

# Fabrication of Water Tank Cleaning Machine

\*YOGESH KUMAR S R, \*NAVEEN KUMAR R A,\* GOWTHAM NAIK T, \*VENKATESH A, \*\* HANUMANTHARAYA R  
<sup>1</sup>U G Student, <sup>2</sup>Assistant professor,

School of mechanical Engineering, REVA University, Bengaluru

**Abstract:** The goal of this project is to develop a mechanical device for cleaning cylindrical domestic water tanks. The mechanical system includes the brushes with motor, shaft, battery and arms. The arms are set, the pump is turned on, the motor draws power from the battery and rotates the shaft at low RPM and the brushes mounted on the arms start scrubbing the tank's inner walls with high torque. Water is one of those regular assets, which for certain reasons, particularly for drinking, is fundamental to each individual. We certainly realize that earth is made of water (three-fourth of the earth), but the whole fourth is not fresh water. In this way, it is our obligation to spare water, keep the new water as fresh as might be expected. The water which is pumped to our home is undoubtedly clean, but it is also the place where it is stored clean. Indeed, we are thinking about the water tanks that are overhead. The quality of your water depends primarily on how clean your tank is. Hence, it is very necessary to clean the overhead water tank. Our aim of this project is to develop a mechanical system for cleaning cylindrical household water tanks

## 1 INTRODUCTION

Recent studies have found no automation-based system used in overhead tank cleaning. This is because of the tank locations' irregular form and varying heights. With previous survey an attempt was made to make a machine for cleaning tank by automation process. An alternative solution has prepared a plan for solving this problem. In India, individual use of Sintex tanks is roughly 71%. After investigations, the data that confronted a ton of troubles in the grim spots such as nonstop work, sporadic installment and various reasons were produced. Persistent work and unforeseeable installment may also be the important purpose behind this endeavor. Thus arrived at a resolution that cleaning the overhead tank using mechanization procedure can be valuable for taking care of each of these problems. Every day we use the tank water for brushing and bathing, for cleaning and moping, for washing clothes and in other household chores.

Sediments scale and algae are accumulated on the water tank walls, roof, and floor with the passage of time. This can potentially clog pipes. The resulting damage to the skin is not hygiene, and will affect health. Therefore cleaning of water tanks is very important.

### 1.2 Methods of cleaning overhead water tanks

This technique is the usual strategy for water tank cleaning where a worker would get into the tank and scour the dividers. This technique is tedious, and

more effort is needed to clean the tank of water. In this technique, by using a siphon or an open outlet drain the tank first. The worker or person who cleans the water tank gets into the tank at that point and cleans the inner divisor using cleanser and water.

At that point each interior surface is washed with plain water to expel all cleanser hints. You may also disinfect the water tank by using chemicals to remove the soil and sediments. The chemicals used have the potential to affect human health. Pressurized water may be sprayed on the tank walls, removing the dirt from the tank surface.



Fig1.1 Manual cleaning of water tank

Automated cleaning of the water tanks allows saving time and money. Whether you are manually cleaning your tanks, or using the fill and drain system, you can be shocked at how much you can save by automating. Automated tank cleaning is ideally suited for apartment complexes and large water tanks located in companies or buildings.

### 1.3 Reasons for cleaning overhead water tanks

In case you keep your water tanks unclean for quite a long time, there are high chances that numerous microbes or infections will contaminate the water. What's more, on the off chance your tank water gets

\* Yogesh Kumar S R, \*Naveen Kumar R A,\* Gotham Naik T,  
\*Venkatesh A currently pursuing bachelor degree program in  
mechanical engineering in REVA University, India.

\*\*Hanumantharaya currently working as assistant Professor in  
REVA University, India

debated by unsafe microorganisms and infection, there's a high chance you'll get sick alongside your family at that point. Indoor waterborne diseases, such as loose intestines, typhoid, and cholera, are India's most widely recognized kind of infections caused by polluted water

## 2 LITERATURE REVIEW

Davis, –J.And Lambert, R., [2002] states that there are three conventional steps to disinfect a water tank. Cleaning the tank keeps the tank empty. Open the valve / tap socket, and remove any remaining liquid. Clean all surfaces at the inside. Using a combination of detergent and water to purify all the tank's internal surfaces. Chlorine testing refill the tank with clean water and allow for 30 minutes of standing.

Ahmad stated that the provision of clean water is critical for people's health. Water supply is distributed through tanks for water storage. Sediment that accumulates in water storage tanks over time will deteriorate the quality of water used by the consumers. Water storage tanks are required by water utilities operators or tank cleaning service providers to clean once in every three years.

Pramod b jachaket "Computerized robot to clean water tank underwater" [2016]. Cleaning up water tanks for storage is a tedious job. Entire work needs to be done manually, and this is a risky task when manual work is considered. Considering the height of water tanks, oxygen shortage can be a big problem. Therefore the need for the use of robotic systems underwater has become more apparent. They create a program in which the user navigates the robot remotely as he wants, as well as monitors other operations such as washing, brushing, sucking, etc..

