

Automatic Sintex Cleaning with IoT and Image Processing

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Abstract - Water storage tanks that are positioned on roof tops or in high elevators can be cleaned and disinfected automatically through this technique. Compared to conventional cleaning techniques, automatic overhead tank cleaning has a number of benefits. It ensures a higher level of disinfection, which is essential for the upkeep and safety of people who consume water from the tank. It is quicker and more efficient. Another method of cleaning tanks without the use of labour-intensive physical labour is overhead tank cleaning. The main benefits of autonomous overhead tank cleaning are better water quality, increased productivity, lower labour costs, and increased worker safety. The procedure normally includes draining the tank, cleaning the internal surfaces, and getting rid of any debris or sediments that may have built up inside. Cleaning water tanks is crucial since the cleanliness of a water tank greatly affects the quality of the water. The development of a mechanical method for cleaning cylindrical water tanks is the goal of this research. The mechanical system consists of a motor, brush-equipped mechanisms, gear rods, and shafts. The shafts and brushes mounted on the c-type mechanisms rotate as a result of the power from the electric supply, beginning to scrub the water tanks inside walls.

Keywords-Overhead Tank Cleaning, Storage Tank, Sintex Tank Cleaning, Disinfectant, Cleaning Mechanism.

I. INTRODUCTION

Water tanks must be cleaned regularly because we use the water in the tank for brushing, cleaning and mapping. Therefore, cleaning the water tanks is very important. A machine with an automated method is developed to clean the water tank. A different strategy was developed to solve this problem. Additionally, 71% of water tanks in India are Sintex tanks. After extensive research, it became clear that cleaning water tanks can cause skin diseases in people, and it is very difficult in requiring constant work in unhealthy conditions. An overhead tank would help solve all these problems. Due to human influences, diseases arose that people did not want. In this case, the machine can clean the tank quickly and easily. Therefore, we concluded that mechanical cleaning of the tank can be useful for all these problems. The resulting skin damage is not hygienic and affects people's health. The author's aim is to minimize the negative impacts on human beings and chemical impacts on people's health cleaning the tank can be avoided. Today's environment, manual cleaning of the overhead tank is labour intensive [4]. We hoped to intervene to overcome it. To this end, we will try to address the disadvantages of overhead tank cleaning. In addition, overhead tanks are made very safe, very efficient, require less cleaning time and prevent environmental pollution. A helical rod locked with two brushes forms a mechanical system. The nut connects two arms to the thread. The shelf is connected by a handle. The arms move as the main shaft rotates clockwise. The success of the project is the elimination of manual work and cutting, because these activities expose people to dangerous infections that negatively affect their health.

II. NECESSITY OF WATER TANK CLEANING

Water is used for cleaning water tanks every day, bathing, sweeping, washing and other household tasks. Sediment, scale and algae accumulate on the walls over time. Water becomes contaminated as a result of this deposition and is not suitable for drinking. This water becomes contaminated and grows more bacteria over time, potentially causing us to become ill. Since manually scrubbing dirt out of water causes skin conditions that harm people, water tank cleaning is essential in our daily lives to address all of these problems [1].

Pre-Cleaning Process

The tank remains empty during cleaning. Remove the valve tap and drain the remaining liquid. Clean the inside of the tank thoroughly with a solution of detergent and water to clean all surfaces. Test for chlorine, fill the tank with clean water and let stand for 30 minutes. The health of the population depends on the availability of clean water. Water tanks

are used to spread water [2]. The quality of water used by consumers deteriorates as sediment accumulates in water tanks over time. Water companies or companies providing fuel cleaning services must clean water reservoirs every three years. Cleaning the underwater water tank with the automated robot Pramod B Cleaning the water tank requires a lot of work. The entire task must be done by hand, which is dangerous due to the physical nature of the work. Due to the height of the water tanks, lack of oxygen can be a serious problem. As a result, it is now clearer than ever why the use of robotic devices underwater is essential. They develop software that allows the user to remotely control the robot and control tasks such as washing, brushing, vacuuming and other activities. The use of robots reduces the need for human labour and reduces the time required [3].

