

Estimation of Evaporation by using “SSV’s Evaporation Pan” method.

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Abstract – Evaporation is the process by which water is changed to vapours (the gaseous state) at the free surface, below the Boiling point of water. Evaporation occurs when molecules of water attain high kinetic energy to eject themselves from the water surface into the atmosphere. The rate of evaporation depends upon a number of factors, such as Temperature, Wind, Atmospheric pressure, Impurities in water, Shape and size of the water surface and nature of the surface.

Estimation of amount of evaporation is required for the planning and operation of various irrigation and water resource schemes. Estimation and control of evaporation is extremely important in arid regions where the water resources are limited. Evaporation is usually estimated as the depth of water lost per day in centimeters. Already there are lots of Evaporation pans are available, such as U.S. Class A Evaporation pan, Colorado Sunken pan, U.S. Geological Survey floating pan and IS Standard pan. In this SSV’s Evaporation pan some of the modifications are done which gives the certain percentage of equal evaporation values as observed in case of Lake Evaporation. The result value of SSV’s Evaporation pan considered the different factors such as Temperature, Waves generated by wind pressure and the different type of soil composition present at water body exposed to sun rays.

Key Words: Pan Evaporation, Pan Modification, Temperature, Soil composition, Water waves, Lake Evaporation.

1.INTRODUCTION

The water scarcity is the main problem which is indian people facing mostly. There are lots of responsible factors such as Evaporation, transpiration and many mores. In case of Evaporation there are lots of methods which are used on the actual site to measure the Evaporation rate of water body. In this paper we discussed the new method that is SSV’s Evaporation Pan method to measure the Evaporation of water body by comparing the readings of pan and water body.

SSV’s Evaporation Pan:

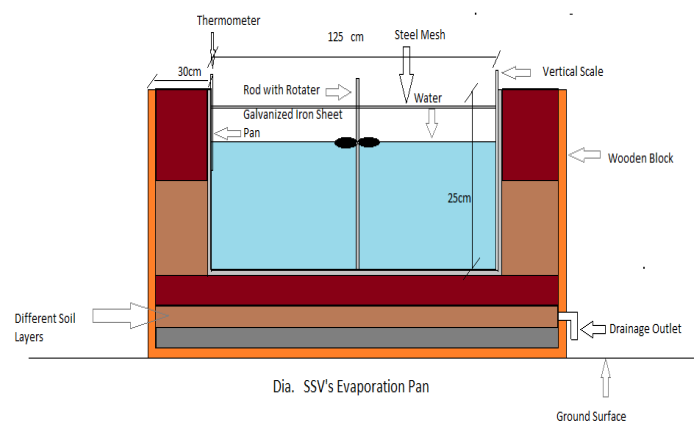


Fig.1 SSV’s Evaporation pan

Making of SSV’s Evaporation Pan :

- 1) **Plain Ground Surface :** The pan is totally resting upon the Plain Ground Surface which gives the levelled terrain to pan , it causes the equal water level readings are observed on vertical depth measuring scale attached to inner boundary of pan.
- 2) **External Wooden Cover (wooden box) :** The external cover box is made up of using Timber having the thickness of 3.0cm. The box is made up of timber because it is not a good conductor of Heat which help to avoid the thermal conductance from ground surface to Internal Evaporation Pan. The Internal Diameter of the wooden box is kept up to 1315cm. The thermal value of terrain causes the affect over the Pan Evaporation readings, which is removed by this External wooden box by breaking the thermal conductivity.
- 3) **Internal Galvanised Iron Sheet Pan :** The internal pan which consist of water is mainly made up of galvanised iron sheet. The internal pan having the diameter of 1250cm . The surfaces of iron pan is in contact with water and soil respectively, which is resulted into the corrosion of the metal sheet. To avoid the corrosion action the internal pan surfaces are painted. There is a fixed gap of 30cm between the external wooden box and

the internal galvanised iron sheet pan. The thickness of iron sheet pan is about 5 to 10cm.

