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Semi-Automated Maintenance System for Cylindrical Water Tank

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ABSTRACT: Water is one of the most important elements in our life. So, we must get proper way to get a clean water for our self and for the society. In the present time, most of us use Cylindrical Over Head Water Tank. We are installing the tank and filling the tank with bore well water and use it for longer time. As days pass by we simply forget about the quality of water, coming from the tank. Due to the deposition of salt, dirt and other particles in the water tank, many problems will start one by one. Here, cleaning and maintenance of water tank become essential, for many reasons. There are also difficulties in cleaning the tank. The objective of this paper is to design, develop and implement about cleaning and maintenance of overhead water tank. By cleaning the tank regularly, we can provide good, quality drinking water and by proper maintenance of water tank, the water distribution pipes can be used for longer time. Maintenance of water tank is an automated sequence of process that involves the usage of water level sensor, electrical solenoid valves, cleaning motor. The whole circuitry is built around a Low Cost Arduino Microcontroller board.

KEYWORDS: Water Quality, Over Head Water Tank, Water Level Sensor, Electrical Solenoid valve, Cleaning Motor, Microcontroller.

I. INTRODUCTION

Bore well water is the main source for feeding the overhead cylindrical water tank. In addition, there are many problems associated with the operation and particularly in the maintenance of water tank, if water is stored in the tank for a longer period. There is a study that indicates 15 to 20% with children and 10 to 12% with adults suffer from skin allergy, hair falling, etc, due to the less quality of water in the tank which caused because of less maintenance of the tank. In addition, poor maintenance leads to blocks and leak in pipe networks [1].

Now-a-days people are taking lot of effort to bring the underground water up-to the overhead tank. However, they give very less importance for maintaining the overhead tank and the content of the water tank is not ensured for the best of its quality. Perhaps, maintenance of water tank can be made with less cost, also an automated process that can extend the lifetime of the filters used in the RO water system, in our houses. [2] Also, the proper maintenance of overhead water tank will lead to good quality of water in the tank, for longer period of time. By proper maintenance of the overhead water tank, the possibility of block and damages in the water distribution pipes due to salt, dirt depositions can be reduced to a greater extent [3]. Every person wishes to use a clean water for himself and his society using a clean water has many advantages for the people.

II. LITERATURE REVIEW

Even though there are lot of research and researcher's contributions were given in the field of Water Tank cleaning/maintenance system, some of the research papers and their methodologies were highlighted. Then our findings in their design/process was given to design our system in a still better way.

A mechanical system was developed to clean the water tank using brushes, rack & pinion arrangement and linkage bar [4], were the cleaning process was said to be effective than the conventional cleaning methods, but the adjustments to be done inside the tank before starting the cleaning process is difficult. Another method was

approached which uses tank using brushes, rack & pinion arrangement, linkage bar and four bar mechanism [5], where the cleaning process was said to be with less man work, but arranging the set-up to start the cleaning the tank is more. Another Cleaning system was proposed for cleaning the storage tanks [6], although the technology is power full and able to clean bigger size water tanks, the method is very expensive. The usage of microcontroller for water cleaning process were proposed for the better reachability, but even then the efficiency was found to be less in the whole cleaning process and also, the human intervention in the cleaning process was found to be more [7-10].

III. OBJECTIVES

The main objective of the project is to design the dirt water rinsing system, which can do the cleaning and rinsing of dirt water in an easier method than the other available methods. The second objective is to design and implement a flushing system, which flushes the dirt water from the tank, at the end of rinsing process. The controller, along with the water level indicator and cleaning process indicator, will control all these process.

