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A Review on Sheet Molding Compound Panel Tank

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Abstract: *In this project we are attempting to study about the Sheet molding compound [SMC] panel tank benefits objectives necessities advantage and disadvantage and there uses the capacity of this is 25000 liters and compression is made with other tanks. By using the different types of software, we can make the models by using AutoCAD, Staadpro and RIVET, various types of loads also can be resisting This type of tank can be calculated by taking references of an IS code 875 Part 3. Where test is can be done that which are not done on it.*

I. INTRODUCTION

Sheet molding compound [SMC], it is a panel which is used in panel water tank. It is a German base technology. This panel water tank is mostly used for industrial purpose and a has a water storage tank in rural areas. It is an over headed water tank. The main advantage of this tank that it can be easily assemble and dismantle the tank because it is fitted with bolts and external bracing. In this project we are going to study the detail about SMC (sheet molding compound) panel water tank, the durability of the tank, the various tests done on panel water tank. We are gathering information from websites. Which are mentioned below in the references.

II. NEED OF THE SMC PANEL TANKS

Majorly tanks are used to store water for the further uses. The main problem of other tank is that the water can't maintain the water quality for long time. By these problems bacteria can be form or any other diseases should form. For this purpose, these types of tanks are very use for preventing the bacterial free water and also to prevent from algae. These tanks can use in various temperature for better water quality for a long time. These types of tanks are very beneficial for India to reduce the diseases which are highly growing now days. As per the WHO [World Health Organization] recommends, the water Quality is important, also in emergency situation like drought, which the stored water can be useful for making food purposes, if the water is drinkable. As we mention our tanks can prevent from bacteria and other diseases [1].

III. SHEET MOLDING COMPOUND PANEL TANK [SMC]

Sheet Molding Compound it is a panel [SMC] which are used in water tanks to store the water. SMC composition is complex mixture of resins and various ingredient fillers, catalyst, thinner etc. The initial purpose SMC water panel tank is to secure the water from bacterial and climatic condition and also to maintain the quality of water for longer duration of time. This tank panels have a upside down structure which makes the water still. The tank has the highest safety factor of bearing strength up to the maximum load. No metals are in contact with water and does not prevent any corrosion. The material used in this tank for the ladder is hot dip galvanized, so it prevents from corrosion. The material used for panels are non-toxic and having a smooth surface with concave and convex structure which allows the pressure at joints and the joints are sealed with non-toxic polyvinyl chloride [PVC] solvent.This panels are having external support with external bracing with bolted connection this makes the panels and tank easy to relocate and to extend or to reduce the size of the tank .

IV. REQUIREMENT OF SMC TANK

- In this tank bacteria or germ formation and their growth can be prevented by blocking the UV Rays from the sunlight.

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- The water tightness in this tank has elasticity and resilience Features which assures the Perfection of Water Thickness.
- The panel tanks can be used in any type of temperature, like in low and high environment.
- The various load can be resisted on this panel tank for long duration of time.
- The size of the tank c
- The Life Expectancy of SMC water tank is about 40-50 Years.

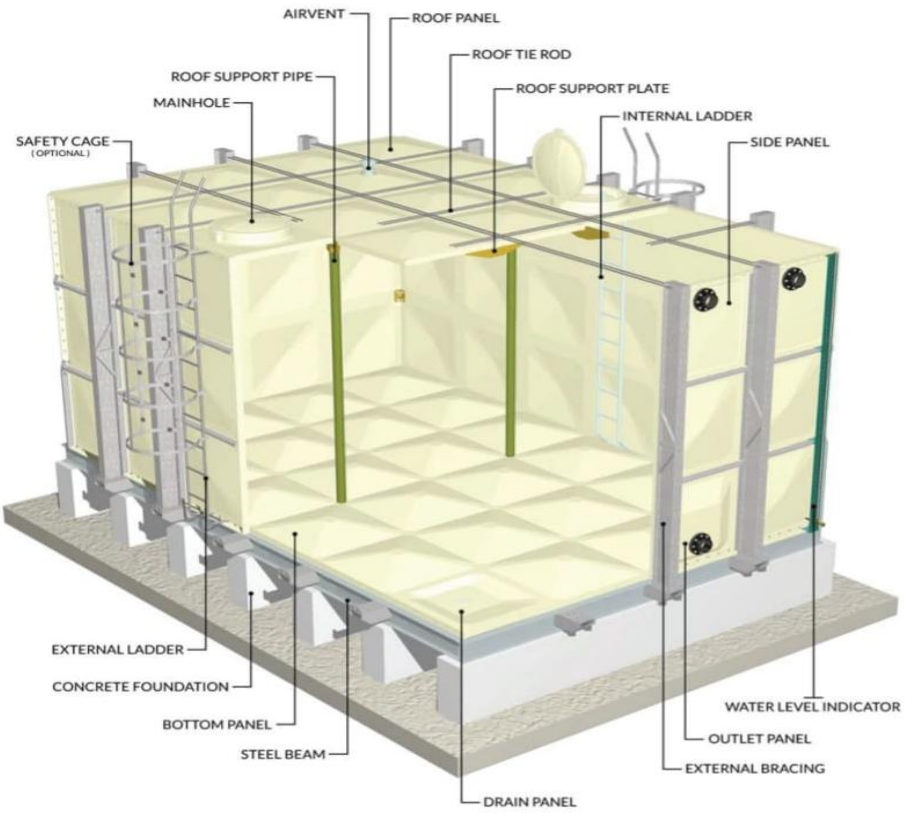

Fig 1. Details of Sheet molding compound tank (4)

