Implementation of Innovative Methodologies For Management of Efficient Water Distribution

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Abstract- *Canals enhanced irrigation water losses and the annual cost of maintenance became uneconomical for the long term. Easy maintenance, durability, modification capability and flexibility of pipelines give them the potential to be an economical alternative to replace the Canals. Pipes were selected to construct a network of the pipeline due to the availability of Plastic Irrigation Pipes and Reinforced Concrete Pipes. This study will identify various methodologies that can be used for efficient water distribution system. Further to which Case Study on one of the Dam will be done with respect to current practices for water distribution system. Based on study questionnaire survey shall be done and further analysis will be conducted.*

Keywords- Enhanced water losses, Maintenance, Design of pipelines, Boundless distribution via Lift irrigation

I. INTRODUCTION

Water is considered as life for all living things. Water is used for various purposes such as agriculture, industries, domestic etc. Water covers 71% of Earth's surface out of which 1.7% is found as ground water, 1.7% in glaciers and ice caps of Antarctica and Greenland, 95.1% of the total available water is found in seas and oceans which is salty in nature. Only 2.5% of this water is fresh water which is available in rivers, lakes, wet-lands, ponds, etc. This water is received in the form of rainfall through water cycle of evaporation, transpiration, condensation, precipitation and run-off, usually reaching the sea. As India's economic is entirely based on agriculture, so water is the necessary need for its economy to grow. Due to the scarcity and seasonal changes, water is not sufficient throughout the year. Therefore there is a need to save and reserve water for all these purposes. Maharashtra is India's one of the most developed states and its large part of population suffers from severe water scarcity.In nearly 70% of the village (around 27,600 villages), water is neither available within 500m nor 15m below the ground. This causes less production of the crops which reduces the GDP of the country. To serve this purpose irrigation is used. There is great necessity of irrigation in Indian agriculture, because of great diversity, variety of climate and weather conditions. Also uncertainty of the monsoon rainfall both in time and place, irregularity in distribution of rainfall throughout the year, excessive rainfall causing flood, draught in an annual event in some areas and some soil need more water. Irrigation is defined as "The artificial application of water to the land or soil in an appropriate volume for the proper growth of plants in order to get maximum yields of cultivation." It is use to assist the growing of agriculture crops' maintenance of landscapes and re-vegetation of disturbed soils in dry areas. During periods of inadequate rainfall the process of water is fulfilled which is done by artificial or man-made channels i.e. canals is known as "Irrigation by Canals". Canal irrigation is observed in states of Uttar Pradesh, Punjab, Haryana, Maharashtra and coastal plains of Kerala. There are some functions and necessity of irrigation in our country. The entire system has been divided into two basic parts that is conventional irrigation system by canals and irrigation by pipeline which is also known (CCDN) closed conduit distribution system. Implementation of Innovative Methodologies for Management of Efficient Water Distribution Conventionally canal irrigation system is most important as it is cheaper. They are also planned for dual purpose effectively i.e. irrigation facilities and control flood. As we know, the economy of India largely depend upon agriculture section and thus irrigation is one of the most important parameter associated with agriculture. Providing the water to the farms by canals is an old times method from many of last years to till date. Due to this large area is irrigated but it is observed that there are many losses due to use of these open canals. To minimise the losses of water like evaporation, percolation, seepage, etc. and preserve the water, Closed Conduit Canal system is preferred over the open canals system. Therefore, the basic purpose of this study is to provide sufficient amount of water to the fields and to increase the efficiency of the water.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

In this method the main components are:

a) Reservoir: In this process first the water is discharged from main reservoir then the water is passes through the pipeline as

the main reservoir is source of water. It may be a Dam, Pond, river etc. for this the reservoir contains automatically operated gates which control discharge of water.

b) Main Canal: The main canal is divided into two parts

- Main canal (head reach): The canal head works are situated in river flowing in a valley and the canal should reach the ridge line in the shortest possible distance. The canal therefore must be aligned and excavated in deep cuttings below NSL (Natural Surface Level).
- Main canal (portion below head reach): These canals are aligned
- along the ridge and somewhat central to command area.

c) Branch canal: These are taken off from the main canal on either side to take irrigation water to the whole track required to be irrigated.

d) Distributaries: Smaller channels which take off from the branch canals and distributes their supply through outlets into minors or water courses. These are aligned either as reach canal or as contour canals.

e) Minor: When the distance between distributary outlet and the farmer's field is very long (more than 3km), a small channel are taken off from the distributaries so as to supply water to the cultivators at the point nearer to their field.

