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An Ingenious Approach: Controlling of Evaporation from Surface Water Resources

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Abstract: ***Loss of water through evaporation is an important consideration for many water supply and irrigation dams. However, practical difficulties have meant that no evaporation control methods have been implemented on major dams. There are three principal categories of evaporation control. These are chemical - application of chemicals to the water surface, physical - change of physical properties including floating structures, and structural - principally provision of covers such as shade cloth. While there have been a number of applications that indicate reduction in evaporation loss, and there are many products on the market, these are difficult to apply in practice on large water supply dams.***

In this project work, evaporation controlling of surface water sources by 'E-CON' unit which comes under physical method is described. 'E-CON' unit designed and manufactured for testing of unit. To check the feasibility of unit, two tests required to conduct, first, without floating on steady surface water source and second, with floating on steady surface water source. After testing, results come out which indicates how much water evaporation controlled by 'E-CON' unit. The characteristics and attractiveness of 'E-CON' unit are- an appropriate technology for urban and rural communities, requires essentially no external resources, needs little expertise to run and maintain, can be understood, controlled and maintained by local people,

'E-CON' unit will be really advantageous such as - severe shortage of fresh water supply is being and will be experienced, scarcity of water will result in insufficient food supply and undesirable health problems. 'E-CON' unit will be environment friendly technology as it's- socially acceptable, economically efficient, hydraulically sound, intelligent tool to enhance the sustainability of controlling evaporation losses.

Keywords: 'E-CON' unit, existing surface water storage, temperature, evaporation, irregular rainfall.

I. INTRODUCTION

In the earlier days availability of water was taken for granted. It is now being realized that water, though replenishable, is not an unlimited resource and cannot be produced or added as and when required, by any known technological means.

The other important limitation is that the availability of water over the years depends upon the spatial and temporal variation of precipitation. Thus water may be abundant during monsoon season and scarce in non-monsoon season, when most needed. The ingenuity of man, therefore, lies in his ability to modify the pattern of availability of water to suit needs. One of the commonest forms of such modification is storage of water during monsoon season for eventual use in lean season. The traditional methods are big storage in natural or artificial ranks. Lately a large number of storages have been constructed. Due to high temperatures and arid conditions in about one third of the country, the evaporation losses have been found to be substantial. Therefore, it is imperative to minimize evaporation losses in the storages/water bodies.

II. LITERATURE REVIEW

A. Erik.Schmidt Ian Philip Craig JAN 2005

Controlling evaporation loss from water storages

Methods to control evaporation,instrument and methodology used,compare economics of different products

Site specific economic assessement is required,further product development is taking place

B. Kevin. Roger, Marianne. L MARCH 2016

Controlling water evaporation through self assembly

To demonstrate that simple binary or ternary systems can exxhibit same humidity buffering behaviour as the stratum corneum

Obtained experimental data for two different model system

C. I.Craig,A.Green JUNE 2005
Controlling evaporation loss from water storages

D. Ian P.Craig JUNE 2005
Loss of storage water due to evaporation
PST-Pressure sensor transducer data was compared to Penman-monteith based estimates of evaporation ,future research planning
PST performance figures approx 60-80% for shadecloths,approx 85-95% for floating cover,5-30% with cetyl alcohol

E. Xi Yao , Charles lemckert , Adam brook AUGUST 2010
Evapoartion reduction by suspended and floating covers
Overview ,modelling and efficiency of suspended and floatinfg covers
Efficiency of Aquacap-73%,Evapcap-90%,Natpro-70%,Superspan-90%

F. Ian.P Craig , Nigel Hancock
Evaporation control project (RWUEI) An evaluation of effectiveness of chemical monolayers ,floating covers and shade structure in reducing dam evaporation The conclusion is unavoidable that a reliable K pan cannot be reliably determined.