IV. HARDWARE ARCHITECTURE

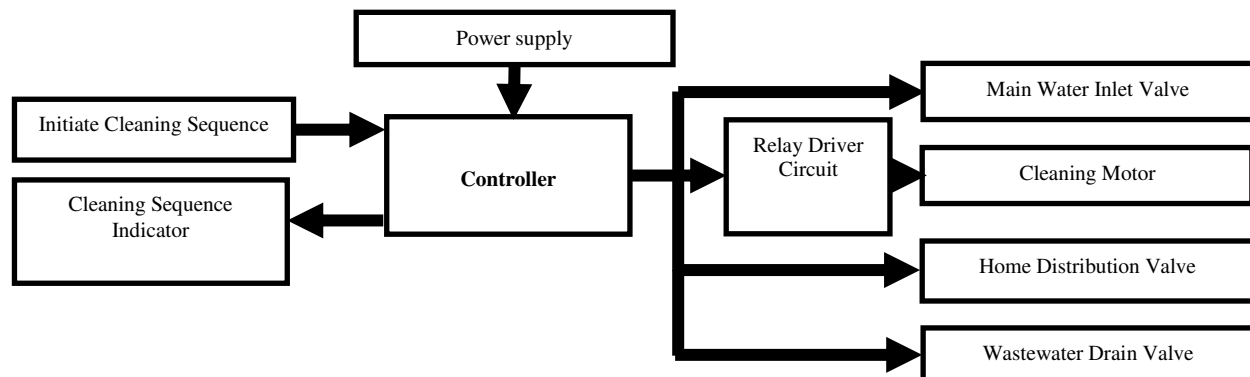


Fig 1 – Block Diagram

The whole sequence of process will be initiated by a signal given to the Arduino board, through a push to ON switch. By receiving this signal, the board will start executing the sequence of process one by one. First the cleaning process will be indicated to the water tank user, by flashing a Light. Second the Home distribution valve will be blocked, to stop the distribution of waste water into the home, during the cleaning process. The main water inlet valve for the tank will also be closed, to reduce the amount of water used for the cleaning process. Third, the cleaning motor will be started through the relay driver circuit. This motor will stir the deposited salt, dirt along with the water. This will make the dirt and salt to mix with the water. Then the waste water drain valve will be opened, to drain out all the waste water. This step will be repeated for one more time and the fresh water will be filled in the tank through main water inlet valve. When the water reaches the maximum level, the main water inlet valve will be closed and home distribution valve will be opened, for the distribution of fresh water into the house. As the last sequence, the cleaning process indicator lamp will be switched OFF.

V. SOFTWARE SIMULATION

The working of the circuit starts with the push to ON switch, for the initiation of cleaning sequence. When the Arduino board receives the initiate command, first the cleaning sequence indicator Lamp will be switch ON, which is connected to pin 9 of Arduino. Then pin 12 and 11 will be made high, to make the main water inlet valve and home distribution valve to close. Then pin 13 will be made high, to start the cleaning motor. After rinsing/stirring the waste water, the waste water drain valve will be opened, through pin 10 of Arduino.