III. MECHANICAL SYSTEM

Cleaner cylindrical water tank production and design are handled by Shubham Srivastav. In this work, the two main mechanisms that were built were reciprocating four-bar connection mechanisms and gear mechanisms [6]. Worm gear is the mechanism employed, and it is used in accordance with the cylindrical tank's height to reciprocate the entire mechanical system up and down. Building drain cleaning mechanisms is relatively straightforward in this operation, and there is less equipment required for the system. Electric motors, bearings, belts, pulleys, and other minor materials like angular bars, etc. make up the majority of the structure [5]. Batteries are used in the trash. Rechargeable batteries are used in a variety of products, including automatic starters, portable consumer electronics, light automobiles, tools, and battery storage power plants.

Investigations

It's crucial to consider elements like these when researching an autonomous overhead tank system:

Tank size

The tank size needs to be suitable for the size of the house or building and the anticipated water demand.

Pump capacity

The pump should have enough power to keep the desired water pressure in place.

Control unit

The control unit should include characteristics like automatic shut-off in the event of malfunction or low water levels. It should also be dependable and simple to operate.

Placement of the sensors

To precisely monitor the water level in the tank, the sensors should be put in place in key areas.

Installation

To ensure safety and proper operation, installation should be carried out by a professional.

Cost

It is important to weigh the system's price against the possible energy savings.

IV. DESIGN AND FACBRICATION

Designing and creating devices to clean rectangular water tanks in homes. The system consists of a machine with an extendable shaft and a moving frame. The walls of the tank are cleaned with a rotating brush and a mechanism that keeps it rotating. The vacuum unit also sucks the sludge from the bottom of the tank, while the spraying mechanism destroys the sludge accumulated on the tank walls. the shaft rotates at 100 rpm. Moreover, it was found to be difficult. Water tanks are cleaned with rotating brushes using a water tank cleaner. To clean the tanks, there is a water nozzle inside the walls that can be used to spray water or soapy water [19].

Motor

At low speeds, a geared motor is utilized to generate significant torque. The specifications of the motor used are as follows: It is a single-phase motor operating at 220 V and consuming 15 A, producing an output of 0.35 HP with a frequency of 50 Hz and a shaft speed of 75 rpm. **Fig 1** shows the motor.

Selection Of Motor

A 12V DC motor is hooked up to the shaft and connecting rod to show the brushes to transform the rotary movement to reciprocal linear movement. It is used to transport the shaft up and down, that's the very last level of the gadget. The mechanism used is a spring compression mechanism [12].

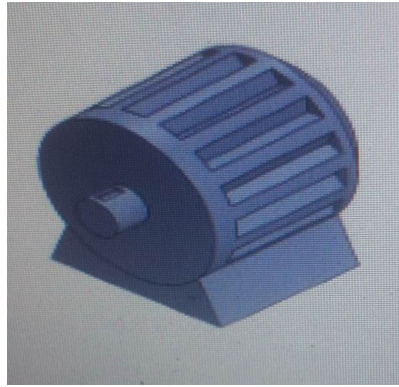


Fig 1. Motor.

Selection Of Material

The device's column is made of mild steel, which is considered when considering the configuration of the machine. To clean the upper tank, DC motor's power is used to rotate the brushes continuously and to move the shaft from the brushes' reference point to end point. Two types of rotating brushes are used for horizontal and vertical cleaning of the upper tank. The brushes are supported with shaft from the side angle and bottom position, size of the side brushes being adjusted according to the tank space with springs with adjustable tension between the brushes. The machine is powered by a 0.25HP single-phase DC electric motor and the microcontroller allows precise control of the up and down movement of the shaft [14-17]. The microcontroller determines the shaft rotations count and brushes rotation at each machine end. It is used in the supply voltage range (0-12) Vac [18]. The vertical axis is about 3.5 feet long and the horizontal axis is about 3 feet, so eight. The mounting bracket is made of mild steel so components can be easily attached to it. A row of brushes is placed on the rotor shaft, where the pulley provides the necessary motion so that the length between each brush from the center is exactly 40 cm [13].