Shubham Srivastav "Cleaner Cylindrical Water Tank Design and Production," January [2016]. They build mechanical system in this work consists of two main mechanisms which are gear mechanism and reciprocate four bar connection mechanism.

The gear used is worm gear which is used according to the height of the cylindrical tank to reciprocate the entire mechanical system up and down.

Guha, A., Ronald, M.Barron, and Balachandar, R., [2011] "Process of water jet cleaning experimental and numerical analysis. This paper investigated the water jet cleaning process in experimental, numerical and theoretical terms. In such cleaning operations very high-speed water jets (80-200 m / s) are typically used.

Ms. smitagourkhedeet, "Design and manufacture of drain cleaning system" Building drain cleaning mechanism is very simple in this work, the equipment needed for the system is less. It consists primarily of electric motor, bearings, belt and pulleys, and other small materials such as angular bar etc. The garbage is

cleaned from the drains using this equipment, which cleans the garbage somewhat

## 3 PROBLEM STATEMENT

In ongoing investigations, it has been discovered that no automation based machine utilized in cleaning of overhead tank. This is a direct result of the sporadic shape and different statures of the tank areas. With past overview made an endeavor to make a machine via automation process for cleaning tank. A substitute arrangement has made an arrangement to tackle this issue. In India, the use of Sintex tanks by the individuals is around 71%. After examinations made the data that have confronted a great deal of troubles like constant work in the messy spots, sporadic installment and different reasons.

## 4 OBJECTIVES

With the passage of time, sediments scale and algae get deposited on the walls, ceiling and floor of the water tank. This eventually clog pipes. It is not hygiene which results damages the skin and it will effects on the health. Hence water tank cleaning is very important. To reduce the human efforts and to avoid the chemical influence on health of person entering the tank for cleaning. Automated water tank cleaning machine enables to save time and money and it provides high safety and high efficiency.

## 5 METHODOLOGY

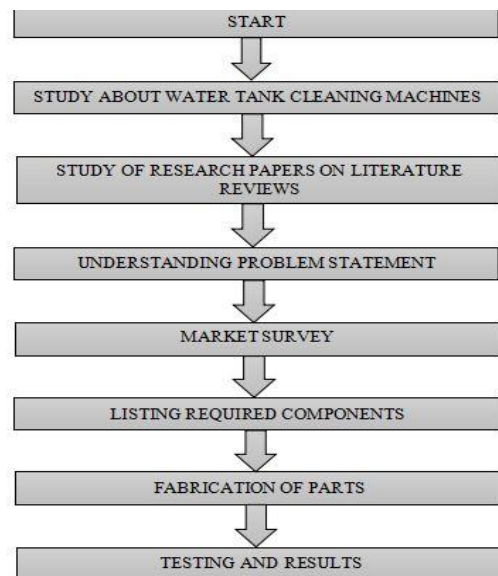


Fig 1.2 Flow chart of methodology

### 5.1 Main components

#### 1. 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, 7.2 ah battery. Device which use rechargeable batteries include automobile starters, portable consumer devices, light vehicles, tools and battery storage power stations.

## 2. PVC Brushes

The brushes are comprised of Poly Vinyl Chloride (PVC) polymer. Brushes joined to the parts of the bargains linkage spin because of pivot of motor shaft to clean the inward surface of the tank. It is suitable for use in dry and wet conditions. PVC is hard wearing and provides excellent sweeping performance. Ideal for use inside and out.

## 3. Bearing

A ball bearing is a type of rolling element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other.

## 4. Shaft

Shaft is a turning machine component, generally roundabout in cross area, which is utilized to transmit power starting with one section then onto the next, or from a machine which maker's capacity to a machine which assimilates power. The different individuals, for example, arms, pulleys and rigging's are mounted on it. It is made of Mild steel. Mild steel is ductile and can easily be machined. Generation of heat is less than that of stainless steel so the tool can have better life and you can do more machining. Cost factor is of prime importance as other steel are more costly than mild steel

## 5. DC motor

A DC motor is any of a class of turning electrical motors that changes over direct flow electrical vitality into mechanical vitality in type of revolution. Its development is delivered by the physical conduct of electromagnetism. DC motor have inductors inside, which produce the attractive field used to create development. The most widely recognized sorts depend on the powers delivered by attractive fields.

## 6. Water nozzle

A nozzle is a device designed to control the direction or characteristics of a fluid flow (especially to increase velocity) as it exits (or enters) an enclosed chamber or pipe. A spout is frequently a channel or container of changing cross sectional territory, and it very well may be utilized to coordinate or adjust the progression of a (Liquid or gas).