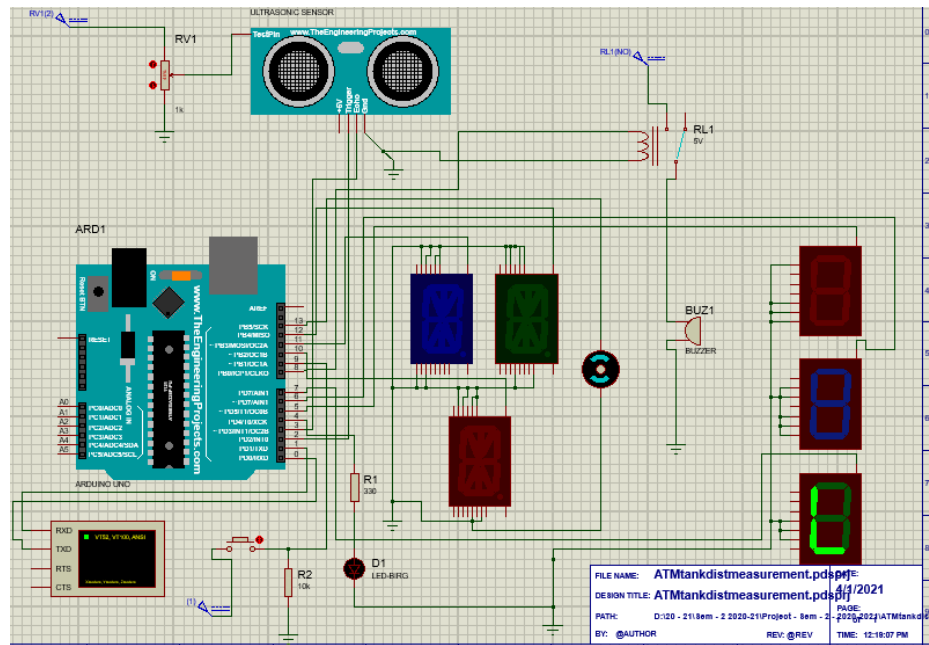


Fig 2 – Simulation Diagram

After another cleaning process, the fresh water will be filled in the tank, after which the water inlet valve will be closed and home distribution valve will be opened for the distribution of fresh water into the house. During the end of cleaning sequence, the indicator lamp will be switched OFF.

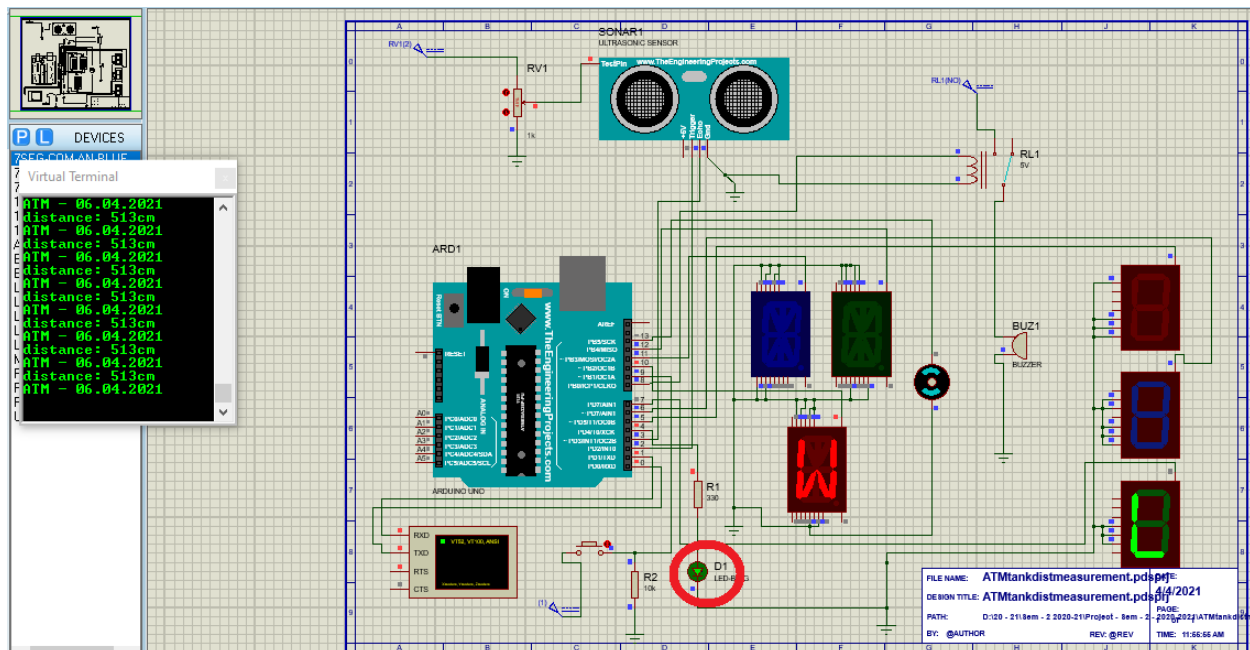


Fig 3 – Checking the project Circuit (After initiating the Cleaning Sequence)

The sequence will start only when the water level is Low in the water tank. Firstly, the home distribution valve will be closed so that no wastewater will come to the home distribution during the cleaning process is going on.