Pads



Fig 2. Brushes.

The brushes are made from polyvinyl chloride (PVC) polymer. Brushes connected to the ends of four-bar linkage, rotate because of the rotation of the motor shaft to ease the interior of the tank [12]. **Fig 2** shows brushes.

Shaft



Fig 3. Shaft.

A hollow MS shaft with an OD of 15 mm is used to convert the rotary motion of the motor to four rods. Shaft holes will be used to adjust the connection of four rods according to the diameter of the tank [13].**Fig 3** shows shaft.

Connector

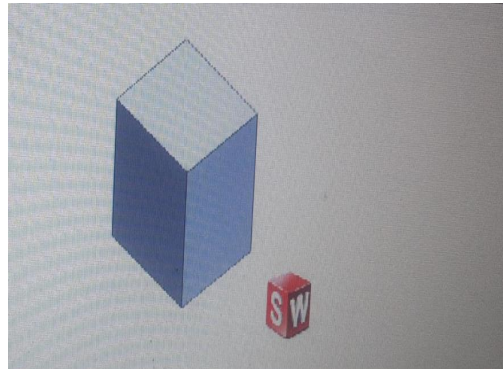


Fig4.Connector.

A clutch is a mechanical component that connects the drive shaft of the engine to the drive shaft, etc., to transmit power. The coupling is like shaft couplings, providing mechanical flexibility that provides tolerance to shaft displacement. Steel plugs are the most used and manufactured. The exact type of steel used varies by machining process, but generally low-carbon steel is used, including materials such as 1215, 1045, and 1026 [11].**Fig 4** shows connector.

Filter

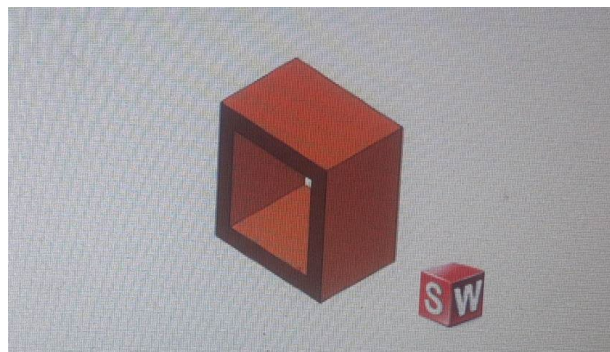


Fig 5.Frame filter.

In construction, framing is the joining of parts to give support and form to a structure. Frame materials are structural steel.**Fig 5** shows frame filter.

Sintex

The water tank is a container for removing water. Water tanks are used to store water used in many applications, drinking water, water system agriculture, firefighting, gardening for plants and livestock, preparation of substances, meal planning and many different tasks [8-10].**Fig 6** shows sintex.

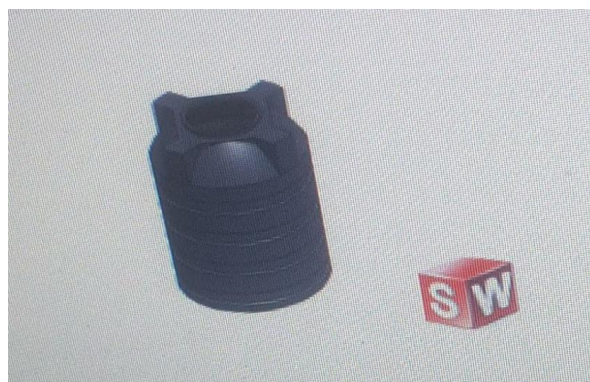


Fig6.Sintex.

V. IOT

To provide reliable water quality data to the community, they created a low-cost IoT-based water quality monitoring system. Simulations of the proposed arrangement showed higher system efficiency with low computational cost and shorter execution time. They have a case study showing how inadequate water supply is a major cause of water scarcity in the Marathwada region. A SCADA system that integrates with Internet of Things technologies for real-time monitoring of water quality [7]. Experimental results show that the proposed system outperforms traditional water quality monitoring systems using Arduino at mega 368 and GSM module.