## 7. Bush

A bush is a mechanical fixing between two,

conceivably moving, parts, or a reinforced fixing point where one mechanical get together is joined to another. In a vehicle or other vehicle's suspension, shrubberies are utilized to interface the different moving arms and turn focuses to the body and different pieces of the suspension. In machines bush give mechanical solidarity to the rotor.

## 8. Water pump

The pumping of water is an essential and down to earth method, unquestionably more functional than scooping it up with one's hands or lifting it in a hand-held can. This is genuine whether the water is drawn from a new source, moved to a required area, filtered, or utilized for water system, washing or sewage treatment, or for emptying water from an unfortunate area. Despite the result, the vitality required to pump water is an incredibly requesting part of water utilization.

## 9. Sintex tank

A water tank is a holder for putting away water. Water tanks are utilized to give stockpiling of water to use in numerous applications, drinking water, water system agribusiness, fire concealment, horticultural cultivating, both for plants and domesticated animals, substance fabricating, nourishment planning just as numerous different employments.

## 5.2 Selection of materials

### Selection of PVC brush

It offers a quality range of PVC brushes and a wide variety of power brushes, which are heavily used for cleaning rust and removing unwanted burr from the products. It is suitable for use in dry and wet conditions. Ideal for use inside and out .High effectiveness Brush material - Plastic, Handle material - PVC

### Selection of Mild Steel

This material is also referred to as soft steel. Because it is softer than other types of steel, sheets of mild steel can be easily welded together to form one continuous piece or to connect the metal joints. Mild steel is ductile and can easily be machined. Generation of heat is less than that of stainless steel so the tool can have better life and you can do more machining. Cost factor is of prime importance as other steel are more costly than mild steel.

### Selection of nozzles

A nozzle is often a pipe or tube of varying cross sectional area, and it can be used to direct or modify the flow of a fluid. Material - Brass, Spray range - Approx., 1-4 meters. Brass combines the best balance between durability, heat conductivity and price. Corrosion resistance, Cost effective.

### Selection of Bush

It is a mechanical element used to reduce friction between rotating shafts and stationary support members, typically, a bushing relies on soft metal or plastic and oil film to support the rotating shaft on the hardened shaft journal. Material - Brass. Corrosion resistance, Cost effective.

### 5.3 Working Principle

Motor draws power from the 12 volts, 7.5 ah battery and drives the shaft. Here the rotating motion of the motor is transmitted to shaft and then to the arms and brushes the induced rotating motion cleans the inner walls of the tank. The links are induced in order to make a lesser area during removal and to make the model induce inside the tank. The whole system is inserted in retracted position into the tank, the arms are then adjusted according to the tank. The arms are 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 arms start rotating along with the shaft. The brush mounted to the shaft is rotated at a speed of 30 to 90 RPM. The bottom is cleaning through horizontal brush and wall cleaning is through side brush. In this way the tank gets cleaned within minimum time. There is also a water nozzle that is used to spray water or soap water to the inner walls of the tank so that the brushes work smooth and the dust or sediments on the wall fall down to the bottom and then can be sucked out of tank.