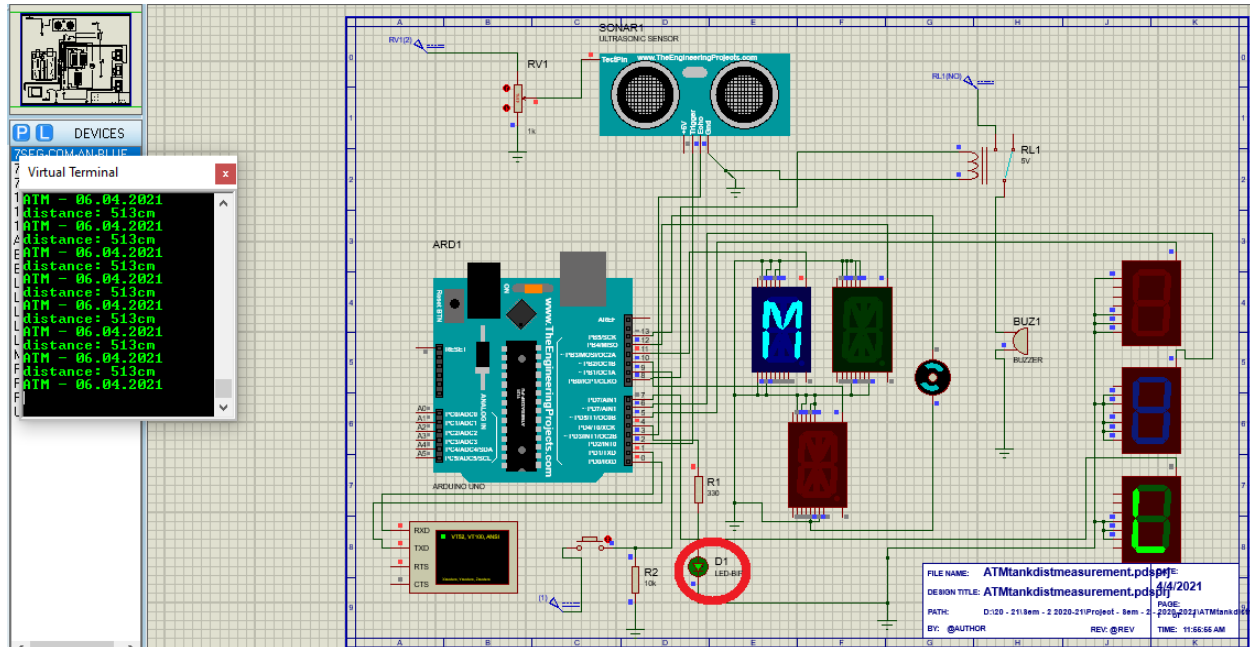


Fig 4 – Checking the project Circuit (After initiating the Cleaning Sequence)

