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RESEARCH ARTICLE OPEN ACCESS

Design and Fabrication of Automatic Water Tank Cleaning Machine

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ABSTRACT:
This project's objective is to develop a mechanical system for cleaning domestic water tanks. The mechanical system consists of two principal mechanisms that are rack and pinion gear mechanism and reciprocating four-bar linkage mechanism. The rack and pinion arrangement is used to transport the entire mechanical system up and down for cleaning the cylindrical tank. Brushes are connected to the ends of the four-bar linkage. A four-bar linkage is made in this kind of manner so that it could be adjusted according to the interior diameter of the tank. When the motor begins the linkage rotates and with the assist of brushes, cleaning of the wall and base of the tank takes place. The reason for this project is to lessen human efforts and to keep away from the chemical impact on the health of someone entering the tank for cleaning. To overcome this we've aimed toward tackling the negative aspects of cleaning overhead tanks, so an automated overhead tank cleaning system is designed to provide excessive safety, excessive efficiency, and much less time for cleaning. The reason for this paper is to clean a domestic cylindrical water tank with the help of a system. The mechanism of this system includes a grooved gear rod connected to two arms with brushes on the ends. The fingers are related to the equipment rod with the aid of using a nut. By rotating the equipment rod, the up and down movement of the two arms is achieved.

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I. INTRODUCTION

Water tanks are used to provide storage of water to be used in lots of applications, drinking water, irrigation agriculture, fire suppression, agricultural farming, each for vegetation and livestock, chemical manufacturing, meals education in addition to many different uses. Water tank parameters include the overall layout of the tank, and preference of production materials, linings. Various materials are used for creating a water tank: plastics (polyethylene, polypropylene), fiberglass, concrete, stone, steel (welded or bolted, carbon, or stainless). Water tanks are a green way to assist developing nations to save clean water. Safe drinking water is one of the fundamental factors for people to maintain a healthy life. Reinforced concrete overhead water tanks are broadly used to provide secure drinking water. Most water supply systems in developing nations, along with India, wherein urbanizing is growing day through the day, depending upon overhead garage tanks and consequently, there may be a want to construct more water tanks. Now while the tanks are established it needs to be cleaned at normal periods to make certain the water is in shape for ingesting.

DESIGN OBJECTIVE

By design, a water tank or container should no longer damage the water. Water is vulnerable to numerous ambient terrible influences, which include bacteria, viruses, algae, adjustments in pH, accumulation of minerals, and gathered fuel line. The infection can come from loads of origins which include piping, tank production materials, animal and bird feces, mineral and fuel line intrusion. A successfully designed water tank works to deal with and mitigate those terrible effects. Water tanks need to be cleaned yearly to lessen the transport of algae, bacteria, and viruses to humans or animals. A survey was made to test when and how the tanks are cleaned. The document says that more than 75% of the overall population clean the tank manually. Most of the tanks mounted are overhead watered tanks. The dust accumulates inside the base and inside the regions where arms do not reach. People may also

forget most of the time to clean the tanks at regular intervals.

NEED TO CLEAN THE WATER TANK

A safety-primarily based information article related copper poisoning as originating from a plastic tank. The article indicated that rainwater becomes accumulates and is stored in a plastic tank and that the tank did nothing to mitigate the low pH. The water was delivered into the houses with copper piping, the copper released via way of means of the excessive acid rainwater and brought about poisoning in humans. Since the plastic tank is an inert container, it does not have an effect on the incoming water. A good exercise could be to research any water supply periodically and deal with it accordingly, on this case, the accumulated acid rain needs to be analysed, and pH adjusted earlier than being added right into the home water delivery system. The release of copper because of acidic water can be monitored with the aid of using numerous technology, starting with pH strips and going to more state-of-the-art pH monitors, imply pH which while acidic or caustic, a few with output conversation capabilities. Most of the algae increases at an optimal pH, among 8..7. degree this is impartial or decrease can assist to lessen the bloom of algae. Potential, surprise products will assist to easy swimming pools or water tanks from algae. In this manner, no one wants to apply a vacuum cleaner to get rid of algae. There isn't any causative link between the plastic tank and copper poisoning, a way to the trouble is to screen saved rainwater with pH signs and upload suitable remedy materials. As time is going through, sediments and dangerous materials might also additionally relax and get deposited on the bottom and walls of the surface. This deposition contaminates the water and makes it not worthy of use. Then slowly the breeding takes place and a few chemical reactions arise as noted above.