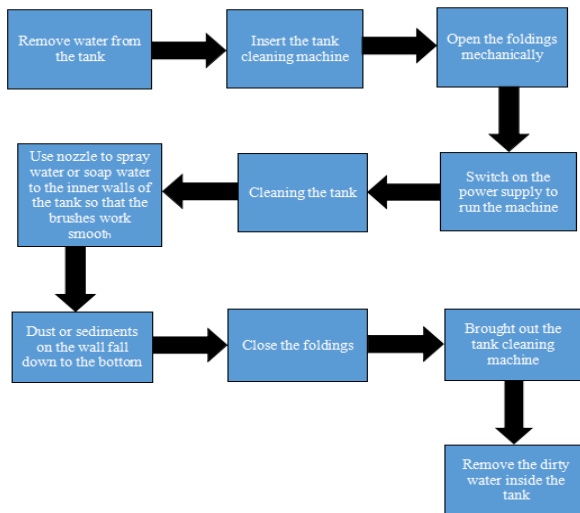


Fig 1.3 Working flowchart

### 5.4 Design and Analysis of Experiment Model

### 2D Line diagram view

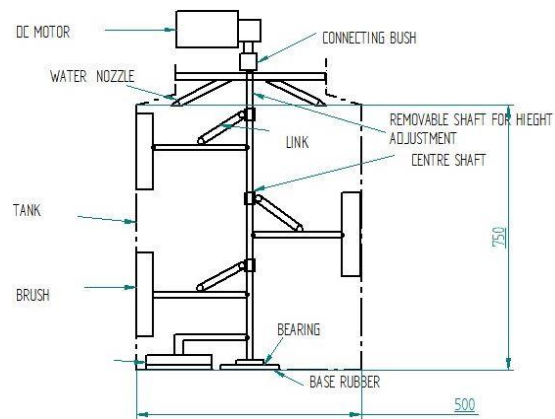


Fig 1.4 2D line Diagram

### 3D Software view

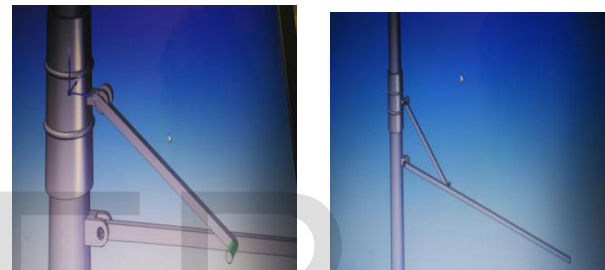


Fig 1.5 3D Software view

These two images help to understand how the closing and opening the arms take place while mounting on water tank. This part has been done in solid edge according to the dimension of the overhead water tank cleaner.

### Frame of the model



Fig 1.6 Frame of the model

An arm of 16-inch length is used which is connected to the brush which is of 13-inch height and 2 inches thick. A lever of width 6.25mm, thickness 4mm of length 4 inch in connected to arm and slider. This combined mechanism provides the sliding motion up and down. The slider has an external diameter of 30mm and 3-inch height along with lever is connected

to the arms. To this entire assembly D.C motor of about 12V which runs at 30 to 60 RPM is attached in this project to move the side shafts up and down continuously. The machine is attached at the top of the tank. Then brushes are mounted at the three ends of the shaft through a surface of the tank. After the complete setup, the motor rotates and the brushes rotate at the surface of the tank. Finally, the water gets drain by the outlet of the tank.

### 5.5 Fabrication process involved

Welding is fabrication or sculptural process that joins materials, usually metals or thermoplastics, by causing fusion, which is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal. In addition to melting the base metal, a filler material is typically added to the joint to form a pool of molten material that cools to form a joint that is usually stronger than the base material.

### 5.6 Experimental results

A water tank cleaning machine is a machine used to clean the overhead tanks such those found to store the water. Tanks must be cleaned from time to time for various reasons. The main reason is to clean the tank is allow to gets fungus. Thus the tank is to be inspected or maintenance to be performed regularly. Water tank cleaning machines work in a manner similar to a wall cleaner. A DC motor of about 12V which runs at 60 rpm is used in this project to move the side shafts. The machine is attached at the top of the tank. Then the brushes are mounted at the three end of the shaft through a surface of the tank. After the complete setup the motor rotates and the brushes rotate at the surface of the tank. The system has been system and cleaning operation also. But the sludge cannot be removed completely thus a suction mechanism is involved at the bottom for complete removal of the sludge from the tank.

## 6 CONCLUSION AND FUTURE SCOPE

### Conclusion

In order to overcome the difficulties of cleaning the water tanks by manual method we investigated and studied about an automatic tank cleaning mechanism. It is difficult to clean the water tank by conventional methods which requires a lot of human labour. By implementing newly developed method it requires less time and human effort for cleaning any kind of water tanks. So, the 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 and industrial water tanks. Domestic water tanks it takes more than one hour to clean the tank and it is a labour intense process. By using this device, the time required for the whole process can be

reduced to less than 20 minutes according to the storage capacity of the tank. Since cylindrical storage tanks with difficult access to the interior space are common in domestic purposes so this project has significant importance in the current scenario.

### Future scope

- This system is user friendly and time saving also the cost is less hence it can be used in the future water tank cleaning purpose.
- The machine can be operated on solar energy. It can be fully automated by using sensors. The machine can be remotely operated.
- The system could be more compact and light weighted and more user-friendly and efficient by improvement in the design and using some other advance equipment.

## 7 ACKNOWLEDGMENT

The satisfaction and excitement that accompany the successful completion of any task would be incomplete without the mention of the people who made it possible, whose consistent guidance and encouragement crowned our efforts with success. We consider ourselves proud to be a part of REVA University family, the institution which stood by our way in all our endeavors.

## 8 REFERENCES

1. Guha, A., Ronald, M. Barron., and Balachandar, R., [2011] an experiment and numerical study of water jet cleaning process. Journal of materials processing technology 610-618.
2. Pramod B Jachaket "Computerized Underwater Robot to Clean Water Tank". Volume:2, Issue:4, 201.
3. Shubham Srivastav, "Design and Development of Cylindrical Water Tank Cleaner" Volume: 6, Issue:1, January 2016.
4. Davis, J. and Lambert, R., [2002] "state there are three steps for conventional and disinfecting a water tank".
5. Ahmad AthifMohdFaudzi, "Clean Water Supply is Important in Ensuring Good Health of people.
6. Ms. SmitaGourkhede, "Design and Fabrication of Drain Cleaning Machine".

IJSER