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AUTOMATIC WATER TANK CLEANING SYSTEM

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ABSTRACT

This paper aims to develop 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 the 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 the inside diameter of the tank. When the motor is started the linkage rotates and with the help of brushes, cleaning of the wall and base of the tank takes place. The purpose of this project is to reduce human efforts and to avoid the chemical influence on the health of a 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. The purpose of this paper is to clean the domestic cylindrical water tank with the help of a 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 the 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 the reduction of cost and 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. The water tank can also be cleaned by using chemicals to remove the dirt and sediments. The chemicals used may affect human health. Pressurized 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. To find such an approach, there is a need of studying the existing approaches and algorithms that had already been used for automatic overhead water tank cleaning systems. This motivates us for the literature review. The organization of this paper is as follows. In Section 2, a systematic presentation of the literature review is done, which involves the list of the related approaches along with the summary of the related work that is more relevant to the developed approach. Section 2 concludes with our findings from the literature review and the motivation behind identified problems.

INTRODUCTION

Cleaning is the process of removing unwanted substances, such as dirt, infectious agents, and other impurities, from an object or environment. Cleaning occurs in many different contexts, and uses many different methods. Several occupations are devoted to cleaning.

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.

Every day we use the tank water for brushing and bathing, for cleaning and moping, for washing clothes and in other household chores. With the passage of time, sediments scale and algae get deposited on the walls, ceiling and floor of the water tank. This can 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. . Manual Cleaning water tank method is the traditional method of cleaning the water tank where a labour would get into tank and scrub the wall. The water tank can also be cleaned by using chemicals to remove the dirt and sediments. The chemicals used may affect the human health. Pressurized 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 efforts for cleaning. Tank cleaning is extremely hazardous activity. When working in confined space personnel are exposed to a number of hazards that in some cases have led to injury or even death. There are various definition of a 'confined space' through are consistently applied. "a place which does not have benefit of natural ventilation" and, "a place which difficult to enter therefore present hindrance to rapid escape in case of an emergency."

Cleaning overhead water tank on your own may be difficult because you need different types of tools, equipment and most importantly the time. However, overhead water tank cleaning is important too and it must be cleaned at least once or twice a year. A Dirty overhead tank can be terrible because it will accumulate dirt that can easily dissolve in the water contained in it.

Frequency of overhead water tank cleaning completely depends on the quality of the water being supplied in your area. If you are supplied with hard water or water containing solvents, then you need to clean your tank more often, at least more than once or twice a year. And to ensure better and effective cleaning you can hire professional water tank cleaners, because they have trained employees and proper equipment to clean overhead water tank.

Reasons for Cleaning Water Tanks:

If you need to know some more important reasons to clean your water tank, then here are the three main reasons why cleaning your water tank isnecessary:

1) Waterborne Internal Diseases*:* If you keep your water tanks uncleaned for months, there are high chances that many bacteria or virus will contaminate the water. In addition, if harmful bacteria and virus contaminate your tank water, then there is a high chance for you to get sick along with your family. Internal water-borne diseases such as diarrhoea, typhoid and cholera are the most common type of diseases in India that is caused by contaminated water. Usually, this happens in the case of drinking contaminated water from outside; but still, if your water tank remains untidy then these diseases can hit you through your overhead tank. Sometimes, malaria is also caused through water; therefore, keep the lid of your tank shut, so that mosquitoes cannot breed there.

2) Skin Diseases*:* Why just internal diseases, contaminated water can also cause skin diseases. It is obvious that you would not be using your tank water just for drinking right. You will bathe with it and wash your clothes and utensils. Therefore, while you keep in touch with such contaminated water, some skin diseases can definitely attack you. You must know that hard water ruins your hair, right. Similarly, if your water contaminated by some toxic matter or some germs, don't you think it will harm your skin? Of course, it will! Do not think just ground water can cause skin diseases, an uncleaned tank may also result in contamination of water.

METHODOLOGY

The whole project is categorized into two parts:

a. Mechanical System

b. Electronic System

a. Mechanical System:

Mechanical Hardware is a structural design based on motors. There are two circular gears which supports the one linear gear DC gear motor which is operated at 12V and have 30 rpm, below the linear gear an another DC gear motor with 100 rpm configuration attached with L-shape brush which rotate and clean the side wall and bottom of water tank as motor rotate.

b. Electronic System:

In this section, a mud detector water quality sensor is used which is attached to the mechanical hardware and controlled by the Arduino-UNO microcontroller. To provide interactionbetweenmicrocontrolleranduser ,aphotodiodesensorisused,sothattheuserca n interact with what is going on the microcontrollerside.

