

Design and Fabrication of Automatic Sediment Preventor in Tank

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Abstract:-The main objective of this project is to design a prototype that can able to prevent the precipitation and sedimentation of sludge and algae in the tank without using any external forces. Most of us use plastic water tank to store the water in our home. If we do not clean the water tank for a long time then the sludge will precipitate on the inner wall of the tank. The precipitate may be harmful when mixed in water. The precipitates settle at the bottom. By using the buoyancy force of the water, a Float (low density material) is made to float on the water surface. A brush like material with rough surface fixed below the float which in contact with inner surface of the tank is used to clean the sludge formed in it and rises or goes down according to the change of water level. A filter is used at the bottom of the setup. Removed sludge will gets settled on the filter. After few months the setup can be taken from the tank, cleaned and can be placed again. The precipitation formed in the tank can be easily prevented by using this simple setup. This project will prevent the sediments and also reduces the risk of diseases which occurred due to the precipitation and sedimentation of salt.

I. INTRODUCTION

All water tanks accumulate sediment over time. The soft sediment in the floor of the water tanks becomes a safe habitat for microorganism like bacteria, protozoa and virus etc. No one think about the sediment and precipitation. The AWWA (American Water Work Association) recommends that water storage tanks be cleaned every 3 to 5 years or as needed. The EPA has published multiple white papers about contamination of public water systems and the importance to keep free of sediment. Sediment is the settlement of solid particles the water tanks. Precipitation is process of precipitating a substance from a solution. For a long time without cleaning the water tank, salts can precipitate on the inner walls and also in the bottom. We should clean that precipitation otherwise it should mix with the water. Due to that human health will be affected in direct and indirect ways.

A. Objectives

The main objective of this project is to prevent the formation of sediments in water tanks without using any external force. We use only the buoyancy force for cleaning

and to reduce the human effort and wastage of time in cleaning the tank manually

B. Principle

The basic principle automatic sediment preventer is “BUOYANCY FORCE”. Buoyancy force is nothing but “a force exerted by any fluid on the object when it is immersed in the fluid”.

II. DESIGNS AND FABRICATION OF ASP

The experimental model of ASP mainly consists of water tank, supporting rod, float and folder, filter, cleaning ring, hub and nylon thread. Each component has been explained in the following sections.

A. Water tank

Water tanks are an efficient way to help developing countries to store clean water. A Water tank is a container for storing water. The need for a water tank is as old as civilization, to provide storage of water for many application, drinking water, and irrigation agriculture, fire suppression, both for plants and livestock, chemical manufacturing, food preparation as well as many other uses. Various materials are used for making a water tank: plastics, fiberglass, concrete and stone, steel also function as water storages. By a design a water tank or container should do no harm to the water. Water is susceptible to a number of ambient negative influences, including bacteria, viruses, algae, changes in pH and accumulation of minerals.

B. Supporting rod

The rod is used to support the whole setup which is made up of STAINLESS STEEL. Supporting rod is made up of STAINLESS STEEL pipe, which gives support to all parts in the setup. The properties of stainless steels can be seen when compared to standard plain carbon mild steel. Although stainless steels have a broad range of properties, in general, when compared with mild steel, stainless steels have: Higher corrosion resistance, higher cryogenic toughness, higher work hardening rate, higher ductility, higher strength and hardness, Lower maintenance.

C. Float

Float is a low density material which can easily float on the water. It can lift the whole setup upward and downward according to the change in water level. Float is made of polyethylene which is light in weight and does not react with water, it has very high pressure inside, so it makes the whole setup to float over water.

D. Folder

Folder is used to fold the filter when we take the whole setup from the tank. It consists of two rods connected with hinges. Hinges are one way closing mechanism which helps the rod to be placed in equiaxial position. It is made up of STAINLESS STEEL. It also acts as a base for the filter. It is square in shape and it moves only in upward direction at hinged place.

E. Filter

Filter is used to prevent the mixing of collected sediment with the water. The water filter removes impurities from water by means of a fine physical barrier. Filter filters dust particles from water to different extents for purposes such as providing agricultural irrigation, accessible drinking water, public and private aquaria. Sponge is especially good at absorbing water and 3 water based solution. Sponges are commonly made from cellulose wood fiber or foamed plastic polymers.

F. Cleaning ring

It is a ring which is in contact with the inner wall of the tank. It cleans the sediment in the wall by the friction. It is a ring like structured element which will always in contact with inner surface of the tank. Rough surface will develop enough friction with inner surface of the tank to clean the precipitation.

G. Hub

Hub is hollow cylindrical element which is made up of PVC (Polyvinylchloride) Pipe. It is used to hold the nylon thread, when we pull the hub upward folder will fold easily.

H. Nylon thread

The thread is used to connect the hub and the folder. Polyethylene is the most commonly used plastic. Its primary usage is in packaging. Polyethylene is low strength, hardness and rigidity, but has high ductility and impact strength as well as low friction. Most PE grade have excellent chemical resistance, mean that they are not attacked by strong acid or strong bases, and are resistant to gentle oxidant and reducing agents. Polyethylene absorb almost no water. Nylon thread is a

thread which is used to connect the folder and the hub. It also provides external support to the whole set up.

