Smart Water Tank Pump Switcher

M.Narendran, R.Sowmya, RVSN Vamsi Krishna, A.Yogendra Reddy, Prachi
SRM Institute of Science and Techniology, Ramapuram Campus, Chennai, Tamil Nadu, India.

Abstract – In this paper we present the idea of a smart water tank pump switcher operated with AVR microcontroller Atmega328P-PU, which is the main component required. So, in this way manual intervention is not required for continuous water supply. This system can also be used for any other fluids in chemical industries or factories. The main aim of this project is to provide optimal water distribution and moreover reduce manpower involved in it.

Index Terms – AVR microcontroller Atmega328P-PU, Water Tank, water level sensors, water pumps.

1. INTRODUCTION

The entire earth is covered with lots of water bodies. The earth's surface is covered with water by almost 70%. But maximum of this water available is in the form of oceans and seas. Thus this water cannot be put to use by humans. Fresh water resource on the earth's surface is very limited .it is nearly 2% only. This leads to a huge problem of water shortage and because of this conserving water becomes the most essential aspect. Conserving each and every drop of water becomes very important for the survival of all the species.

We find that due to lack of proper awareness and management of various water systems, most of the fresh water being available goes waste. If we go on wasting the water it might be difficult for the future generations for accomplishing their basic demands and hence to contribute for the conservation of water we should propose new and improved systems of water management and implement them successfully. With this in mind we are trying to create an improved system for water tank management.

By implementing this concept in various residential colonies and in other places where there is a usage of overhead tanks we can minimize the wastage of water .Implementation of this concept will also reduce manual work or human interference which will be easy for everyone .It will be both time and energy saving.

This paper is organized in the following manner. Chapter one gives the introduction of this paper. Chapter two concentrates on the literature survey done. Chapter three concentrates on the basic concepts of system design. Chapter four focuses on design and implementation part. Fifth chapter deals with block diagram and its architecture. Sixth chapter deals with flowchart. The result at which we arrive is discussed in seventh chapter. Eighth and ninth chapter focuses on application area and on conclusion and future work respectively. Tenth chapter of acknowledgement is dedicated to the people and institute.

2. RELATED WORKS

YEAR	TITLE	TECHNIQUE	REMARKS
2010	Microcontroller Based Automated Water Level Sensing and Controlling	Microcontroller chip technology	Furthermore, it can indicate the amount of water in the tank that can support Global Water types including cellular data loggers, satellite data transmission Systems for remote water monitoring system.
2013	Microcontroller based automatic water level control system	Microcontrollers and GSM	An improvement on existing water level controllers by its use of calibrated circuit to indicate the water level and use of DC instead of AC power thereby Eliminating risk of electrocution.
2014	Smart Water Tank Management System for Residential Colonies Using Atmega128A Microcontroller	At mega 128A microcontroller	This system can be implemented using Level sensors which would render an accurate water level and it can be operated using Smart Phones
2015	Smart Water Monitoring System Using Wireless Sensor Network at Home/Office	Wireless Sensor Technology and microcontroller(PID)	to monitoring the water such as water level monitoring, water pollution monitoring and water pipeline leakage monitoring

2015	Android Based Smart Water Pump Controller With Water Level Detection Technique	Android operation system and application interface.	The user can control the pump even on the go, remotely From anywhere.
2015	Smart Water Monitoring System Using Wireless Sensor Network at Home/Office	Wireless Sensor Technology and ZigBee	Using the monitoring system we can easily prevent the water and the water will Be saving to our generation.
2016	A Design and Development of Smart Wireless Sensor Network for Farming Water Supply System	smart wireless technology using microcontroller and ZigBee control	Using this system we can monitor the status of all the sensors (Soil-moisture, Temperature, Water level) and Also the ON/OFF status of the motor and Fan.
2016	Wireless water level controller using ZigBee	ZigBee transceivers, Wireless Sensor Technology	This is one of the motivations for this research, to deploy computing techniques in creating a barrier to wastage in order to not only provide more financial gains and energy saving, but also help the environment and water cycle which in turn ensures that we save water for our future.
2017	Iot and gsm based automatic water pump control	IOT and GSM	The time period required for controlling the water pump from the website is about 15 sec, This time delay can be reduced to fraction of seconds.
2017	IoT based Water Monitoring System: A Review	Arduino Uno, Raspberry Pi and Internet of Things	A challenger in real time monitoring & control system and use to solve all the water related problems.

TABLE 1: LITERATURE SURVEY

3. BASIC CONCEPTS

Our proposed system will have a water tank and a basement water tank. The water tank will have 2 sensors on for low level (L) and the other for high level (H). Use of a magnetic float switch will activate two reed sensors so that the float (with magnet) should terminate its travel in front of L and H reed sensors. When the L sensor triggers its micro controller input the water pump is activated and the STANDBY indicator changes to PUMP ON. When the H level is reached the water pump is deactivated and the STANDBY indicator goes on. Water pump is activated again only when the water level reaches L. The use of LED indicates the on, off and standby status of the pump. A dry run sensor is fitted in the basement water tank to indicate that there is no water in the basement water tank. With the dry run sensor the electric motor is protected as it immediately deactivates the water pump.

