International Journal of Scientific Research & Engineering Trends
Volume 4, Issue 2, Mar-Apr-2018, ISSN (Online): 2395-566X

Design and Development of Over Head Tank Cleaner

Raviteja shetti kp
Department of Mechanical Engineering, NMIT, Bangalore, India
ravitejakp66@gmail.com

Khaja Ts
Department of Mechanical Engineering, NMIT, Bangalore, India

Sunil Kumar
Department of Mechanical Engineering, NMIT, Bangalore, India

Narsgonda Bhojgonda
Department of Mechanical Engineering, NMIT, Bangalore, India

***Abstract* – Water is one of those natural resources, which is essential to each and every human being for many purposes, especially for drinking. We already know that earth is composed of water (three-fourth of the earth), but the entire three fourth isn't fresh water. Therefore, it is our duty to save water, keep the fresh water as much fresh as possible, and also to keep it free from water pollutants. The water that's pumped to our home is undoubtedly clean, but is the place where it gets stored clean as well? Yes, we are talking about the overhead water tanks. The health of your water largely depends on how clean your water tank is. Hence, cleaning overhead water tank is very necessary. Our aim of this project is to develop a mechanical system for cleaning domestic cylindrical water tank. The mechanical system includes motor, shaft, battery and Arms with brushes. The arms are adjusted according to the dimensions of the tank, once adjusted the machine is switched ON, the motor draws power from the battery and rotates the shaft with low RPM and high torque, the brushes mounted on the arms starts scrubbing the inner walls of the tank.**

Keywords: - **Cylindrical water tank, four bar linkage, motor shaft, rack and pinion, battery, Arms**

I. INTRODUCTION

In recent studies it has been found that no automation-based machine used in cleaning of overhead tank. This is because of the irregular shape and various heights of the tank locations. With previous survey made an attempt to make a machine by automation process for cleaning tank.

An alternate solution has made a plan to solve this problem. In India, the usage of syntax tanks by the people is approximately 71% After studies made the information that have faced a lot of difficulties like continuous work in the dirty places, irregular payment and other various reasons.

Continuous work and irregular payment may also be the major reason for this attempt. So, came to a conclusion that cleaning the overhead tank using automation process can be useful to solve all these problems. In this case, machine has the capability to clean the tank easily and quickly. Designing of our machine is based on the survey report conducted.

II. METHODS OF CLEANING OF OVERHEAD TANKS

1. Manual method

Manual scrubbing (e.g.Fig.2.1) in which wall and floor of tank are scrubbed to remove dirt, sediments, fungus and stains, but this method is more tedious and time consuming. First clean the tank, second, chlorinate the tank and third, check the chlorine concentration. But this method is very difficult and time consuming where the size of the water tank is large. Manual method is suitable for individual homes or buildings having small sized water tanks.

Fig.1 Manual Cleaning of water tank

2. Semi automated

Semi-automated tank cleaning process starts with cleaning the manhole and surrounding dirt, mud and algae. Then using special high-pressure jet (e.g.Fig.2.2) wall, all the interiors are cleaned. Dirt and sludge are removed using a vacuum pump and industrial pump. After cleaning the water tank, the water tank is disinfected using chlorine or antibacterial agents. Some professional cleaning service providers use UV Radiator to kill remaining bacteria. The

process of cleaning ends with the testing of residual chlorine left in the tank.

Fig. 2.Semi automated Cleaning of water tank

III. REASONS FOR CLEANING THE OVERHEAD WATER TANK

If you need to know some more important reasons to clean your water tank, then here are the five main reasons why cleaning your water tank is necessary.

1. Waterborne internal diseases

If you keep your water tanks uncleaned for years, there are high chances that the water will get contaminated by many bacteria or virus. And if your tank water gets contaminated by harmful bacteria and virus, then there is a high chance for you to get sick along with your family.

2. Skin diseases

Why just internal diseases, contaminated water can also cause skin diseases. It is obvious that you wouldn't be using your tank water just for drinking right? You will bathe with it and also wash your clothes and utensils. Therefore, while you keep in touch with such contaminated water, you can definitely be attacked by some skin diseases. But you could easily avoid such skin diseases by cleaning overhead water tank every 6 months or so.

3. Foul odor

If you water is uncleaned for ages, then it is obvious that it is going to smell as foul as drain water. This is the result of residues and sediments that is mixed in your drinking water. Sometimes foul odor in the water may not be harmful to your health, but you may not be able to drink it because of its foul smell.