I. Steps involved in installation of automatic sediment preventer (asp)

STEP 1: Modify the inlet of the water tank according to the folder diameter when it is in folded state. STEP

2: Clean the tank perfectly before we fix the setup in the tank. STEP

3: Pull the hub to fold the folder and then we easily fix the setup in the tank and leave the hub inside the tank. Folder will return to the normal position. STEP

4: After few months, the setup is taken from the tank and the precipitate will be removed from the filter. After cleaning the filter, it is replaced again in the water tank.

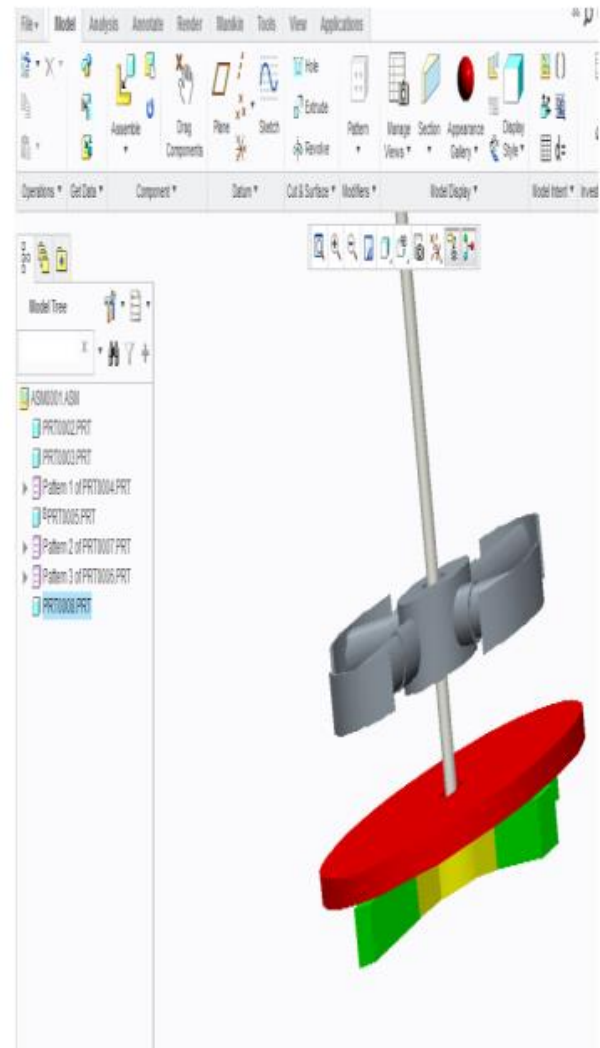


Fig. 1:- Modal of ASP

III. WORKING OF (ASP)

It works simple principle that “due to buoyancy force low density material can easily float on the water”. BUOYANCY FORCE is a “force exerted by any fluid on 4 the object when it is immersed on the fluid”. Due to this low density material can easily float on the water surface. In the supporting rod, folder is fixed at the one end. Filter is fixed in the folder by using the silicon gum. The small STAINLESS STEEL rod is extended from the folder where the cleaning ring is fixed.

At the other end of the supporting rod float will fixed, over that hub is fixed. Hub will free to slide on the supporting rod, in which nylon thread from four arm of the folder will connected to the hub separately. The water from the inlet pipe enters into the tank. Initially the setup will be at the bottom when the water level rises float will rise according to the water level. While the float rises the whole setup will lifted, due to that cleaning ring will in complete contact with inner wall. Friction will created between the wall and the cleaning ring, due to the rough surfaces on that ring.

Due to the friction, precipitate will remove from the surface and mixed with water. Mixed precipitate will settle down at the filter due to the “GRAVITY”. If we empty the tank, setup will come to the bottom due to their self weight. In this also gravity plays the major role. Due to this formation of precipitation will be prevented by this small setup.

IV. RESULT AND DISCUSSION

The salt precipitates in the inner wall of the tank and also settles at the bottom. The automatic sediment preventer we prevent the precipitation of the salt completely without using any external force. It needs only natural force namely

- Buoyancy force
- Gravity force

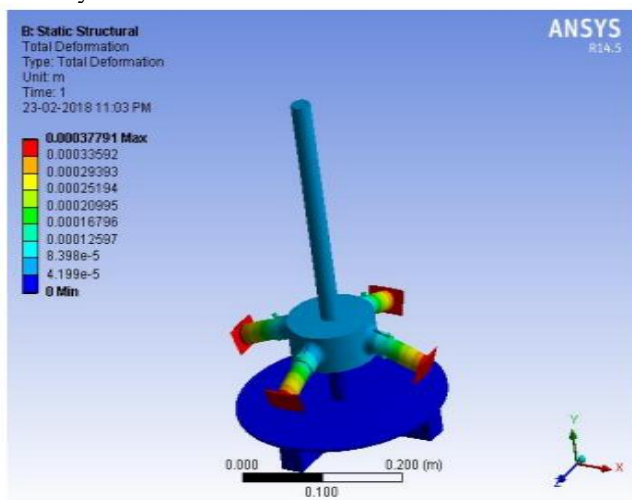


Fig. 2:- Analysis of ASP

This analysis shows that this setup can easily withstand the pressure created by the impact of water up to 10 N/m². By using this simple setup precipitation of salt can be prevented. It consists of simple parts so the cost of whole setup is very low and the part can be easily replaceable.

V. CONCLUSION

The automatic sediment preventer is used to remove the sediments from the tank. These are used to reduce human effort required for cleaning the water tanks. It will be commonly used in all houses and factories. It is easily surmountable and it is light so that it can be carried easily. The filter which is used can be reusable when cleaned.

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