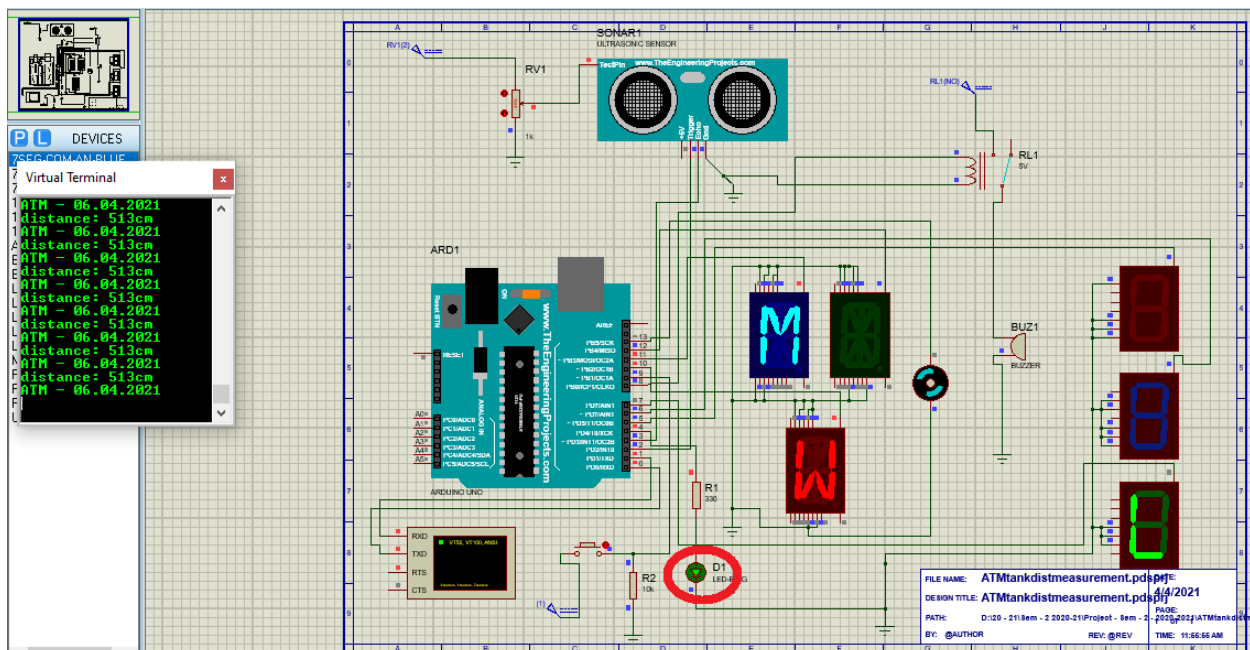


Fig 5 – Checking the project Circuit (After initiating the Cleaning Sequence)

The cleaning motor will start the rinsing process and then the waste water drain valve will be opened to drain the rinsed waste water, then the Water inlet valve will be opened to get new water into the tank for cleaning for the second time.

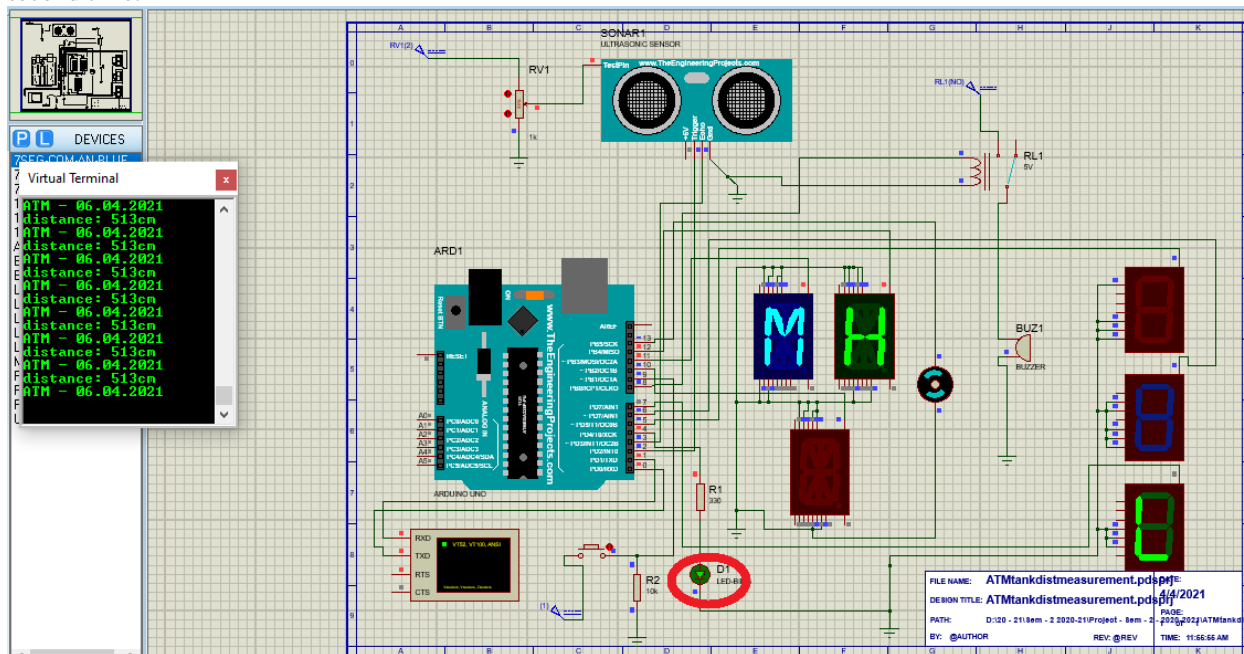


Fig 6 – Checking the project Circuit (After initiating the Cleaning Sequence)