4. Bad taste

Usually, it is the iron content in the water that gives you a metallic taste, and you would also see the color is slightly rusty or reddish. But, if you taste something completely different than the metallic taste then this could also be the result of sediments mixed with the tank water. Therefore, cleaning your water tank is necessary. And in any way, you cannot drink water that tastes bad.

5. Different color

If you find your water to be rusty in color and is staining your glass as well, then don't worry it's a case of iron content in water, that isn't harmful at all, in fact, it improves oxygen circulation in blood. But if you find some tiny sediment dissolved in water, or water that is foul colored then you might need to stop using it immediately and test it and then take essential steps.

IV. MAIN COMPONENTS

1. Gear motor

Gear motor is used to produce high torque with low speed. 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.

Fig. 3. Gear motor is used to produce high torque

2. Four Bar Linkage

A plane linkage consisting of four links pinned 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.

Fig. 4. Four Bar Linkage

3. Shaft

Shaft made up of mild steel of diameter 1inch is used to transmit rotary motion from motor to the four-bar linkage. The links are connected through welded holes provided on the shaft and holds the sliding bush adjust the four-bar Linkage according to the diameter of the tank.

Fig. 5. Shaft is used to transmit rotary motion

4. Brush

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

Fig.6.Brush used for clean the inner surface of the tank.

5. Battery An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices, here we are using 12 volts, 7.5 ah battery.

6 Pump

Simple aquarium pumps are used for both the nozzle and the suction of the water after cleaning. high-speed rotation of impeller to throw out water in pump body through centrifugal force, achieving the purpose of moving water or increasing water pressure.

Fig.7.Pumps is used the nozzle and the suction of the water after cleaning

V. WORKING PRINCIPLE

The Over head tank cleaner developed on the principle of umbrella four bar mechanism mainly consists of a rigid shaft in which all the links are connected to this shaft, further cleaning brushes are intern connected to the links which are fixed to shaft. Shaft is connected to the gear motor in which it is driven by an external battery source.

This tank cleaner is also provided with 2 nozzles and suction pump. This tank cleaner is fixed to the tank in such a way that where all the brushes come into contact with the internal periphery of tank.

When the motor switch is turned on the shaft starts to rotate intern brushes starts to scrub the interior wall of tank thus removing the dirt present on walls of tank. Nozzles are provided on top of tank which sprays water or cleaning agent thus making the work simple and fast. Further suction pump is provided which sucks up all the dirty water from tank.

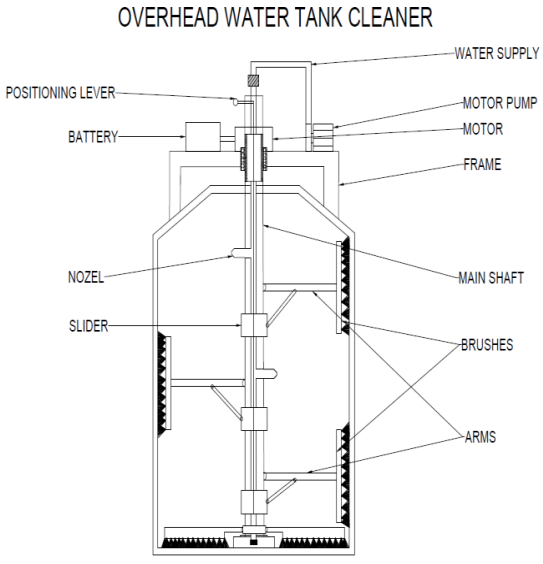

Fig.8. Overhead water tank cleaner

VI. CONCLUSION

Advanced model for tank cleaning system is cleaning the tanks thus making the operation user friendly. The working prototype is promising both in terms of imparting cleanliness and avoiding excess manpower. The project can be even extended to increase the cleanliness of the tank by insulating the frame and other components using stainless steel. The water tank cleaner was used to clean the water tanks by using rotating brushes. This method was more effective and safe than the conventional methods. This method is capable to clean water tanks within less time and human efforts.

ACKNOWLEDGEMENT

It is a pleasure for us to present this paper where guidance plays an invaluable key and provides a concrete platform for completion of the paper. We would like to thank our internal guide Mr.Manjunath.HN & Mr. Ramesh Babu Department of Mechanical Engineering and Dr. Kiran Aithal his valuable encouragement and constant guidance without which we wouldn't have looked deeper into our work and realized both our shortcomings and our feats. This work would not have been possible without them.

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