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# Underwater Tank Cleaning System

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*Abstract:* The "Underwater Tank Cleaning System" concept presents an innovative solution for effectively cleaning debris from the surface of underwater tank. The system utilizes a PMDC motor as its driving force, a diaphragms water pump and filtration bag is used to efficiently remove contaminants. A suction pipe is employed to facilitate the intake of debris into the system. Additionally, to ensure operational safety and longevity, a thermistor is integrated to monitor and regulate motor temperature underwater. To enhance user interaction and control, the system is equipped with a Cam Development Board (ESP32). This allows users to monitor and manage the cleaning process via wired connection, providing real- time feedback and control capabilities.

***Keywords*- PMDC Motor, Flow Meter, filtration Bag, SMPS, brush**

## I. INTRODUCTION

Water tanks are essential for storing water used in numerous activities like drinking, farming, firefighting, and industrial processes. They come in various designs and can be made from different materials such as plastics, fiberglass, concrete, stone, or steel. These tanks play a crucial role in providing safe drinking water and supporting various agricultural and industrial needs. They are particularly beneficial in developing countries where access to clean water is limited. Having access to safe drinking water is vital for ensuring people can lead healthy lives. The water is often tested daily, if the chlorine residual goes down, operators do not ask why and they just add more chlorine. After a long time, the additional chlorine breaks down and becomes contaminate in the tank that can cause cancer [1]. Instead of constantly adding more treatment chemicals, cleaning sediment from the floor of tanks is a better solution. Traditional cleaning methods are often labor-intensive and time-consuming, requiring manual intervention and significant resources. To address these challenges, the "Underwater Tank Cleaning System" presents an innovative solution leveraging modern technology and engineering principles. In water storage facilities, the maintenance of water quality involves the cleaning of floor and walls of water tank that stores the water [2]. The maintenance of underwater tanks, whether for industrial, agricultural, or recreational purposes, poses unique challenges due to the accumulation of debris and contaminants on the tank's surface. “Design and manufacture of drain cleaning system" In this task, the building drain cleaning mechanism is quite straightforward, requiring minimal equipment for the system. Electric motor, bearings, belts, pulleys, and other minor parts like angle bars, etc. make up the majority of its components. With the help of this equipment, the trash is cleaned from the drains, which partially cleans the garbage [3]. Clean water is essential for everyone's health. Tanks are used to store water and distribute the water supply. The quality of the water that consumers use will decline over time as sediment builds up in water storage tanks. Operators of water utilities or companies that offer tank cleaning services are obliged to clean water storage tanks once every three years [4].

## II. METHODOLOGY

It would use suction pipe to suck various types of debris that are found in underwater tank including algae, mold, rust, sediment, sand, organic matter, and sometimes even stone. These materials may need to periodically remove to maintain the tank's efficiency and prevent clogging or contamination issues.

It would use PMDC motor serves the purpose of driving the cleaning mechanism jets, suction devices, to remove debris from tank's surface. The PMDC motor provides the necessary power and torque to operate the cleaning equipment efficiently underwater (compact size, high efficiency, precise speed control).

The key components would include a dc motor, an intake hose or nozzle, and porous bag to capture particles. The motor creates a pressure difference that causes air to be drawn in, carrying debris with it into the collection tank.

The porous bag is used to capture the debris that are found in tank's surface. It will also capture large debris such as stones, leaves, twigs, that may have fallen into tank, or other sizable particles from entering the potentially clogging the cleaning equipment or the plumbing system.

## III. FILTRATION PROCESS AND CONTROL MECHANISM

The water suction and filtration process is shown in fig.1, for which it uses water suction element from which it will take in the water and the debris of tank's surface that will go through primary porous element. An 800 LPH high flow suction pump will create pressure difference causes air to be drawn in carrying debris with it into the secondary filter element and the water flow sensor will sense water flow after that clear water will become out.

