

# Designing of Semi Automated Water Tank Cleaner

## *Low cost Semi Automated Water Tank Cleaner*

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**Abstract:** Water tanks are used in domestic, commercial, and industrial sectors for daily water storage. Over time, tanks accumulate dirt, algae, sludge, and microorganisms, contaminating water and posing health risks. Manual cleaning methods are unsafe, time-consuming, labor-intensive, and often require full tank drainage. This project focuses on designing a semi-automated water tank cleaning system that improves cleaning efficiency and ensures user safety. The study aims to develop a compact, low-cost, portable system for cleaning tank interiors without human entry. The project seeks to reduce manual effort, minimize water wastage, and offer an effective solution for households and small-scale applications. The system is simple, easy to operate, and affordable, suitable for widespread use in developing regions. Technically, the system includes a rotating cleaning brush, an adjustable rod for handling, a 12V DC gear motor for brush power, and a flexible shaft connecting the motor to the brush. The flexible shaft transmits power smoothly and allows brush angle adjustment for efficient cleaning in curved or hard-to-reach areas. This setup ensures smooth brush rotation and effective removal of algae and deposits. Additionally, a 12V DC motor-powered water pump removes dirty water and contaminants during cleaning, enhancing effectiveness.

**IndexTerms - Water Tank Cleaning, Semi-Automated System, DC Gear Motor, Rotating Brush, Hygiene, Low-Cost.**

## I. INTRODUCTION

Water is an essential resource required for domestic, agricultural, and industrial activities. In most residential and commercial buildings, water is stored in overhead or underground tanks before distribution. Over time, dust particles, sediments, algae growth, and microbial contaminants accumulate inside the tank, affecting the quality of stored water. If tanks are not cleaned regularly, the contaminated water can lead to various health problems. The conventional method of cleaning water tanks involves manual labor where workers enter the tank and scrub the surfaces using brushes and cleaning tools. This method is time-consuming and poses safety risks to workers due to confined spaces and contaminated environments. Additionally, manual cleaning may not remove all dirt deposits effectively.

To overcome these limitations, the development of semi-automated cleaning systems has gained attention. A semi-automated water tank cleaner uses mechanical components such as motors, brushes, and pumps to assist the cleaning process while minimizing human effort. The objective of this project is to design and develop a simple and cost-effective semi-automated water tank cleaning system that can effectively remove dirt and sludge from tank surfaces. The system uses a rotating brush mechanism driven by a DC gear motor and a flexible shaft to clean the tank walls. A water pump is used simultaneously to remove contaminated water and sludge. The proposed system improves cleaning efficiency, reduces manual labor, and enhances safety during the cleaning process.

## II. 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.[1]

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.[2]

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.[3]

Guha, A., Ronald, M. Barron, and Balachandar, R., [2011] "Process of waterjet 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.[4]

Ms. Smitagourkheedeet, "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.[5]

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.[6]

### III. CONCEPT DESIGN

The concept of the semi-automated water tank cleaning system is based on a rotating brush mechanism combined with a water removal system. The system is designed to clean the inner surfaces of the tank without requiring a person to enter the tank.

The main components of the system include a DC gear motor, flexible shaft, cleaning brush, water pump, and hose pipe. The motor is used to generate rotational motion which is transmitted through the flexible shaft to the cleaning brush. The flexible shaft allows the brush to reach different areas of the tank. When the motor is switched on, the brush rotates at high speed and scrubs the tank walls and bottom surfaces, removing dirt, algae, and sludge deposits. At the same time, the water pump removes dirty water and waste particles from the tank through the hose pipe. This design ensures efficient cleaning while keeping the motor and electrical components outside the tank, improving safety and ease of operation.

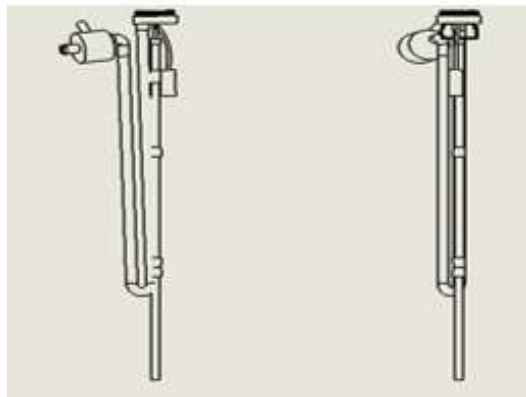


Fig 3.1 2D Diagram of Conceptual design

### IV. COMPONENTS USED

**4.1, DC Gear Motor:** 12V DC gear motor is used to rotate the cleaning brush. The gear system reduces the speed while increasing torque, allowing the brush to rotate effectively and remove dirt deposits.



Fig4.1 12V DC Gear Motor

**4.2, Flexible Shaft:** The flexible shaft transmits rotational motion from the motor to the brush. It allows movement and flexibility so the brush can reach different parts of the tank during cleaning.



Fig 4.2 Flexible Shaf

**4.3,Cleaning Brush:** The brush is attached to the flexible shaft and performs the actual cleaning operation. The rotating brush scrubs the tank surfaces and removes accumulated dirt and algae.