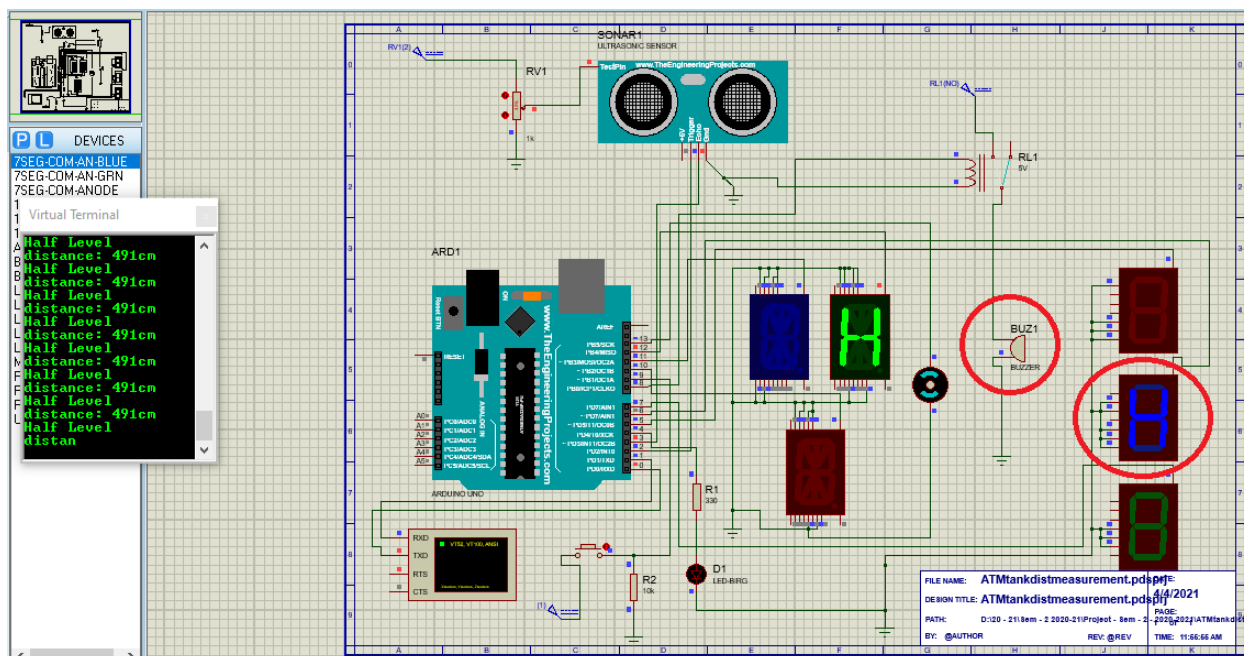


Fig 7 – Checking the project Circuit (Buzzer will give sound when Level is Half)

After rinsing for some more time the wastewater drain valve is opened again to drain the wastewater. After the cleaning sequence is finished the water will be stored in the drain and when the water reaches half level in the tank, home distribution valve is opened to distribute the water to the home distribution pipes.

VI. HARDWARE IMPLEMENTAION AND EXPERIMENTAL RESULTS

Before starting the sequence, the Home distribution valve will be opened. The sequence will start only when the water level is Low in the water tank. Firstly, the home distribution valve will be closed so that no wastewater will come to the home distribution during the cleaning process is going on.



Figure 6.1 - Checking the project (Low Level of Water in Tank)



Figure 6.2 – Checking the project (After initiating the Cleaning Sequence)

The cleaning motor will start the rinsing process and then the wastewater drain valve will be opened to drain the rinsed wastewater, then the Water inlet valve will be opened to get new water into the tank for cleaning for the second time.

