

# Design and Fabrication of Cylindrical Water Tank Cleaning Machine

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**Abstract:** In India the use of water tanks by the general population is 71%, water is used for all the daily chores. Water tanks are used in houses, industries and some other buildings. Cylindrical water tank is commonly used in house hold applications. Cleaning the water tank is one of the major issues faced by people, which leads to accumulation of impurities which may consist many harmful particles. Present methods of water tank cleaning are time consuming and require more effort for cleaning. It is necessary to build an automatic or user-friendly water tank cleaning machine. In this regard it is decided to design and fabricate cylindrical water tank cleaning machine. This is achieved by doing the project planning, designing the CAD Model, material collection and fabrication of the machine. The fabricated machine is then tested to check the performance. Finally, it is noticed that the fabricated water tank cleaning machine is an efficient and safer machine. Also it is less time consuming and less human effort needed.

**KEYWORDS:** Water Tank, Motor, Brush.

## I. INTRODUCTION

In India the use of water tanks by the general population is 71%, water is used for all the daily chores. Water tanks are used in houses, industries and some other buildings. Water tanks are used to provide storage of water for use in many applications, drinking water, irrigation, agricultural farming, food preparations, etc. There are different types of water tanks. Out of which cylindrical water tank is commonly used in house hold applications [1]. With the passage of time, sediments scale and algae get deposited on the walls, ceiling and floor of the water tank. This deposition contaminates the water and makes it unfit for use. With time algae and bacteria grow and breed in this water, infecting it and could make us fall sick eventually. Hence water tank cleaning is very important. Cleaning of cylindrical water tank is one of the major issues faced by people, which leads to accumulation of impurities which may consist many harmful particles. Manual scrubbing in which the wall and floor of the tank are scrubbed to remove dirt, sediments, fungus and stains, but this method is more tedious and time consuming [2]. The water tank can also be cleaned by using chemicals to remove the dirt and sediments. The chemicals used may affect human health. Pressurised water can be sprayed on the walls of the tank which will remove the dirt from the tank surface. These methods are time consuming and require more effort for cleaning. The automatic cleaning of the water tank is designed to provide high safety, high efficiency, faster cleaning and avoid problems of environmental contamination.

## II. PROBLEM STATEMENT

Water tank cleaning is necessary in periodic maintenance of water supply systems in domestic use. The tank cleaning is done manually which is not efficient and a very difficult task. As per the survey there is no automatic tank cleaning machine available in the market, therefore it is necessary to design, develop and fabricate a water tank cleaning machine.

## III. LITERATURE SURVEY

Prayosha innovative [1] Sedimclean water tank cleaning machine which cleans sediments in the tank. It is a vacuum cleaner type system which cleans the tank without removing the water from the tank. Sedimclean water tank cleaning machine which cleans sediments in the tank. It is a vacuum cleaner type system which cleans the tank without removing the water from the tank. Brown J. A [2] vacuum tanker for cleaning storage tanks which is a vaccine cleaning system for cleaning the water tank and also acts as a water pump to force water. Powerful technology to clean big water tanks more efficiently and in very less time. M.S.Triantafyllou and G. S. Triantafyllou [3] An efficient swimming vehicle is a mechanical system to clean the swimming pool using motor, mechanical arrangements, brush and floss. Fish-like underwater microrobots which clean the swimming pool effectively. W. S. N. Trimmer and K. J. Gabriel [4] Design considerations for a practical electrostatic micro-motor: A high torque less speed motor of very small size. Shubham Shrivastav, Hari Om Kumar [5] Design and development of cylindrical water tank cleaner. Easy to use and effective cleaning of the water tank is done

#### IV. METHODOLOGY AND DESIGN

The steps that need to be followed to efficiently and effectively to complete the project work is made in a flow chart shown in fig.1. It shows the various steps involved in the project.

Once the problem statement is formed then the planning of project is done. After the planning, collected the information regarding the project by doing the literature survey on the

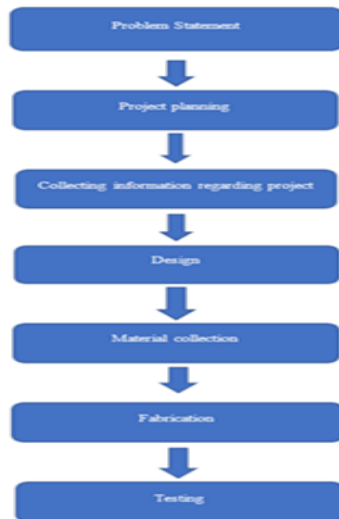


Fig.1. Flow Chart

#### DESIGN

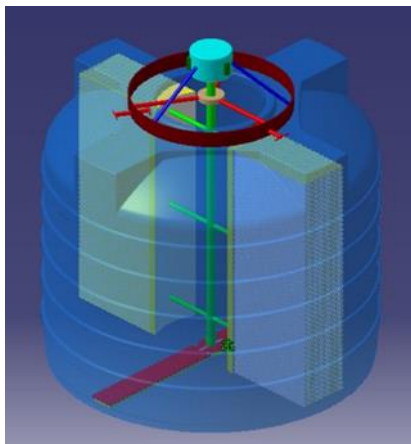


Fig.2. 3D Model of the Assembled Machine

topic. According to the plan and information from the literature survey an appropriate design is created. The materials required for the project is collected and fabricated according to the design. The final project is tested to check the performance.