V. COMPONENTS PARTS OF SMC PANEL TANK AND THEIR FUNCTION

1. **Concrete Foundation:** It is a structure built at the bottom of the surface to resist the load of the SMC Panel Tank and to have a strong surface to rest the tank on that surface.
2. **Steel Beam:** These are a structure build above the concrete foundation to give the support to the panel tank and also to transfer the load of the tank to the foundation.
3. **Bottom Panel:** It is a layer of number of panels join with the steel beam, it is a bottom layer of the SMC Panel and the shape of inner panel is convex to transfer the load to the joints of the panel and having a smooth surface to resist the growth of algae.
4. **Side Panel:** This panel is use to cover the sides of the tank which is connected with bottom panel, steel beam, external bracing and roof tie rod.
5. **Drain Panel:** It is a panel fitted at the bottom corner of the tank to drain the water from the tank. The shape of this panel is in concave. By having convex panel inside, the flow of water makes easy to drain out.
6. **External Bracing:** It is a structure provided to give the support to the side panel and these bracing are joint to steel beam and roof tie rod with bolts and nuts connection.
7. **Outlet Panel:** In this panel the outlet is provided to connect the pipe and distribute the flow of water.
8. **Water Level Indicator:** This instrument is used to indicate the water level.

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9. **Manhole:** These are a structure made to inspect the tank from inner side of tank.
10. **Inner Ladder:** These are a structure made inner side of the tank for inspecting the tank from inner side of the tank.
11. **External Ladder:** These ladders are used to reach the manhole for inspecting the tank.
12. **Roof Panel:** These panels are used to cover the upper side of the tank and also to give support to side panels and roof tie rod.
13. **Roof Support Plate:** This Plate is used to support the panel from inside the tank.
14. **Roof Tie Rod:** The tie rod is use to give support to Panel and also to the external bracing.
15. **Air Vent:** Air vent helps in the easy circulation of air in overhead tank.
16. **Roof Support Pipes:** These pipes are used to support the roof panels. These pipes are made with.
17. **Safety Cage:** The safety cage is made for the safety of the person who is going to inspect the tank.

VI. METHODOLOGY

Survey the area and take the measurement where the foundation of the tank is to be built, Site clearance should be done before theconstruction of Foundation is built , Construction of steel beam above the foundation , Assemblingthe panels , joining panels with the help of nut bolt and external bracing, external ladder should be joint at the external bracing and side panel , roof tie rod should be placed at the roof for the support at the roof panel , manhole and air vent is provided , inner ladder should be joint inside the tank for the maintenance [2].

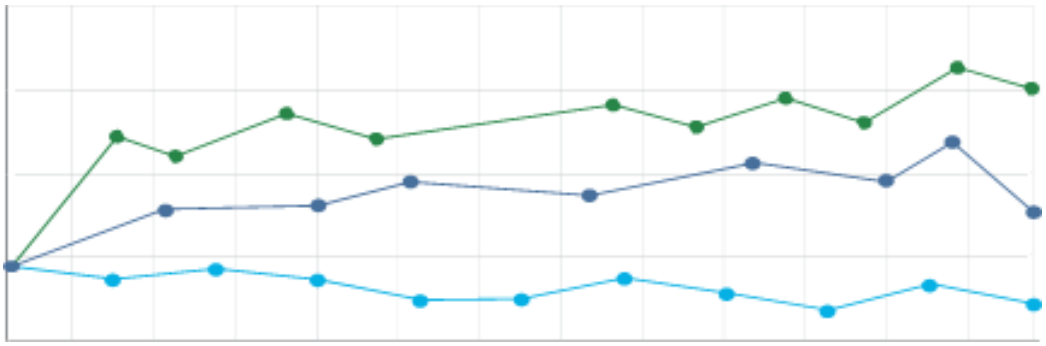
VII. DESIGN OF PANEL TANK

Design of Panel tank using FEM method using various software like Auto Cad, Staad Pro, Etc. The SMC panel with minimum of 75mm flanges at every side of panel Roof Panels: 1000 X 1000 X 75mm the resting on ground and whose walls are rigidly joined at the vertical and horizontal edges [2].

