

Design and Development of an Effective Overhead Water Tank Cleaning System

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ABSTRACT

This paper aims to develop a mechanical system for cleaning domestic cylindrical water tank. The purpose of this project is to reduce the human efforts and to avoid the chemical influence on health of person entering the tank for cleaning. In this modern world, cleaning of overhead tanks manually is a tedious job. To overcome this, we have aimed at tackling the disadvantages of cleaning overhead tanks, so an automatic system overhead tank cleaning is designed to provide high safety, high efficiency, less time for cleaning and to avoid environmental pollution problems.

Keywords – Water, Water Tanks, Cleaning

INTRODUCTION

Water Tank systems are the general water providing techniques used by almost all the applications. Since the use of water is more, these tanks have wider application network. But the necessity of cleaning these water tanks also become important because the water always contains some kind of impurities in it. Therefore, instead of manual cleaning of the overhead tanks, there should be a system which can effectively clean the overhead tank in less time. Following are the disadvantages of uncleaned water tanks -

- 1) **Waterborne Internal Diseases:** If we keep our water tanks uncleaned for years, there are high chances that the water will get contaminated by many bacteria or virus. Due to this, the water gets contaminated and there is a high chance of Internal water-borne diseases such as diarrhoea, typhoid and cholera which are the most common type of diseases in India, Usually, this happens in the case of drinking contaminated water from outside; but still, if our water tank remains untidy then these diseases can hit us through our overhead tanks.
- 2) **Skin Diseases:** Contaminated water can also cause skin diseases. The water from overhead tanks is also used for other purposes. So, in this case, usually, we get in contact with water. Therefore, while we get in touch with such contaminated water, we can definitely be attacked by some skin diseases.
- 3) **Foul Odour:** If we keep water tanks as uncleaned for ages, then it is obvious that a harsh smell will come out from the tank. This is the result of residues and sediments that are mixed in our drinking water. Sometimes a foul odour in the water may not be harmful to our health, but we may not be able to drink it because of its smell.

4) Bad Taste: Usually, it is the iron content in the water that gives us a metallic taste. But, if we taste something completely different than the metallic taste, then this could also be the result of sediments mixed with the tank water. Therefore, cleaning our water tank is necessary. And in any way, we cannot drink water that tastes bad.

LITERATURE REVIEW

Raviteja shetti kp et.al [1]. in their paper, studied the general disease caused from uncleaned water tanks. 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

Thonge Suraj D.1 et.al [2] aims at developing a mechanical system for cleaning domestic cylindrical water tank. The mechanical system includes two main mechanisms which are rack and pinion gear mechanism and reciprocating four bar linkage mechanism. The rack and pinion arrangement is used to move whole mechanical system up and down for cleaning the cylindrical tank. The rack is fixed on the motor and the four-bar mechanism is attached to the motor shaft. PVC brushes are attached to the ends of the four-bar linkage. Four bar linkage is made in such a way that it can be adjusted according to inside diameter of the tank. When the motor is started the linkage rotates and with the help of brushes, cleaning of wall and base of tank takes place. The purpose of this project is to reduce the human efforts and to avoid the chemical influence on health of person entering the tank for cleaning.

S. Abhishekh et.al [3] in their paper explained cleaning of overhead tanks manually is a tedious job. To overcome this we have aimed at tackling the disadvantages of cleaning overhead tanks, so an automatic system overhead tank cleaning is designed to provide high safety, high efficiency, less time for cleaning and to avoid environmental pollution problems. Purpose of this project is to clean domestic cylindrical water tank with the help of mechatronics system. The mechatronics system consists of a grooved gear rod attached to two arms with brushes at ends. The two arms are connected to the gear rod by nut. By rotating the gear rod, the up and down motion of the two arms is achieved. The gear rod is rotated with the help of a D.C gear motor. The main grooved shaft is powered by an A.C motor. The motor and the shaft are connected by a rubber belt. The clockwise rotation of the main shaft will make the arms move and vice versa. The whole operation is controlled by a circuit consisting of relay switches, buttons, and PIC microcontroller. The number of times for the operation to repeat can be fed into the circuit. The achievement of this project is reduction of cost and manual

labour because there will be harmful diseases for the person who will go inside and it will affect the health as well as the other human being who consumes water from the tank.

Yogesh K. Chaudhari et.al [4] explained their purpose of the project is to clean domestic cylindrical water tank with the help of mechanical system. This mechanical system consists of wiper motor, chain, sprocket, shaft, bearing, PVC brush. In this assembly open chain is welded to the square pipe and at the end of square pipe wiper motor is attached. The square chain welded square pipe is up and down with help of sprocket rotating with hand with the help of shaft rotating by hand with handle. The shaft is supported on the base with two pedestal bearing. Brush assembly is attached to the motor shaft.

PROBLEM STATEMENT:

In recent studies it has been found that no automation based machine is 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 sintex 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.

CONSTRUCTIONAL FEATURES



Figure No.1 : 3D Drawing of Base Frame



Figure No.2 : Actual Frame With Motor

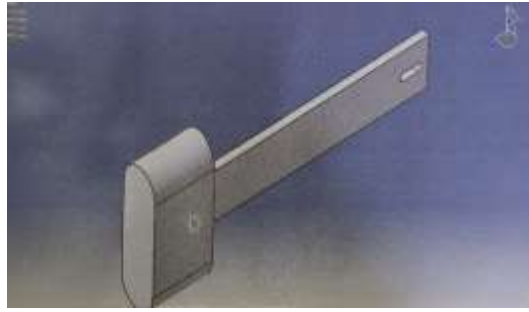


Figure No.3 : 3D Drawing of Brush Mounting Link



Figure No.4 : Actual Brush Mounting Link

WORKING:

Firstly, the whole water is removed from the tank. Detergent is then sprayed on the inner wall of the tank for easy removal of dirt. The whole system is inserted in retracted position into the tank. The four bar linkage is then adjusted according to the tank diameter in such a way that brush at end of the shaft touches the bottom of tank. Now the motor is switched ON. The four bar linkage starts rotating along with the shaft. This causes scrubbing of inner wall of tank by the brush attached to the ends of linkage. For cleaning upper portion of the tank the whole mechanism is reciprocated along the guide ways with the help of handle connected to the rack and pinion arrangement. In this way the tank gets cleaned within minimum time.

CONCLUSION :

The water tank cleaner was used to clean the water tanks by using rotating brushes. This method was more effective and safer than the conventional human efforts. 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 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. The project can be even extended to increase the cleanliness of the tank by insulating the frame and other components using stainless steel.

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