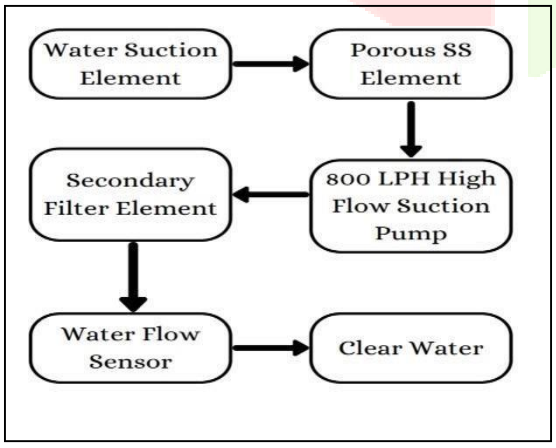


Fig.1 Water Suction and Filtration Process

The control mechanism is illustrated in fig.2, featuring an Arduino microcontroller connected to a 16*2 LCD display. It receives inputs from robot control switches, filter switches, and a water flow sensor, and provides outputs to a relay, relay driver, and buzzer. To power the Arduino and camera module operating on 5 V DC, an SMPS converts 230 V AC to 12 V DC, which then feeds into a buck converter to obtain 5 V DC. The relay and relay driver control the 230 V AC water pump, left motor, and right motor responsible for propelling the system's wheels.

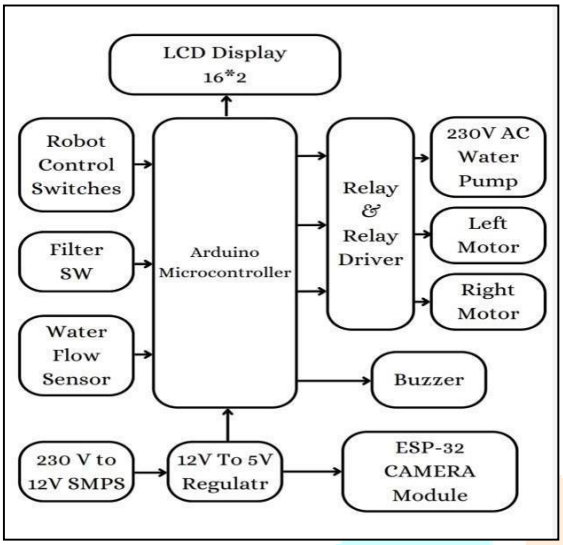


Fig.2 Controlling Mechanism

A porous bag is represented in fig.3, serving as a garbage bag within the system. These filtration bags are designed to eliminate debris and sediment from the water, preventing blockages in nozzles and other equipment.

Fig.3 Filtration bag

A picture of a water flow sensor is displayed in fig4, which is crucial for detecting how fast water moves through the system. These flow meters help regulate the amount of fluid used, preventing unnecessary wastage and ensuring effective cleaning.

Fig.4 Water Flow Sensor

A motor is illustrated in fig.5, utilized to draw water from the tank. This motor provides the necessary power to operate pumps or agitators, essential for circulating water or cleaning solutions within the tank.

Fig.5 Water Pump

## IV. ADVANTAGES OF FILTRATION SYSTEM

**Efficient Cleaning**: The main aim of the system is to effectively cleanse the tank's interior surfaces, eliminating debris, sediment, algae, and other particles.

**Enhanced Water Quality**: The cleaning process should result in improved water quality within the tank, ensuring it complies with necessary standards for its designated use, whether it be for drinking water, industrial applications, or other purposes.

**Cost Efficiency**: By reducing the frequency of manual cleaning or the reliance on costly specialized equipment, a well-designed cleaning system should offer long-term cost savings.

**Safety**: Prioritizing safety for both personnel and the environment is crucial. This involves minimizing risks associated with entering the tank for cleaning and ensuring the use of safe and environmentally friendly cleaning agents.

**Automation and Management**: Ideally, the system should incorporate automation and control functionalities to streamline the cleaning process, enabling operators to monitor and adjust cleaning parameters as required.

**Infrastructure Longevity**: Regular cleaning helps prolong the lifespan of the tank and associated infrastructure by preventing corrosion, deterioration, or other damages caused by accumulated debris and contaminants.

## V. CONCLUSION

In conclusion, the creation of an underwater tank cleaning system has several advantages, such as effective cleaning, improved water quality, cost savings, safety assurance, and long-term infrastructure longevity. The automation feature offered by the system is excellent. This device solves the problems with conventional tank cleaning techniques by leveraging cutting edge technology and creative design. Because of its capacity to function in submerged situations, it is an invaluable tool to a variety of businesses. This technology has the potential to completely transform underwater maintenance procedures and advance environmental sustainability with more development and application.

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