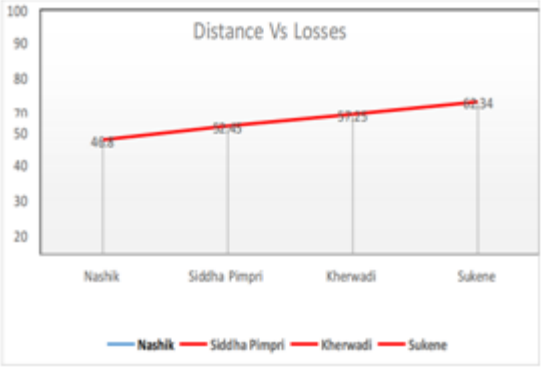
f) Water courses: These are not Government channels and belong which are excavated and maintained by the cultivators at their own cost, to take water from Government-owned outlets provided in distributary or minor.

Estimation

The State Government of Maharashtra estimates cost for various categories. After every 5-7 years. Government also launches a new irrigation scheme "*Jalsandharan Yojna*"Govt. allows 500 cr. For every district. The central Govt. also going to launched1 "*Pradhanmantri Krishi Jal Yojna*"Estimation of irrigation projects in Maharashtra

3.1.8 Efficiency

Efficiency of any procedure is ratio of output obtain in process for some input provided. Similarly, in this method, the efficiency of the method is 0.47. Therefore, now a days it is need to rise the efficiency of this method.



III. STUDIES AND RESULTS

After studying the important parameters we get the result as follow. It's important to note that the specific results and benefits of an enclosed pipeline system as an alternative to a canal system can vary depending on factors such as the scale of the system, terrain, crop types, and local conditions. Feasibility studies, proper design, and appropriate management practices are crucial for maximizing the benefits of an enclosed pipeline system in a given agricultural context. The evaporation losses are calculated from the detail given in the proforma 6C. Graphof Evaporation Vs rotation period i.e.; months is plotted. (Fig. 14) From graph it is seen that the evaporation rate is increases from kharif season to rabbi season and to hot weatherseason. The quantity of evaporation rate find out from the details is varying from 7mm to 9mm The seepage losses are calculated from the detail given in the proforma 6C. Graph of Seepage Vs rotation period i.e.; months is plotted (fig.15). From graph it is seen that the seepage loss rate is decreases from kharif season to rabbi season and to hot weather season.The quantity of evaporation rate find out from the details is about 40 % of the total losses of canal.

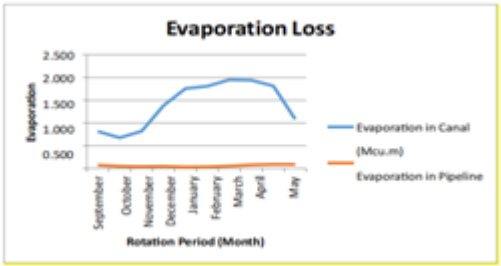


Fig .12 Graph of Evaporation Loss

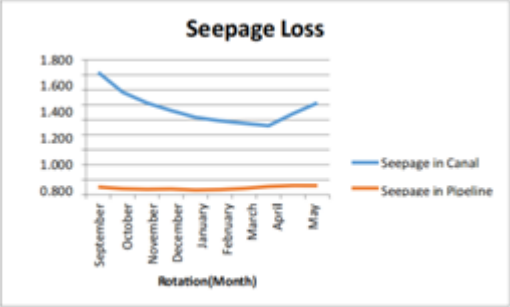


Fig .13 Graph of Seepage Loss

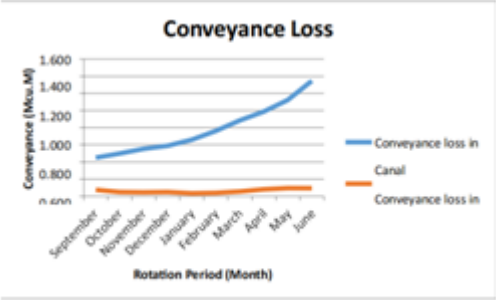


Fig .14 Graph of Conveyance Loss

The Conveyance losses are calculated from the detail given in the proforma 6C. Graph of Conveyance loss Vs rotation period i.e.; months is plotted (Fig No. 16). From graph it is seen that the Conveyance loss rate is increases from kharif season to rabbi season and to hot weather season. Conveyance loss mainly includes losses due to transpiration, water theft and other losses.