Some Static analysis of elevated water tanks can resist the conversion of seismic load in equivalent on static loads. As per the IS 1893-2003 has provided the method of analysis of elevated water tank from the seismic load. These tanks are analyzed by both the condition i.e., fully filled by water and in empty conditions. For both the conditions the tank can be idealized for a one mass structure. For the large capacity of tanks, are more precise. Historically the loads are depended on various types of area which can affect the panel tank, That's why the area becomes more important for various types of loads such as seismic load. The condition should be beneficial for the tanks as much they can resist the load.

Dynamic response of elevated water tank is not simple to define the behavior of tank is not predictable. Dynamic problem of the storage water tank is not simple as it is because of the structure of the panel tank. Base on various experiments, studies, calculations on the panel are developed to calculate hydrodynamic forces [3].

Expansion and contraction due to temperature variation is shown graphically in the figure no 2



016 324864 8096112 128144160 176 192208

(HOURS)

WATER TEMPERATURE VARIATION

SPT Insulated SPT NORMAL STEEL

Fig No 2: Graphical representation of Expansion and contraction due to temperature variation Temperature Variation

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Thermal Properties

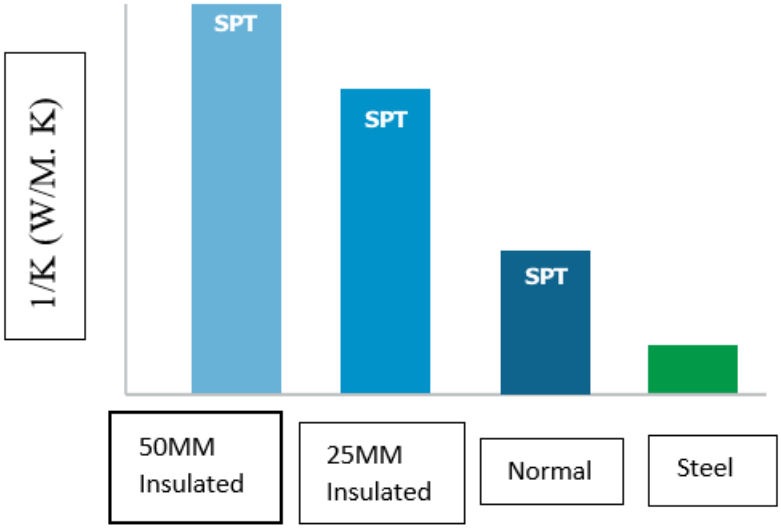

Fig No 3: Thermal properties[4]

VIII. COMPARISON WITH CONVENTIONAL METHODS

This type of tank can maintain the water quality hygienic as compare to the other water tank which is made. In this panel tanks the material is used are more flexible as compare to the other water storage tank like RCC, Plastic and Steel tanks. These tanks are more thermal conductive as like to the other tanks. Major comparison where taken that is durability and strength of tank for the longer duration time. The drainage of this tank can be done by given the drain panel and as compare to other tank the drainage is not provided. There is no problem of water leakages because of the panel arrangement and simplification of the tank due to additional support of outer bracing with bolted connection this make the water tank easy to fit and as compare to the other tank these facilities are not provided or this type is not use. In this tank the flow of the water is in downstream to upstream because of structure of panel made inside is in convex as also compare to other the flow is straight as the tank made.

In this tank sunlight or UV rays does not pass inside the tank, as it prevents from bacterial free and algae free as compare to other tanks there are highly chances which can affect by algae and other bacteria inside the tank [4] .

IX. VARIOUS TEST DONE ON THE SMC PANEL TANK

The Panels are tested by various test such as Tensile Strength at break of panel as per IS 14399 (Part1) 1996, Bending Strength (Cross Breaking) of the panel which is proven as per IS 14399 (PART1) 1996. This panel is tested as Fire Retardant [4]

X. BENEFITS OF SHEET MOLDING TANK

This type of panel tank is easy to assemble and dismantle.

- It is 100% weather resistant.
- It is light in weight and extremely stronger panel.
- These panel are moisture and rot proof
- The water stored in tank is 100% safe for drinking.
- The size of the tank can vary up to own choice.
- The time period for building the standard size of the tank is 1 day.
- This tank is easy to dismantle and relocate.
- This tank is corrosion free tank, no metal parts are come to the contact of water
- This tank isless costly than RCC Tanks

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- This tank Requires less maintenance as compared to other tanks
- This tank is very easy to install or assemble
- This tank doesn't require any skill labors for installation
- Materials used in this tank are easy to transport.
- Ideal for storing water from subzero to higher hot climates

XI. CONCLUSION

SMC panel tanks [Sheet Molding Compound] is very use full for human safety regarding to the quality of drinking water. That The SMC Panel Tank contains most of the Durability Rather than Any other Tank [i.e., RCC tank, Plastic Tank Etc.]. The SMC Panel Tank Have the Highest Safety Factor of 6 times Bearing strength above Maximum Anticipated Load [5].

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