Figure 4.3: Brush

**4.4, Water Pump:** A small 12V DC water pump is used to remove dirty water and sludge from the tank during cleaning. This helps maintain a cleaner environment inside the tank.



Figure 4.4: Water Pump Arrangement

**4.5,. Hose Pipe:** The hose pipe is connected to the water pump and used to discharge contaminated water outside the tank.



Fig 4.5 Hose

## V. OPERATION OF THE SYSTEM

The operation of the semi-automated water tank cleaner involves several fabrication and assembly processes such as cutting, drilling, assembling, and adhesive bonding. Cutting operations are performed to shape the required components according to the design dimensions. Drilling is carried out to create holes for mounting the motor, shaft, and other parts.

Adhesive bonding (gluing) is used to secure certain components and ensure proper alignment. After assembling the mechanical parts, electrical connections are made to supply power to the DC motor and water pump. During operation, the brush attached to the flexible shaft is placed inside the water tank. When power is supplied, the motor rotates the flexible shaft, causing the brush to rotate and scrub the tank surfaces. Simultaneously, the water pump removes contaminated water and sludge from the tank.

## VI. TESTING AND RESULTS

The semi-automated water tank cleaning system was tested to evaluate its operational performance, cleaning efficiency, and reliability. The testing was conducted using a domestic water storage tank containing artificial dirt, algae deposits, and sediment layers to simulate real tank conditions. The main objective of the test was to verify whether the developed system could effectively remove contaminants from the tank walls while reducing manual effort and cleaning time.

**6.1 Testing Procedure:** The system was assembled and powered using a **12V DC power supply**. The rotating brush connected to the **12V DC gear motor** was inserted into the tank using the adjustable guiding rod. When the motor was switched on, the brush started rotating and scrubbing the inner surfaces of the tank. At the same time, the **12V DC water pump** was activated to remove dirty water and loosened sludge from the tank.

During the testing process, several parameters were observed such as brush speed, pump discharge rate, cleaning time, and overall cleaning efficiency. The performance of the system was carefully monitored to ensure smooth operation of the flexible shaft and motor without vibration or overheating.

**6.2. Observations:** The rotating brush effectively removed algae and dirt from the tank walls. The flexible shaft allowed the brush to reach curved and corner areas easily. The water pump continuously removed contaminated water and debris during the cleaning process, improving the overall cleaning effectiveness. The system operated smoothly without mechanical instability.

### 6.3. Performance Results:

Sl. No	Parameter Tested	Observed Value
1	Motor Voltage	12 V DC
2	Brush Rotation Speed	~60 RPM
3	Pump Discharge Rate	~18 L/min
4	Cleaning Time	15 – 20 minutes
5	Cleaning Efficiency	High

Table 6.1 Performance Analysis

### 6.4. Result Analysis

The testing results indicate that the developed water tank cleaner operates efficiently with reduced cleaning time and minimal manual effort. The rotating brush provided effective scrubbing action while the water pump removed loosened contaminants from the tank. The system proved to be reliable, safe, and suitable for cleaning domestic water tanks.

Overall, the experimental results confirm that the proposed semi-automated water tank cleaning system improves cleaning efficiency and provides a practical solution for maintaining water hygiene.



Fig 6.1 final project

## VII. CONCLUSION

Water Tank Cleaner design and fabrication are complete, marking a milestone. The goal of a compact, low-cost, efficient cleaning device has been met, reducing effort and improving hygiene. This system uses 12 V DC motors for brush rotation and water suction, ideal for household convenience. Engineering Success: The DC motor's integration with the flexible shaft enables smooth motion to the nylon brush for effective cleaning. This design removes algae, sludge, and sediment from tank walls and bottoms, ensuring clean water. The custom PVC impeller pump efficiently removes large volumes of water and debris. The adjustable rod mechanism allows flexibility to reach different tank depths, validating the design for various tank sizes. Operational Efficiency: Testing confirms this device reduces manual labor and cleaning time significantly. It also eliminates the need for workers to enter the tank, enhancing

safety. In a study, the Water Tank Cleaner cut cleaning time by nearly 50% compared to conventional methods, proving effectiveness. Sustainability: Low-voltage DC motors reduce power consumption, making the device eco-friendly. The PVC frame and reusable components enhance cost-effectiveness and support sustainable maintenance. In conclusion, this project shows affordable mechanization can improve water tank maintenance, enhance safety, and promote better hygiene. The Water Tank Cleaner exemplifies technology's potential in addressing household challenges.

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## REFERENCES

- [1] Davis, J. and Lambert, R., [2002] “state there are three steps for conventional and disinfecting a water tank”.
- [2] B Jachaket “Computerized Underwater Robot to Clean Water Tank”. Volume:2, Issue:4, 2011.
- [3] Shubham Shrivastav, Hari Om Kumar, “Design and Development of Cylindrical. Water tank cleaner”, IEEE Trans. Commune., vol. 6, no. 1, pp. 1-7, Feb. 2016.
- [4] 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.
- [5] Ms Smita Gourkhede, “Design and Fabrication of Drain Cleaning Machine
- [6] Ahmad Athif Mohd Fau
- [7] dzi, “Clean Water Supply is Important in Ensuring Good Health of people.

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