II. LITERATURE SURVEY

Sr. No	Title of the Paper	Author/s	Finding	Future Scope
1	Automatic Overhead Water Tank Cleaning System	Rohit R. Dabhade1 , Shubham V. Lasankute2 , Sanket P. Wankhade3 , Shubham G. Darokar4 , Prof. Vikramsingh R. Parihar [1]	This method was more effective and safe than the conventional methods	The future scope of the project is to extend it with auto feeding mechanism by which the manpower involved in feeding gets removed. Through the help of the auto feed mechanism it is easy to clean the tanks without excess man power.
2	Design & Fabrication of Water Tank Cleaning Machine	Mr. Yogesh K. Chaudhari 1 , Mr. Nitesh B. Patil2 , Mr. Sachine A. Khangal3 , Mr. Nisar S. Shaikh4 , Mr. Shrikant U.Nagare5	This equipment was found to be effective in cleaning cylindrical water tanks	This method is capable to clean water tanks within less time and human efforts.

3	Design and development of automatic water tank cleaning machine	G.Bhaskar,Y.Chandu,S.B.Fazul Rehman,V.Ganesh,R.Sai Lokesh	Water splashes everywhere along the dividers in the tank and the rotating brushes clean the external separators.	The future scope of the project is to extend it with auto feeding mechanism by which the manpower involved in feeding gets removed. Through the help of the auto feed mechanism it is easy to clean the tanks without excess man power
4	Fabrication of Water Tank Cleaning Machine	Mr. Shubham Samrit1 , Mr.Divyarajsingh Mandale2 ,Mr. Ankit Rokade3 , Mr.Paresh Choudhary4 , Mr.Faisal Khan5 , Mr.Abhijeet Kongre6 , Mr.Harshal dalvi7 , Mr Saurabh Zade8 Prof. M.S.Giripunje	For cleaning the tank we need one worker which take more time as well as water	
5	Design and Development of Over Head Tank Cleaner	Raviteja shetti kp,Khaja Ts, Sunil Kumar, Narsgonda Bhojgonda	The working prototype is promising both in terms of cleanliness	

PROPOSED SYSTEM

This system is divided into three parts which explains the detailed explanation about the automatic water tank cleaning machine included in our proposed system. Part one includes the information about the materials and main components which are to be used in our system. Part two describes the number of materials required and the method in our system. Part three includes the methodology and working of the system.:

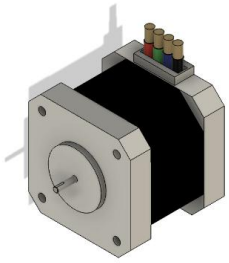
PART 1:

PROPOSED SYSTEM

The main components used for making automatic water tank cleaning machines are

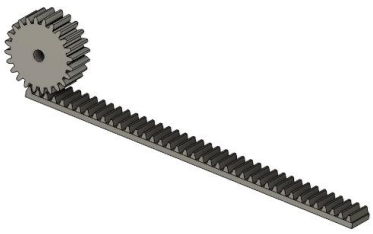
1.Gear Motor
2.Four Bar Linkage
3.Rack and Pinion
4.Shaft
5.Brush

1. Gear Motor Gear motor is used to produce high torque with low speed. The motor used has specifications as single-phase 220V, 15A which produces power of 0.35 HP and frequency of 50 Hz and the shaft speed is 75 rpm.