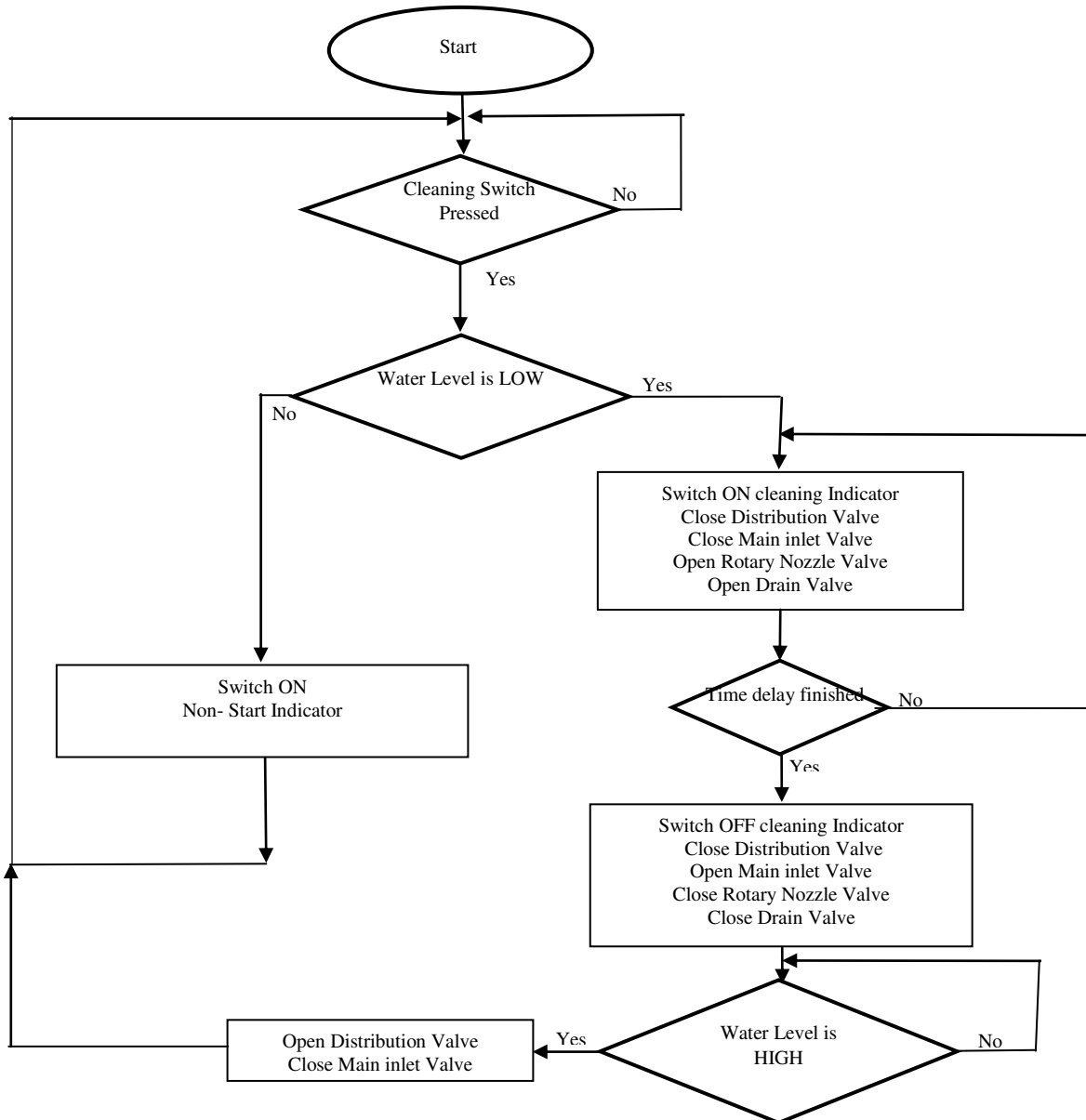


Fig 6.4: Flowchart of the operation

After rinsing for some more time the waste water drain valve will be opened again to drain the waste water. After the cleaning sequence is finished the water will be stored in the drain and when the water reaches half level in the tank, home distribution value will be opened to distribute the water to the home distribution pipes.