Image Processing

Image processing: Computer vision technology is then used to process the collected images. Using filters to reduce noise, increase contrast and detect the edges of an object in an image is part of this process. Detection of various reservoir components, including the water surface, sediments, debris, and other contaminants, can be achieved by feature edge detection. Cleaning: Cleaning can be started based on the identified components. For example, when sediment is found, a cleaning system can be activated to remove it. Monitoring: During the entire cleaning process, the system constantly evaluates the working condition and changes it as needed. Filling and Reporting: Once cleaning is complete, the system can provide a report detailing how much sediment; debris or other contaminants have been removed from the tank. To keep tanks clean and reduce the risk of contamination, automated top tank cleaning using image processing can be a useful and practical method [20-22].

Design & Development of Automated Sintex Cleaning

The 3D model of the prototype and the Wireframe model were made using Solid-works software. Water storage tanks are cleaned using automatic cleaning machine. Tanks need to be cleaned several times for a variety of reasons. The design and development of the water tank cleaning machine consists of different machine model. Fig 7 shows the 3D model of automated sintex cleaning with IoT & image processing and Fig 8 shows assembly of components.

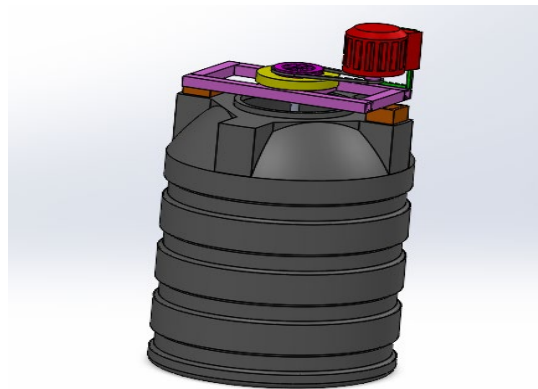
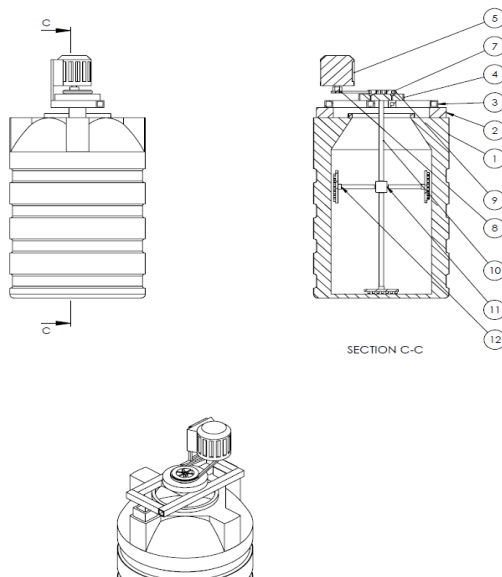


Fig 7. 3D Model of Automated Sintex Cleaning with IoT& Image Processing.



S.NO	PART NO	DESCRIPTION	QTY
1	PRT001	SINTEX	1
2	PRT002	FRAME LIFTER	2
3	PRT003	UPPER FRAME	1
4	PRT004	TOP PLATE	1
5	PRT005	MOTOR	1
6	PRT006	MOTOR LOADER	1
7	PRT007	PULLEY	1
8	PRT008	SMALL PULLEY	1
9	PRT009	BELT	1
10	PRT010	HANGER	4
11	PRT011	PAD	3
12	PRT012	CONNECTOR	1

Fig8. Assembly of Components.

The above picture consists of the set of the components used in the automatic synthetic cleaning machine. And the picture also shows how the set is placed inside the tank cleaning automatic synthesis.

VI. CONCLUSION

The water tanks were cleaned with the rotating brushes of the water tank cleaner. Compared to traditional approaches, it was safer and more effective. With this technology, water tanks can be cleaned with little effort. One worker is needed to clean the tank, which requires additional time and water. As we all know, water wastage is a big problem nowadays. We have given this machine an excellent position to solve these problems. Water tanks are cleaned with the rotating brushes of the water tank cleaner. Compared to traditional methods, this approach is more efficient and safer.

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