2. Four Bar Linkage A plane linkage consisting of four links pinned from tail to head in a closed loop with lower or closed joints. It is a plane mechanism consisting of four links that form rotating kinematic pairs. The four-bar linkage is arranged in such a way that it adjusts the inner diameter of the tank.

3. Rack and Pinion A rack and pinion is a type of linear actuator that comprises a pair of gears which converts rotational motion into linear motion. A circular gear called "the pinion" engages teeth on a linear "gear" bar called "the rack". Rotational motion applied to the pinion causes the rack to move relative to the pinion. the motor attached to the rack is moved in the vertical direction along the guideway with the help of the handle attached to the pinion.



4.Shaft A shaft made up of mild steel with a diameter of 15mm is used to transmit rotary motion from the motor to the four-bar linkage. Holes provided on the shaft, adjust the four-bar linkage according to the diameter of the tank.

5.Brush The brushes are made up of Poly Vinyl Chloride (PVC) polymer. Brushes attached to the ends of the four-bar linkage revolve due to the rotation of the motor shaft to clean the inner surface of the tan

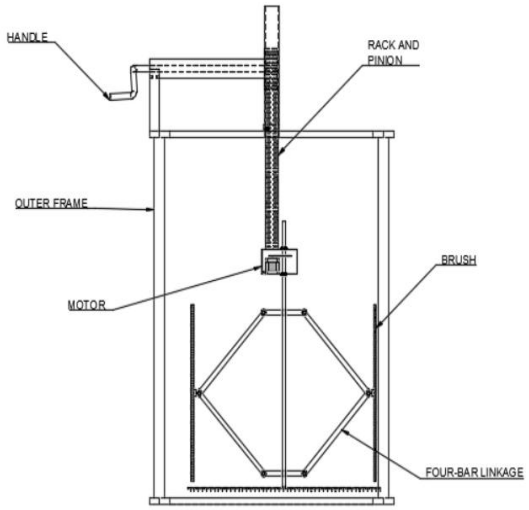
PART 2:
Selected material

The rows and columns of the machine are Aluminium material. The brushes rotate constantly based on the input power which it gets from the AC Motor to clean the overhead tank. A variety of rotary brushes are used to clean the overhead tank in horizontal and vertical positions. A shaft is used to preserve the brush's interior and backside positions wherein the adjustable springs with tension are utilized among the brushes to alter the dimensions of the side brushes as in keeping with the tank's area requirement. The 0.25 horsepower electric kind single-phase Ac motor is used to run the system. is operated in a supply voltage variety of (0-12) V ac. The setup stand is made of such that every one of the additives are effortlessly made to repair upon it. Spring is an elastic item used to keep mechanical energy. Springs are generally created from spring metal. There is a big range of spring designs; in normal usage, the time period regularly refers to coil springs. Small springs may be wound from pre-hardened stock, while large ones are crafted from annealed metal and hardened after fabrication. . An extension or compression spring has devices of pressure divided through distance, for example, lbf/in or N/m. Torsion springs have devices of torque divided through angles, which include N•m/rad or ft•lbf/degree. The inverse of spring rate is compliance, that is: if a spring has a rate of 10 N/mm, it has compliance of 0.1 mm/N. The stiffness

(or charge) of springs in parallel is additive, as is the compliance of springs in series four Design