4. DESIGNS AND IMPLEMENTATION

For this project we have been using

- AVRmicrocontroller Atmega328P-PU: This micro controller is used for the water level detection with One port in automatic mode and other in manual mode with switch selection. The EEPROM storage option of the micro controller is also being used.
- Water level sensor: It used in overhead tank is a reed switch with two point level for detecting the low level and the high level. The sensor used in the basement water tank is a one point level float switch acting as a dry run protector.
- Power supply unit: This setup will require a DC supply voltages in the range of 9v to 12v,1 amp rated DC power adaptor to energise the system, an on board linear voltage regulator to provide clean DC supply
- Water Tank: Overhead water tank and the basement water tank
- LCD: For displaying on ,off and standby status
- Water pump: For pumping of water into water tank.

5. BLOCK DIAGRAM/ ARCHITECTURE

The block diagram describes the working of the smart water tank pump switcher.

Firstly if there is no water available in the basement water tank the dry run sensor will turn on and the pump will go to the off state. If water is available in the basement water tank then it is pumped into the overhead tank. If there is no sufficient water in the overhead tank indicated by the low level sensor (L) and when the water in the overhead tank reaches the high level (H) the sensor will automatically turn off

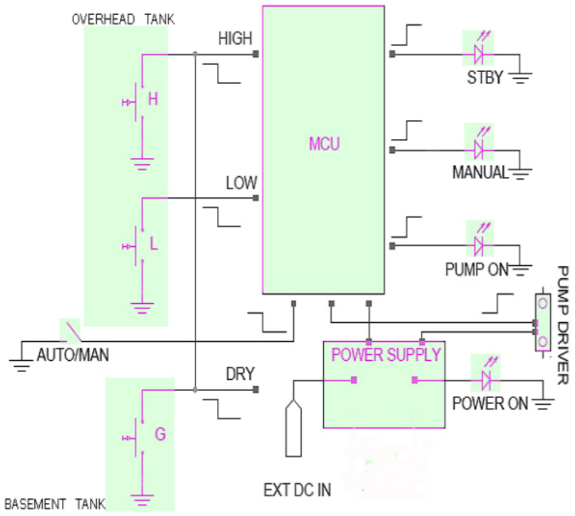

FIGURE 1: BLOCK DIAGRAM

6. FLOW CHART

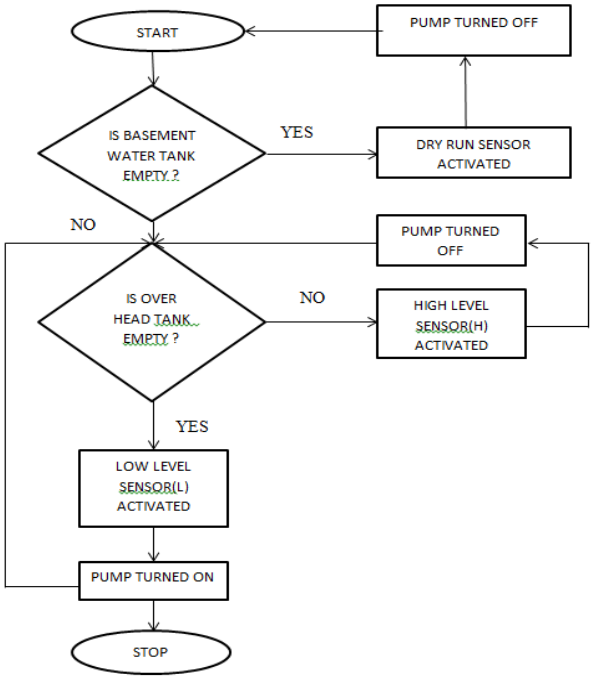

FIGURE 2: FLOWCHART

If there is no water available in the basement water tank the dry run sensor will turn on and the pump will go to the off state. If water is available in the basement water tank then it is pumped into the overhead tank. If there is no sufficient water in the overhead tank indicated by the low level sensor (L) and when the water in the overhead tank reaches the high level (H) the sensor will automatically turn off.

7. RESULTS

Thus, if there is no water available in the basement water tank the dry run sensor will turn on and the pump will go to the off state. If water is available in the basement water tank then it is pumped into the overhead tank. If there is no sufficient water in the overhead tank indicated by the low level sensor (L) and when the water in the overhead tank reaches the high level (H) the sensor will automatically turn off

Thus by referring this paper the implementation of this system can be done very easily. This system can be put to actual use in all the places where there is a use of water tank. By this we can efficiently save the wastage of water and reduce the manual work.

8. APPLICATION AREAS

This system can be very well implemented in residential colonies. It can also be put to use near many industries where large water tanks are to be filled and monitoring of these tanks is a must. It can also be used in nuclear plants where the monitoring the tanks become mandatory.

9. CONCLUSIONS AND FUTURE WORK

Water is a very important resource and it is very important that we save it efficiently so that our future generation can also enjoy its presence. Thus water conservation becomes a very important aspect. Our soul intension of taking up this project is to establish a system by which we can implement and reduce wastage of water. On execution of this system, it will certainly help to reduce water wastage.

