DVP PLC is used for directing the pumping action. Programmable logic controller is a governor system using electronic operations. It is easy storing procedures, handy extending principles, functions of sequential/position control, timed counting and input/output control are widely applied to the field of industrial automation control.

Delta's DVP series programmable logic controllers offer high-speed, steady and highly reliable applications in all kinds of industrial automation machines. In adding to fast logic operation, bountiful commands and multiple function cards, the cost-effective DVP-PLC also supports various communication protocols, connecting Delta's AC motor drive, servo, human machine interface and temperature checker through the industrial network in to a complete "Delta Solution" for all users.

Ultrasonic sensors work by transfer sound waves that echo off of a target and return to the transmitter. The term ultrasonic means above social hearing, or any sound wave above 20 kHz. This method is quite accurate. Because the speed of sound is a continuous, under fixed atmospheric conditions, the time from the sound burst to the return is measured and translated into a distance. The sensor’s microprocessor analyzes the distance and converts it to a level indication, volume measurement, or a rate of flow. It also compensates for temperature, and filters the signal.

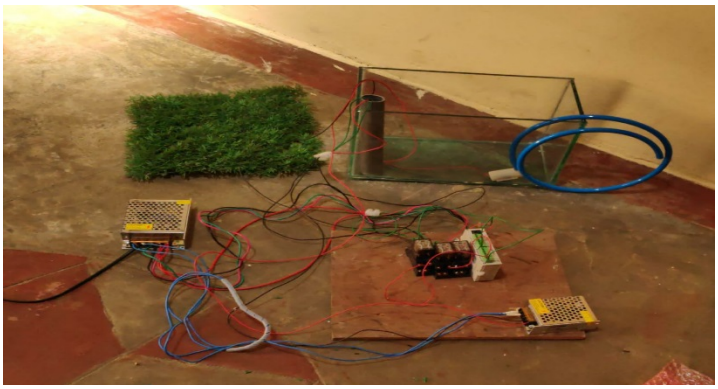

Fig 3.1 Bore -well management system (Hardware prototype)

IV. RESULT AND DISCUSSIONS

The hardware kit which is designed for the purpose of bore well management will give level measurement. The SCADA monitoring system is developed for a small area as shown in Fig 4.1 and 4.2. The data base is created based on the population count and the usage of individual. From this, the water requirement is measured and the availability of ground water is taken from the level sensor.

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 *Volume 8, Special Issue 1, March 2019*

A Two Days National Conference on Emerging Trends in Electronic and Instrumentation Engineering (NCETEIE 19)

12th & 13th March 2k19

Organized by

Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

Fig 4.1 screenshot SCADA design for residential area

Fig 4.2 screenshot SCADA design for Agricultural

Accordingly the pump should be ON of OFF. The time measurement and controlling of the pumping will be programmed in PLC as shown in Fig 4.3.

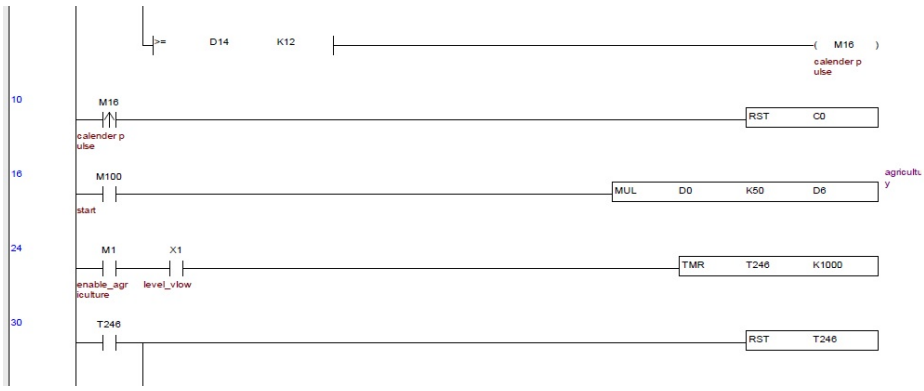

Fig 4.2 screenshot of part of PLC program

Thus successfully designed an IIOT based system, which can provide the access to the ground water based on requirement and ground water level. This system enhances the assurance for maintaining ground water level with the supply to the agriculture / residence water supply. Also it holds the database for supply. This system is now ready to install and tested successfully.

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 *Volume 8, Special Issue 1, March 2019*

A Two Days National Conference on Emerging Trends in Electronic and Instrumentation Engineering (NCETEIE 19)

12th & 13th March 2k19

Organized by

Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

V. CONCLUSION

When we compare the data's around 20% as a average water supply is saved. This shows that our method of implementation is successful method to save the ground water supply. There are various methods taken by various organizations, but this method what we proposed will be quite effective, transparent system to be in place, can be easily connected to any centralized data logger, secure and safe management of personal data due to usage of OPC.

REFERENCES

[1] C.J. Taylor and W. M. Alley, "Ground-Water-Level Monitoring and the importance of Long-Term Water-Level Data," *U.S. GeologicalSurvey Circular* 1217, 2001.
[2] W.B. Solley and R. R. Pierce, "Estimated use of water in the United States in 1995," *U.S. Geological Survey Circular* 1200, p. 71, 1998.
[3] J.A. Butterworth, R. E. Schulze, L. P. Simmonds, P. Moriarty, and F. Mugabe, "Long-Term Groundwater Level Fluctuations Due to Variation in Rainfall," *Hydrology and Earth SystemSciences* 3(3), 1999.
[4] Prevedel, B., Wohlgemuth, L., Henninges, J., Krüger, K., Norden, B., Förster, A., CO2SINK Drilling Group. 2008: The CO2SINK boreholes for geological storage testing. Scientific Drilling 2008, No. 6, p. 32-37.
[5] Al-Omair, A., Ukaegbu, O.O., Alshafie, M., Shafiq, M., Almarri, A., An innovative multi-reservoir permanent downhole monitoring system through a single well, SPE 126158, 2009.
[6] W.M. Wendland, "Temporal Responses of Surface-Water andGround-Water to Precipitation in Illinois," *Journal of the AmericanWater Resources Association* 37(3), pp. 685-693, 2001.
[7] H.R. Byun and D. A. Wilhite, "Objective Quantification ofDrought Severity and Duration," *Journal of Climate* 12(2), pp.742-2-756, 1999.
[8]. Phillip Ravenscroft and Ricky Murray, "GroundwaterMonitoring forPump Operators", DWAF, March 2004.
[9] Barry Freifeld, Tom Daleya,Paul Cook, Robert Trautz and Kevin Dodds," The Modular Borehole Monitoring Program: a research program tooptimize well-based monitoring for geologic carbon sequestration",Energy Procedia 63, 3500 – 3515,2014
[10]Rob Knowles,"Bore Hole Water Level Monitoring", PMC Engineering LLC,February 2016.