Design

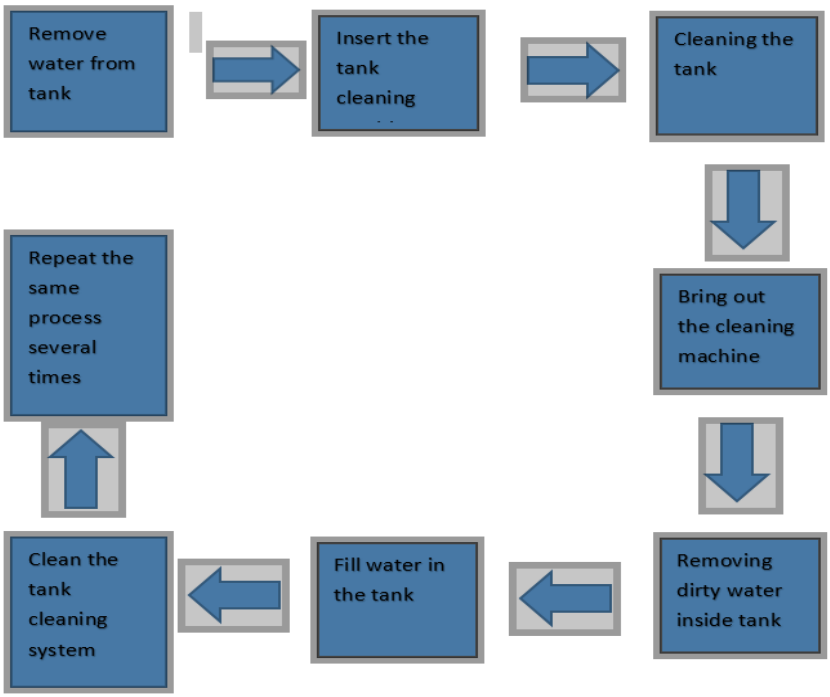
Figure 1



This is the layout of a water cleanser in which the fundamental substances are made of Steel (AISI 304) and the tank is made of polymer plastic The rack and pinion are made of plain carbon metal. This layout contains three brushes which might be given a rotational in addition to linear movement with the assist of Gear Motor that is linked with the assist of the shaft. The gadget is given a basis to deal with its overall weight and maybe swept effortlessly into the tank to clean it.

III. METHODOLOGY

Figure 2



The working of a system is shown as seen in the above methodology, the very first step is the removal of water. The water is removed from the tank to initiate the process.

After the water is removed, the machine is inserted into the tank. The machine should be carefully inserted and check whether it is placed properly inside the tank.

Now when the machine is inserted and placed properly, one should open the foldings and start cleaning the tank. It has to open in such a way that the brushes are in contact with the surfaces of the tank.

After the tank is cleaned properly, close the foldings and remove the machine from the tank.

Remove the dirty water which was being cleaned from the tank. After purification, fill purified water withinside the tank And then clean the tank cleaning machine once more properly. Repeat the same method a few times.

IV. RESULT

In this project, An AC motor of approximately 0.35HP operates at 75RPM is used to rotate the shaft at a fixed speed. The Shaft is installed at the motor & T-fashioned pipe the motor is connected to the pinnacle of the tank, after the whole configuration, the motor rotates alongside the brushes the internal surface of the tank walls. Hence the automated tank cleansing system works withinside an equal manner as a wall cleaner. Finally the water drainer through the opening of the tank through the usage of a pipe.

V. CONCLUSION

In this work, the automatic water tank cleanser become efficiently evolved to clean the water tanks with the usage of rotating brushes. This approach is more powerful and more secure than the traditional techniques of cleaning which takes much less time and human effort. Water splashes anywhere alongside the dividers within the tank and the rotating brushes clean the external separators. The water tank cleaner becomes used to clean the water tanks through the usage of rotating brushes. This technique becomes extra powerful and secure than the traditional methods. This technique is successful to clean water tanks with much less time and human effort. The superior version for tank cleaning systems is cleaning the tanks for that reason making the operation user-friendly. The running prototype is promising each in terms of supplying cleanliness and avoiding excess manpower. The destiny scope of the mission is to increase it with an auto-feeding mechanism through which the manpower involved in feeding receives removed. With the assist of the auto-feed mechanism, it is simple to clean the tanks without extra manpower. The mission may be even extended to boom the cleanliness of the tank through insulating the body and different components with the use of stainless steel.

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