This system can be further improvised by using advanced microcontroller .It can also be improvised by connecting the system to your mobile phone and operating the sensors from a remote place by using the mobile phone.

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REFERENCES

[1] Ocampo-Martinez, C.; Puig, V. ; Cembrano, G. ; Quevedo, J. “Application of predictive control strategies to the management of

complex networks in the urban water cycle [Applications of Control] ". IEEE conference on Control Systems, (Volume:33, Issue: 1) Date of Publication:Feb. 2013 Page(s): 15 – 41 ISSN :1066-033X

[2] Verma, S., Prachi, "Wireless Sensor Network application for water quality monitoring in India". Publisher IEEE. National conference on Computing and Communication Systems (NCCCS), 2012 Date of Conference: 21-22 Nov. 2012 Page(s):1-5

[3] M. Javanmard, K.A. Abbas and F. Arvin, "A Microcontroller-Based Monitoring System for Batch Tea Dryer", CCSE Journal of Agricultural Science, Vol. 1, No. 2, December 2009

[4] Lu Xiu-ru; Pang Hong-jie ; Jiao Xiao-song; Cao Ying-qi, "Innovation and Development on Scientific Management of Water Resources". Publisher IEEE. International Conference on Management and Service Science (MASS), 2010. Date of Conference:24-26 Aug. 2010 Page(s):1-4.E-ISBN: 978-1-4244-5326-9

[5] S. M. Khaled Reza, Shah Ahsanuzzaman Md. Tariq, S.M. Mohsin Reza. "Microcontroller Based Automated Water Level Sensing and Controlling: Design and Implementation Issue" . Proceedings of the World Congress on Engineering and Computer Science 2010 Vol I WCECS 2010, October 20-22, 2010, San Francisco, USA

[6] Xu Jian-Hua; Luo A-Ling "Research on Water Resources Automatic Monitoring and Management System". Publisher IEEE. Fourth International Conference on Computational and Information Sciences (ICCIS), 2012 Date of Conference: 17-19 Aug. 2012 Page(s): 1135 – 1138

[7] Hu Likun; Li Guangping ; Huang Wenqin "Level Control System of Double-Hold Water Tank Based on Inverse System Method and PID". Publisher IEEE. 2nd International Conference on Intelligent Human-Machine Systems and Cybernetics (IHMSC), 2010 (Vol:2), Page(s):129-132, 26-28 Aug. 2010

[8] Jiang Wei, "Intelligent Building Control of Water Tank Based on Fuzzy Theory". Publisher IEEE International Conference on Intelligent Computation Technology and Automation (ICICTA), 2010 (Volume:2) Date of Conference: 11-12 May 2010. Page(s): 549 – 552. E-ISBN : 978-1-4244-7280-2

[9] Russin, E. ;Beaumariage, D. ; Deibel, L.E. ; Zumwalt, B., "A technical development plan for a next generation water level measurement system". Publisher IEEE. OCEANS '85 – Conference on Ocean Engineering and the Environment Date of Conference:12-14 Nov. 1985. Page(s): 242 – 252.

[10] S.Venkatlakshmi,S.Vivekanandhan, S.Revathi, E.M.Shakthi Arul, C.Paramasivam, "Industrial Process Management Using LabVIEW ". IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e- ISSN: 2278- 2834,p- ISSN: 2278-8735. Volume 5, Issue 6 (Mar. - Apr. 2013), PP 46-56.

[11] Rao, H.S. "Modeling of water distribution systems". IEEE Conference on Decision and Control including the 16th Symposium on Adaptive Processes and A Special Symposium on Fuzzy Set Theory and Applications, 1977 .(Volume:16) Date of Conference Dec. 1977 Page(s): 653 - 658

[12] Jervis, M.W. "Control and instrumentation of large nuclear power stations a review of future trends". IET Physical Science, Measurement and Instrumentation, Management and Education - Reviews, IEE Proceedings A (Volume:131 , Issue: 7) Date of Publication: September 1984 Page(s): 481 - 515 ISSN :0143-702X

[13] Harminder Kaur, Ravinder Singh Sawhney, Navita Komal, "Wireless Sensor gNetworks for Disaster Management". International Journal of Advanced Research in Computer Engineering & Technology Volume 1, Issue 5, July 2012

[14] Thenkabail, P.S., "Improving Water Productivity for Agriculture - Predicting and Preventing Crisis in Irrigated Water Use in a Changing Climate". Publisher IEEE Global Humanitarian Technology Conference (GHTC), 2011 Date of Conference: Oct. 30 2011-Nov. 1 2011 Page(s): 176

[15] Tahat, A. ;Abukhalaf, M. ; Elmuhesen, O. "Solar energy water heater remote monitoring and control system". Publisher IEEE International Conference on Electronic Devices, Systems and Applications (ICEDSA), 2011. Date of Conference: 25-27 April 2011 Page(s): 98 – 103 ISSN : 2159-2047