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Review on Study on Evaporation Control in Reservoir

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ABSTRACT: We the human creatures of the world are living because we are having a set of sustainable elements on the earth such as the water, the air, the land, etc. These all natural elements are useful for our survival on the planet earth. Out of these basic elements, the most common liquid which is widely available on our planet is the water. The water is the most vital, primary, elementary and basic requirement of the human. Contribution of the water in the development of India is very much crucial and key role is always played by the water in socio-economic development of India. As our country is agrarian country and the water is the prime need to increase the yield of agriculture product. This project revealed that the physical methods can reduce evaporation effectively without environmental consequences methods of Evaporation Control.

KEYWORDS: Evaporation, *Reservoir*, Evaporation Control, temperatures, vapour pressure

I. INTRODUCTION

Water is one of the nature's precious gifts, which sustains life on earth. Civilizations over the world have prospered or perished depending upon the availability of this vital resource. Water has been worshiped for life nourishing properties in all the scriptures. Vedas have unequivocally eulogized water in all its virtuous properties. We the human creatures of the world are living because we are having a set of sustainable elements on the earth such as the water, the air, the land, etc. These all natural elements are useful for our survival on the planet earth. Out of these basic elements, the most common liquid which is widely available on our planet is the water. The water is the most vital, elementary and basic requirement of the human. Contribution of the water in the development of India is very much crucial and key role is always played by the water in socio-economic development of India. As our country is agrarian country and the water is the prime need to increase the yield of agriculture product. Our gross domestic production, all over demands, the bullshness of each and every sector, very much depends on the availability of the water and the Gross Domestic production is higher in the year in which availability of the water is sufficient. It is also found that for the efficient development, the optimum use of the water is very much important.

Nowadays, the water has become a part of non-profit to profit organization, which engages various countries across the world with-holding sewage data for nearly all the countries and provides a better way of the water use and its management which can be useful for various routine activities. But due to a huge wastage of the water, the water is becoming one of the scarce resource day-by-day in the world and also in our country, India. The corporation and the farmers draw ground water which is less costly and easily available. Moreover, as and when they need the water, it can be drawn from the ground and thus groundwater levels have reduced, as the ground water level reduces, relatively the sea water level becomes higher so there is land ward hydraulic gradient which results into the flow of the seawater or the salty water stars approaching towards the ground which is called as the sea water intrusion into the ground and the amount of pollutants in the water is increasing rapidly, as per the report by the World Resource Institute. The report states that with more than half of India's total areas are facing high to extremely high stress; almost 60 core people are at very high risk of the surface-water supply disruptions.

A. Evaporation Loss

When the molecules of the water situated at the surface are changed its state from liquid into vapour and escaped from the water body. Hence the quantity of the water is decreased, called as the loss of the evaporation. This process occurs even below boiling temperature of the water. During this process, the heat energy is absorbed by molecules of the water and it converts into the kinetic energy, as the cohesive forces prevailing between the water molecules are not so high and the water molecules now possess the kinetic energy, the result of which the molecules of the water eject themselves



from the surface and start upward motion towards the atmosphere. The amount of the energy used by the unit of mass of water to convert its state from liquid into vapour at a constant temperature is called the latent heat or the evaporation and it is about 585 calories per gram. Whenever the energy from the outside is not obtainable, the heat energy which is obtained from the water bodies itself is used for the evaporation and because of this the temperature of the water is reduced.

II. STATE OF DEVELOPMENT

A lot of research works have been done on the evaporation, the water conservation, the water augmentation and water supply in the past. The research works conducted in the past showed that the need of estimation of the available quantity of the water for the effective management of the water resources, for the improvement of the water supply, for the water utilize administration and for the reduction of the water losses from the resources, Good quality literatures are available on the same area and an extensive review works have been undertaken on the same literature in this paper.

Mostafa A. Benzaghta et. al. (2009) The future effects of climate change on water resources in the world will depend on trends in both climatic and non-climatic factors. Evaluating these impacts is challenging because water availability, quality and stream flow are sensitive to changes in temperature and precipitation. Other important factors include increased demand for water caused by population growth, changes in the economy, development of new technologies, changes in watershed characteristics and water management decisions. Global warming and the increasing concentration of greenhouse gases in the atmosphere will affect temperature and rainfall. This change has direct effect on reservoirs storage and availability of water resources. For example, measurements done in Australia showed that 95% of the rainfall is evaporated again which effect the available water storage. Many methods were proposed to reduce evaporation from open reservoirs. These methods can be categorised as physical and chemical methods. Research was done evaluate the effectiveness of the methods in evaporation reduction from reservoirs. Published research revealed that the physical methods can reduce evaporation effetyly without environmental consequences but chemical methods effects water quality and reduce evaporation by 20 to 40% only.

Yara Waheeb Youssef et. al. (2019) many methods have been tested and developed all over the world to save water from evaporation process. This paper presents a state of-art review of published research work in the last 14 years (from 2014 to 2018) in which it was focused on the physical, chemical and biological methods of evaporation reduction from water surfaces. The main characteristics, as well as the advantages and disadvantages of each method are indicated. Among these used techniques for reducing evaporation are physical methods that use floating or suspended covers and can save a large percentage of water (between 70 and 95%). The use of thermal mixing by compressed air seems to be very important for evaporation suppression on deep reservoirs (greater than +18 m). Moreover, currently chemicals are widely used to reduce water evaporation, such as Water Savr, and can save relatively a small percentage of water (between 20 - 40%). Biological methods such as floating plants, wind breakers and palm fronds can provide a significant decrease in the volume of evaporation but they have some restrictions on their uses.