Benefit cost Ratio

A project that cannot be financed is considered as useless, in order to implement the proposed project, it is essential to raise money to construct, operate and maintain it. In order to justify the proposed project is economical, viable or feasible and is likely to yield more returns i.e. benefits after it complete construction, it is essential to determine the benefit to cost ratio for the project, and if this ratio is greater than unity or at the most equal to unity then only the project can be defined as 'the ratio of total annual benefit to total annual cost, both being measured in terms of money'. It is also useful in choosing the best proposal for the project among the various proposed alternatives.

Benefit-cost ratio = Total annual benefit/Total annual cost

In this case we also calculate the annual benefits of the conduit system. The rate of interest. It is equal to 10% P.A. The calculations are shown in table No. 10 for the closed conduit system the benefit to cost ratio is equal to 1.41. It will be more if the life period of The component is more. Benefit cost ratio is calculated foe whole life of structure.

Benefit-cost ratio = 4825975993 / 3250000000

= 1.48

Benefit-cost ratio for canal system

In the construction of canals the cost is mainly due to the excavation, maintenance ecost, cost of hydraulic structures like syphon, cross drainage work etc. The main fact about the canal is it requires more cost for its construction but the Benefits are limited.

IV. CONCLUSION

After studying the project on Enclosed pipeline system alternative to Canal system we got to know that, the use of enclosed pipeline systems has a number of advantages, such as higher agricultural water availability, improved water distribution efficacy, decreased water losses, and long-term cost effectiveness. These technologies support sustainable agricultural practises and higher crop yields by managing water scarcity, improving water productivity, and reducing land acquisition obstacles.

- Using enclosed pipeline systems instead of canal systems can help increase the quantity of water available to farmers, ensuring that there is enough water for both their farming demands and other essential home needs. Enclosed pipeline systems provide a long-term solution to increase water availability for agricultural use by reducing water losses and enabling effective water distribution.
- Improving the effectiveness of water distribution in agricultural irrigation necessitates research into better demand management and distribution performance. Better demand management is made possible by enclosed pipeline systems, which provide accurate water supply and control. Water distribution may be optimised by farmers to increase yields and increase agricultural output.
- Understanding how several forms of losses, including percolation loss, evaporation loss, and seepage loss, affect crop yields requires the calculation of these losses. Comparing enclosed pipeline systems to canal systems can assist minimise these losses, which can lead to considerable water savings and increased agricultural output. We can evaluate the efficiency of enclosed pipeline systems in water conservation and improving agricultural yields by calculating these losses.
- It is critical to examine how enclosed pipeline irrigation systems affect issues with land acquisition. Compared to canal systems, these systems require less land, lowering the difficulty for farmers in acquiring land. Utilising

available land for irrigation effectively can enable sustainable farming practises and assist address land shortage issues.

- The long-term cost-effectiveness of enclosed pipeline systems should be investigated even if they may initially cost more than canal systems. Through enclosed pipeline systems, efficiency and water productivity may be boosted, which can eventually lead to cost savings. Despite the initial investment needed, enclosed pipeline systems can prove to be a cost-effective alternative for irrigation by lowering water losses, optimising water consumption, and increasing agricultural yields.
- From the results of the project work, it is concluded that irrigation by pipeline is more beneficial than the canal system. After the observation it is found that the losses like the evaporation, conveyance and the seepage are more in canal system and can be completely reduced in the closed conduit distribution network. The evaporation losses are 1.5% of the total losses. Seepage losses are 39% of total losses and conveyance losses are 12%.
- After the estimation work it is found that the benefits to cost ratio of Closed Conduit Distribution Network is 1.48 whereas, canal system have 0.953. The efficiency of the yielding the area is increased in Closed Conduit Distribution Network. Closed Conduit Network Distribution system irrigates 45% more land than canal system in same quantity of water.

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