The design of the water tank cleaning machine was done in design software – CATIA V5. The complete design was based on the literature survey and it is shown in figure 2.

thread and brushes are attached. These hold the brushes and the nylon threads which are tied into the aluminium sheets. Also used in specific regions to shift the stresses that will be produced during the working. Iron strips are used to hold the motor. These are used to arrange the nylon threads in such a way that it takes up the form of the brush. Holes are made on these sheets and the nylon threads are tied to these. As mentioned above these threads are used as the brushes. Holes will be made in the aluminium sheets and these threads are tied through those holes. There will be a number of such holes so the threads are measured and made or cut in equal lengths and then are tied to the sheets. These are used to clean the walls of the tank these are used to clean the bottom of the tank. These are held by the help of the iron slips that's welded to the hollow steel rod connected to the motor or the driving part. This is an important part of the whole set up. The motor runs and gives the driving force or the power to the whole set up and machine to work. The motor required for this set up is a single-phase motor of 1440 rpm and 1 HP of 250 V. The pump is used to pump in the water that's required to clean the tank and to pump out the dirty water that's produced or remained after the tank's been cleaned and the machine is stopped.

#### V. MATERIALS & FABRICATION

It is the part which needs to be cleaned so measurements are taken of the tank that is to be cleaned. This is also the basic and first step of construction; with the help of the taken measurements the design of the machine is produced. Steel rod is used to give the machine a sort of backbone; it's the part which is used to connect the cleaning part to the motor. It also stays as the foundation to which the nylon

##### FABRICATION

The fabrication of the water tank cleaning machine is done in steps. The steps involved in this are as follows:

STEP 1: The fabrication starts with taking measurements from the sketch.

STEP 2: A workshop is located to fabricate the machine. Now the materials are purchased and brought to the workshop.

STEP 3: A hollow steel rod is taken according to the height of the tank which is 1397 mm, the rod should have 100 - 127 mm, more height so that the motor can be connected later.

STEP 4: The bottom part of the rod 4 brushes of 152 mm is attached. The brushes are held together by an iron slip of 4mm thickness and 100 - 110 mm length which is screwed to the brushes.

STEP 5: The iron strips are then connected to the rod in such a way that it can have swinging motion so when the machine is inserted into the tank the brushes will be in contracted position but once it touches the base of the tank it retracts, this will clean the base of the tank.

STEP 6: The next brush is manually created. Two aluminium sheets are taken of 177 mm width and 1219 mm length to

which holes are made in 12 mm gaps. To the holes the nylon threads are now tied to the holes that were created. The thread length is kept at 381mm. Now this made-up brush is attached to the steel rod by welded joints and nuts and bolts. This will clean the walls of the water tank. This completes the brush and cleaning part as shown in figure.

STEP 7: After setting up of the brushes, the support to hold the motor is constructed which consists of an iron slip of 4 mm thickness, 1270 mm length, 50 mm width and a slip of 4mm thickness, 609mm length, 50 mm width and 4 iron slips of 4mm thickness, 253mm length, 76mm width. The picture of the motor part is shown in figure. After the completion of fabrication and assembly of parts, the cylindrical water tank cleaning machine will be as shown in the figure 5 and figure 6.



Fig.3. Manually created brush



Fig.4. Motor part



Fig.5. Assembled machine



Fig.6. Top view of the assembled machine

## VI. WORKING

The working of this machine starts firstly with removal of the water from the tank. Now a mix of water and detergent which creates lather is sprayed all around the walls of the tank, which will help in removal of dust and mud that is stuck on the walls of the tank. Now the machine is inserted into the tank through the manhole of the tank.

The bottom of the machine has brushes which enter the tank in contracted position and when it reaches the bottom, it expands by the force applied on the brushes from the tank's base; these brushes will clean the bottom of the tank. To clean the walls of the tank we have nylon threads which scratch the walls of the tank when the motor starts rotating. This is the cleaning part.

After the insertion of the cleaning part, a stand is kept above the tank's manhole to hold the motor. Motor is then connected to

the power supply which results in the rotation of the motor since the cleaning part is connected to the motor by means of hollow steel rods the cleaning part also starts to rotating which results in cleaning of the walls of the tank due to the centrifugal force that's applied on the nylon threads and the brushes, cause of the rotating motor.

## VII. CONCLUSION

After the preparation of the design, fabrication and testing of cylindrical water tank cleaning machine, it is concluded that

- This method is more effective and safer than the conventional methods.
- This machine is capable of cleaning water tanks within less time and human effort.
- The advanced machine for tank cleaning and thus making the operation user friendly.

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