VII. CONCLUSION

This idea will be helpful for all the water tank users. It will be very helpful for cleaning and maintaining the tank in an automated sequence of process, without any manual intervention. In addition, it will be easy to equip in any water tank. The cleaning and maintenance of the water tank will be made easier using the proposed module. This Water Tank Maintenance System is a grateful idea, which provides an appropriate solution for cleaning and maintenance of water tank, water pipes etc., also, it is a promising initiative in the field of Water Tank maintenance system. For testing purpose, the delay time between the sequences was kept low. In an actual water tank maintenance system, this delay time will be kept long enough, according to the tank size, inlet water pressure, waste water drain pressure etc., The proposed idea can be extended to use solar energy for its operation, which make the usage of renewable energy. Also, an automatic water distribution system can be designed for domestic or industrial building, by adding water level sensor in the over hand tank and sump water tank. Then it can be extended to a leakage monitoring system, by using water flow sensor.

REFERENCES

- [1] N Vijaya Kumar, R Ramayas, "The real time monitoring of water quality in IOT environment", IEEE sponsored 2nd international conference on innovations in information, embedded and communication systems (Iciiecs) 2015.
- [2] Chalchisa, Derara & Megersa, Moa & Beyene, Abebe. (2017). Assessment of the quality of drinking water in storage tanks and its implication on the safety of urban water supply in developing countries. Environmental Systems Research. 6. 10.1186/s40068-017-0089-2.
- [3] IOT based water level and quality monitoring system in overhead tanks, Dr. K. Raghava Rao, Sanagala Srinija, Kukkala Hima Bindu, D. Satish Kumar, International Journal of Engineering & Technology, 7 (2.7) (2018) 379-383
- [4] Over Head Water Tank Cleaning Machine, Mr.Vijay T. Gorade, Mr.Prerak C. Kulkarni, Mr.Akash K. Awari, Mr.Akash C. Dehade, International Journal of Advance Research and Innovatice Ideas In Education, Vol-5 Issue-1 2019 ISSN (O)-2395-4396
- [5] Automatic Water Tank Cleaning Machine, Thonge Suraj D, Shelke Prasad K, Wakte Vaibhav B, Thonge Sharad A, Prof. Shinde R.S, International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 02 | Feb -2017, e-ISSN: 2395 -0056
- [6] Design & Fabrication of Water Tank Cleaning Machine, Mr. Yogesh K. Chaudhari, Mr. Nitesh B. Patil, Mr. Sachine A. Khangal, Mr. Nisar S. Shaikh, Mr. Shrikant U.Nagare, International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 6 Issue V, May 2018, ISSN: 2321-9653
- [7] Automatic Overhead Water Tank Cleaning System: A Review and an Approach, Rohit R. Dabhade, Shubham V. Lasankute, Sanket P. Wankhade, Shubham, G. Darokar, Prof. Vikramsingh R. Parihar, International Journal of Advanced Engineering Research and Science (IJAERS) Vol-5, Issue-10, Oct- 2018, ISSN: 2349-6495(P) | 2456-1908(O), <https://dx.doi.org/10.22161/ijaers.5.10.25>
- [8] Experimental Verification of Three Mode Controller for Home Appliance Using Wireless Technology, Maswoodhur Rahman Abdul Wahidh and Muruganandam Masilamani, IIUM Engineering Journal, Vol. 22, No. 2, 2021, <https://doi.org/10.31436/iiumej.v22i2.1618>
- [9] Smart Street Lighting System, A. Maswoodhur Rahman, Salah Al Din Al-Shaaili, Al-Moatasem Al-Shaaili, Waleed Al-Shaaili, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE), Volume 10, Issue 5, May 2021, DOI:10.15662/IJAREEIE.2021.1005015
- [10] Simulation and Implementation of Loop based Bank Locker Security System using Cost Effective Microcontroller and GSM Module, M.Muruganandam, A Maswoodhur Rahman. (2019), International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering 8(9): 2175 – 2181, <https://doi.org/10.15662/IJAREEIE.2019.080900>.



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