Abdelmajeed, M. A. et. al. (2009) Gasoline is a volatile organic compound (VOCs) which consists of different hydrocarbons with different boiling points in the range of 30-200oC. The light compounds that have boiling point of less than 40oC constitute about 10%. Khartoum, Sudan is characterized with an average of 10 hrs. of sunshine and solar radiation of 3.05-7.62 kWh/m²/day and average temperature of 32 to 40oC. Under these conditions high evaporation rate is expected from storage tanks. The objective of this study is to evaluate the evaporation loss of gasoline from internal floating roof storage tank. The case study is based on metrological and operation data for the year 2008. The result revealed that the total evaporation loss is 0.5%. This is significantly higher than that set by the ministry of energy [i.e.0.25%]. The results should be of concern to the petroleum industries and government. The reduction of evaporation loss of gasoline will give attractive economic returns as well as reducing air pollution and hazards.

Qian-Qian Xia et. al. (2022) Reservoirs play a vital role in agricultural irrigation, food security, and ecological protection in arid and semi-arid areas where water resources are scarce. In the Tarim Basin (TB) in north-western China, a large number of reservoirs have been built or are being built, resulting in significant evaporation losses. However, information about the distribution, area and evaporation rate of the reservoirs in TB is limited. To contribute, we present an inventory of reservoirs and calculate their monthly surface area and evaporation rate during the study period of 1990–2019, using the Terra Climate dataset, Google Earth Engine (GEE) platform, Landtrendr algorithm,



Penman method, and Landsat images. The results suggest: (1) the inventory of 167 reservoirs in TB consists of 142 existing reservoirs (built before 1990), 5 new reservoirs (mountain reservoirs, built during 1990–2019), and 20 dried-up reservoirs (plain reservoirs that went extinct during 1990–2019). (2) The reservoir types in TB are mainly plain reservoirs with an altitude of less than 1500 m and an area of less than 10 km², accounting for about 88% of the total number of reservoirs. (3) The surface area of the reservoirs increased at a significant rate ($p < 0.05$) of 12.45 km²/y from 401 km² in 1990 to 766 km² in 2019. (4) The evaporation rate of the reservoirs increased at a slight trend of 0.004 mm/d/a and varied from 2.57 mm/d in 1990 to 2.39 mm/d in 2019. Lastly, (5) The evaporation losses of reservoirs in TB significantly increased ($p < 0.05$) from 4.72×10^8 m³ to 4.92×10^8 m³ due to the significant increase in reservoir surface area ($p < 0.05$) and the slight increase in evaporation rate from 1990 to 2019. This study provides essentials of the reservoir inventory, surface area, and evaporation rate with considerable baseline inferences for TB that may be beneficial for long-term investigations and assist in local water resources decision support and sustainable management in arid regions.

Mrs. M. S. Joshi et. al. (2021) Demand for water has been increased nowadays as a result of increase in population and industrial activity. Global warming and increase in concentration of greenhouse gases in atmosphere will affect temperature and rainfall. This change effect on reservoir storage and availability of water resources as resources are limited. Development of water resources should ensure efficient control, conservation and use of available water. The need of water saving is greatest in areas of low runoff and less rainfall. Water losses by evaporation must be minimized for greatest utility of limited supplies. Seepage loss in water course return to stream and aquifers for reuse, evaporation loss signifies water that is lost from available supply. Measurements done showed 95% of rainfall is evaporated which affect the available water storage. Evaporation from reservoirs is important issue frequently, so there is need for more emphasis on minimizing if not preventing the losses due to evaporation. This evaporation can be retarded by either physical, chemical or biological methods among which physical method is most effective. Published research reveals that floating covers is most effective method for evaporation control which reduces about 70% of evaporation. This method could be applied in different arid and semi-arid areas which could help decrease in evaporation rate.

Azolla Fern et. al. (2018) In these project is deals with control the evaporation of water in lakes and ponds using azolla fern. The project is done by experimental using chemistry and environmental laboratory. Using the instruments of Chinese glass bowl and heat the water to find out the evaporation. These projects execute in Roever Engineering College. We make pond to find the evaporation of these project deals with control the evaporation of lakes and ponds. The pond size is 2m length ,2.5m breadth and 0.3m depth, then provided with the half level of water 500 liters only. The lake to be provided the azolla to control the evaporation of water and erosion of banks, in this project execute in model protocol. Azolla is a branched free floating aquatic fern and is it is one of the food for animals like goat, cow, fish etc. Evaporation refers to water losses from the surface of a water body to the atmosphere. Evaporation occurs when the number of moving molecules that break from the water surface and escape into the air as vapor is larger than the number that re-enters the water surface from the air and become entrapped in the liquid. Evaporation increases with high wind speed, high temperatures and low humidity. A sizable quantity of water is lost every year by evaporation from storage reservoirs and evaporation of water from large water bodies influences the hydrological cycle. Among the hydrological cycle, evaporation is perhaps the most difficult to estimate due to complex interactions among the components of land-plant-atmosphere system.

III. CONCLUSION

This research is solely discussed in terms of a literature review. The study's findings suggest that there are always various types of water losses in the water supply system of any city. The evaporation losses are taken into account in this research work among all the water losses, as the rate of the evaporation losses is considerably high. The problem of evaporation losses is more critical when there is a shortage of water in a region. For further study, we will study different types of method use for evaporation control and its advantage and disadvantage and for the reservoir that are easy, cost-beneficial, and easily available, and then suggest five economical methods.

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