G. Mostafa A.Benzaghta and Thamer A. Mohamad May 2009
Evaporation from reservoir and reduction methods
Research was done to evaluate the effectiveness of physical and chemical methods in evaporation reduction from reservoirs
Physical methods are able to save a greater % of water(i.e betn 70-100%)
Physical control methods are more permanent

H. Abdul Halim Ghazali,Mostafa Ali Benzaghta DEC 2010
Study on Simplified model for Estimating Evaporation from reservoirs
Linacre evaporation model was tested for its accuracy using daily,weekly and monthly records.The
records were measured by class a evaporation pan
Statistical tests show that the model gives reasonable accuracy.Thus the linacre model can be used when the available meteorological data is limited(air temp only).

I. Youssef F.Lawgali JUNE 2014
Estimation of Evapotranspiration using climate models
ET using three climate models(FAO-Penman Monteith,Hargreaves-Samani and penman)
Based on model testing the statistical analysis show that the Penman model gave a better estimation than Hargreaves –Samani model.

J. Mohd Amin Mohd Soom JUNE 2012
Testing of evaporation reduction methods in humid climates
Study focused on the measurement of capability of floating and structural covers to reduce evaporation from open water bodies in a humid climate
Results confirm the effectiveness of these covers for evaporation reduction with no harmful effects on water quality.

III. NEED OF E-CON UNIT

To reduce surface water evaporation to a minimal extent.

IV. OBJECTIVES

A. To study evaporation of surface water and methods to control evaporation.
B. To select materials and resources for manufacturing of evaporation control unit.
C. To test evaporation control of unit and to check its feasibility under working condition.
D. To know the efficiency, suitability of evaporation control unit after test, results and discussion for the same.

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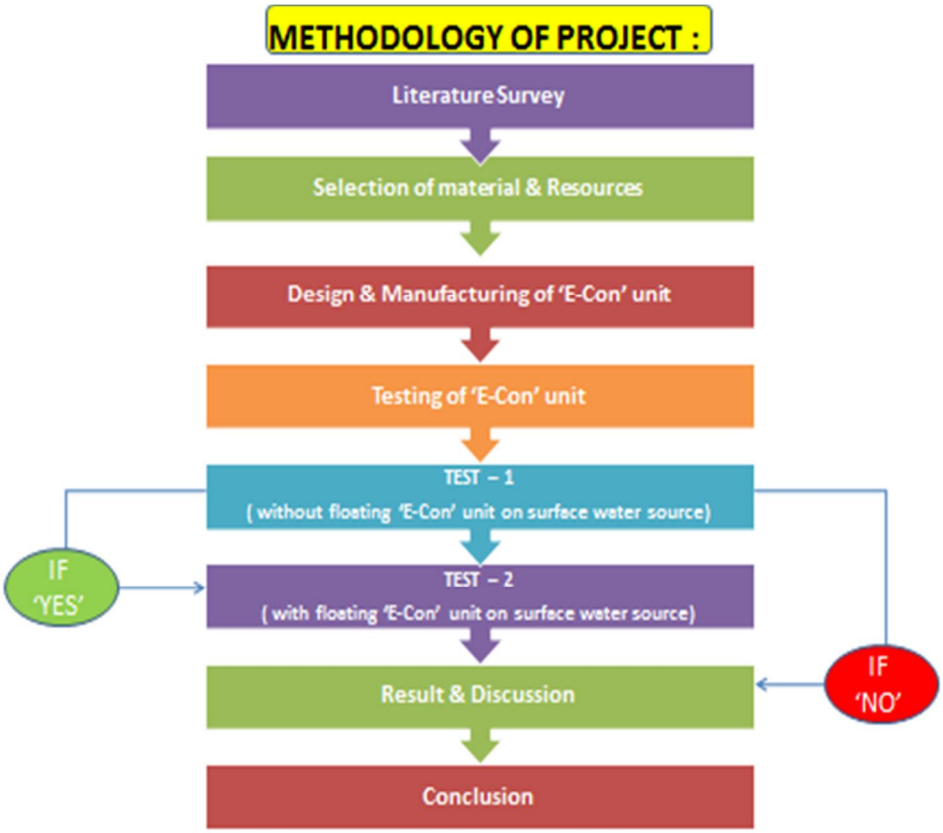
V. METHODOLOGY