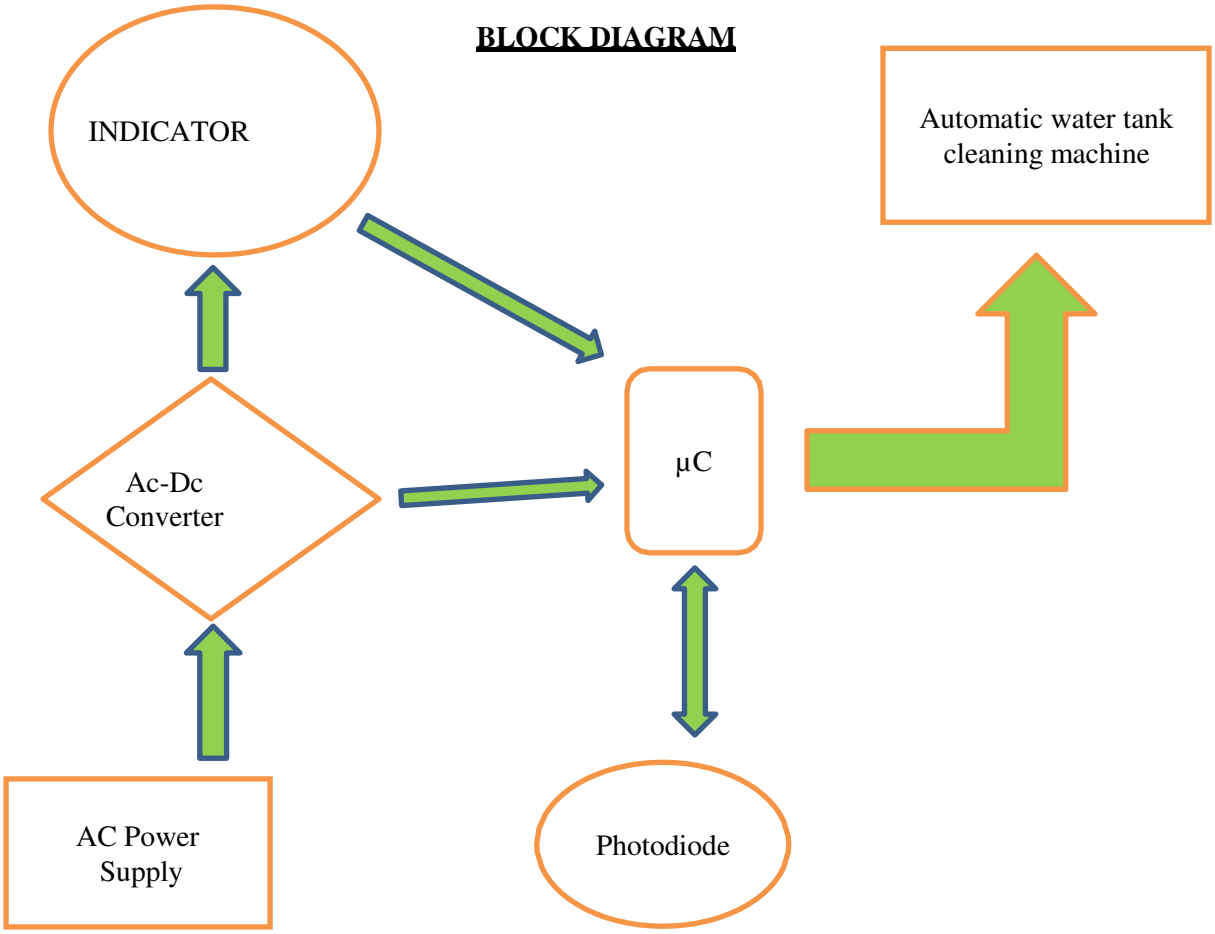
When the power supply is on, the first water quality sensor comes into play and sends the data about the quality of water to the microcontroller using which process this data according to the health standards. With the help of photodiode, the microcontroller sends an alert message to the user.

Themicrocontrolleractivatesthesolenoidva lvewhichallowstheextrawatertoflowoutfro m the tank while in between when the water level reaches a lower level; microcontroller deactivates the solenoid valve so that flow of water gets stopped. Then the motors which are mounted on the top of the water tank. After that, all remaining muddy water again flows out from the solenoid valve. Now, the water tank is getting cleaned andempty.

CONCLUSIONS

This project will consume less human efforts and time and proved to be more effective and safe.It also contributes to reduce health issues which arise due to unclean water.

BLOCK DIAGRAM



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