- 4) **Soil Composition :** As the lake boundary/banks are consist of different composites of soil which are having the various values of thermal conductivity, so in this SSV's Evaporation pan same environment (pan Boundary) is created by using different type of soil by arranging the soil in different layers. Clayey soils had the lower thermal conductivity than the sandy soil at all water levels. The Thermal Conductivity ranged from 0.37 to 1.42 for sandy loam and for clay soil it ranges from 0.39 to 0.41 mcal/s.cm.⁰C. In this Evaporation pan the Boulder layer of 8 to 10cm thickness is arranged in bottom-most layer. In second layer the the different types of clays such as black cotton soil and red soil are arranged in layers in between the External Wooden block and Internal iron sheet pan. The Soil thickness is maintained about 30cm.
- 5) **Rotating Fan :** The pan consist of Centrally placed Rod with Rotating Fan, which produced Water waves continuously. By using the motor the fan is operated with speed of 1 rotation / 5 second. The Evaporation readings are surely affected by the waves formation over the water surface. The Rotating fan is operated by electric power.
- 6) **Drainage Outlet :** The pan consist of Drainage outlet for the removal of excess water present in the soil, which is present between external wooden block and internal galvanised iron sheet pan. Due to the soil is exposed to atmosphere, there is high chances of saturation of soil in case of rainy season. The drainage outlet is provided at the bottom layer of soil having the diameter of 1.0cm.
- 7) **Thermometer :** The pan consist of Thermometer, which is mainly useful for to check the temperature of water after every specific span. The temperature factors shows the adverse effect over the Evaporation rate of water. So it is important to take record of water temperature.
- 8) **Steel Mesh :** A Steel mesh is provided to cover the pan. It is effective in case any external factor (drinking of water by animals and birds) is responsible to lowering of water level in evaporation pan. A steel mesh is mainly having the larger openings such that there is no any adverse effect of steel mesh in evaporation process of water.
- 9) **Vertical Scale :** The pan consist of Vertical scale which is useful for measuring of reduced water level in the Evaporation pan.

2. Observations of SSV's Evaporation Pan :

For measure the workability of SSV's Evaporation pan the pan is kept open for 24 hours in open terrain. Before that the pan is fully filled with water. The depth of water in the pan measured without any manual error.

The pan kept open at morning 8.30 am and the depth of water is recorded. The precautions must be taken so that there is no any external factor is responsible for the water level reduction in the pan. On the next day after completion of 24 hours the another reading is note down on the observation table. The reduction in the water level gives the the amount of Evaporated water.

Table no. 1 given below shows the value of water level in cm observed in pan over 24 hours duration.

Table.1 water level observation

Sr. No.	Time	Depth Of Water In Pan
1	8.30 am (1 st day morning)	20.00 cm
2	8.30 pm (same day Evening)	18.4 cm
3	8.30 am (next day morning)	17.8 cm

- Amount of water Evaporated = (water level observed at initial time - water level observed at final time)
- Amount of water Evaporated = 20cm - 17.8 cm
- Amount of water Evaporated = 2.2 cm

3. Limitations :

- 1) In rainy season there is huge possibility of change in water level in pan due to the open surface of pan.
- 2) Readings must be taken sharply on time without causing any late, it will cause the error.
- 3) It will gives the Evaporation values which are approximately equal to lake evaporation values.
- 4) Pan requires continuous supply of electricity for the successfully rotations of rotating fan for waves formation at water surface.

4. CONCLUSIONS

- This SSV's Evaporation pan method is effectively applicable to measure the water evaporation.
- The temperature variation is successfully included in this evaporation pan.
- The different types of soil surrounded by the evaporation pan is responsible to create the same thermal nature present at natural water body.
- In this SSV's Evaporation pan we can create the waves produced on the pan which has adverse effect over the evaporation rate. As the waves are formed over the pan surface it will cause the reduction in water evaporation. So the rotator fitted to the pan is helpful to achieve the nearest evaporation value by the pan.
- As the extra soil is covered surround the pan which reduces the excessive rise in temperature of the water body and which gives the effective results of water evaporation.
- The direct exposure of metal pan and its sides causes the adverse effect over the evaporation of water. In case of ssv's evaporation pan the oil coating reduces that error.
- The water table observed after 24 hours is showing the evaporation upto 2.2cm depth.
- This SSV's evaporation pan method is useful for different situations with effective results.

5. REFERENCES

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