VI. SITE LOCATION

A. Uttareshwar Talav, Vasai Road (W).

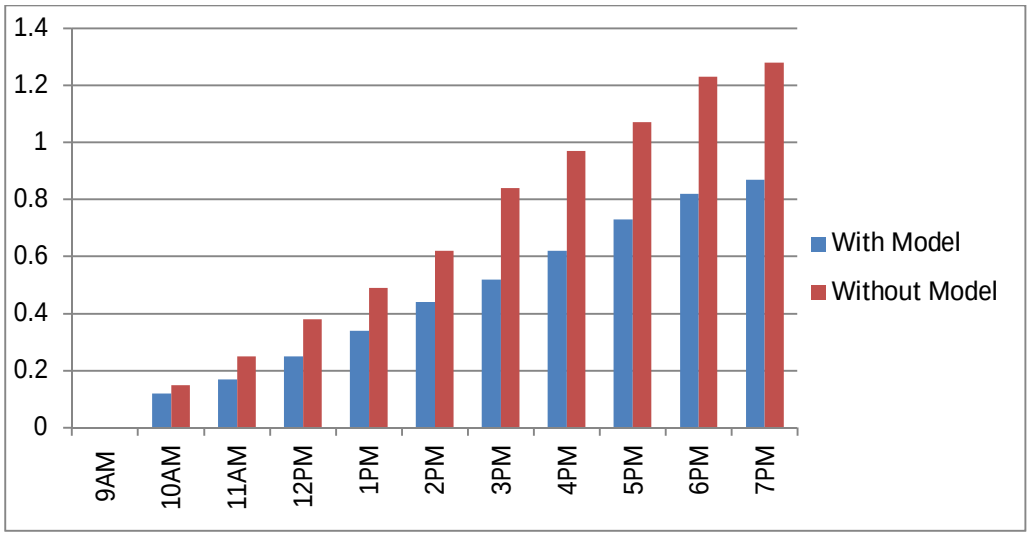
Fig. Represents : Case Study on the left and testing of model on the right.

VII. OBSERVATIONS AND CALCULATIONS

Time	Day 1		Day 2		Day 3		Day 4		Day 5		Avg Evap	
	w	wo	w	wo	W	wo	w	wo	w	wo	w	wo
9:00 am	0	0	0	0	0	0	0	0	0	0	0	0
10:00 am	0.10	0.15	0.10	0.10	0.15	0.15	0.10	0.15	0.15	0.20	0.12	0.15
11:00 am	0.15	0.25	0.15	0.20	0.20	0.25	0.15	0.25	0.20	0.30	0.17	0.25
12:00 am	0.25	0.40	0.25	0.30	0.30	0.40	0.20	0.40	0.25	0.40	0.25	0.38
1:00 pm	0.30	0.50	0.35	0.40	0.40	0.55	0.30	0.45	0.35	0.55	0.34	0.49
2:00 pm	0.40	0.65	0.45	0.55	0.50	0.65	0.40	0.60	0.45	0.65	0.44	0.62
3:00 pm	0.50	0.85	0.50	0.80	0.55	0.85	0.50	0.85	0.55	0.85	0.52	0.84
4:00 pm	0.60	0.95	0.60	0.95	0.65	1.00	0.60	0.95	0.65	1.00	0.62	0.97
5:00 pm	0.70	1.10	0.75	1.00	0.75	1.10	0.70	1.05	0.75	1.10	0.73	1.07
6:00 pm	0.80	1.25	0.85	1.20	0.85	1.25	0.80	1.20	0.80	1.25	0.82	1.23
7:00 – 9:00 pm	0.85	1.30	0.90	1.25	0.90	1.30	0.85	1.25	0.85	1.30	0.87	1.28

*All readings are in cms
w- with model in the tank 1,wo- without model in the tank 2

EVAPORATION OF WATER (in cm) WITH MODEL v/s WITHOUT MODEL



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VIII. CONCLUSION

Results deduced from the above readings indicate that ONE ECON unit reduces Evaporation by 67.97% .If, a number of such units are placed next to each other Evaporation can be lowered to minimum .Thus, this experimental model successfully controls the evaporation.

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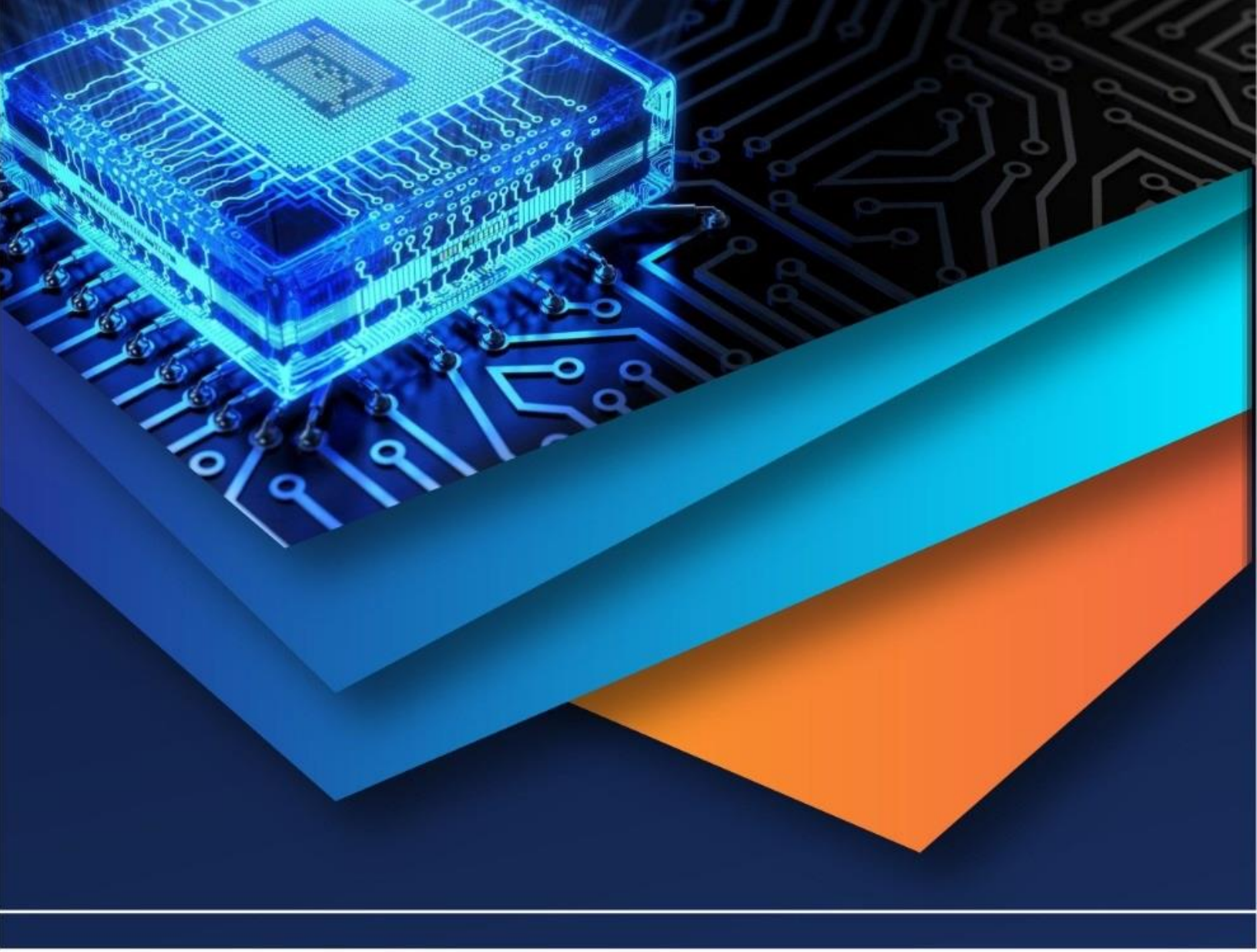

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