Enclosed pipeline alternative to canal system

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Abstract- *This abstract highlights a novel approach in the field of transportation infrastructure, considering the development of an enclosed pipeline system as an alternative to traditional canal systems. Canals have long served as essential conduits for water transportation, enabling the movement of goods and fostering economic growth. However, they have inherent limitations, such as high construction and maintenance costs, environmental impacts, and land requirements. In response to these challenges, this study proposes an enclosed pipeline system that addresses the drawbacks associated with canals. The enclosed pipeline system leverages advanced engineering techniques and materials to create an efficient and sustainable transportation network for goods and resources. This research investigates the enclosed pipeline system's technical feasibility, economic viability, and environmental sustainability. It will explore various aspects, including design considerations, construction methods, operational efficiency, and maintenance requirements. The study will also assess the potential benefits and drawbacks of adopting this innovative approach. The findings of this research will contribute to the ongoing discourse on modernizing transportation infrastructure. If proven viable, the enclosed pipeline system has the potential to revolutionize the transportation industry by providing a cost-effective, environmentally friendly, and versatile alternative to traditional canal systems. By exploring this innovative concept, policymakers, engineers, and stakeholders will gain valuable insights into the feasibility of implementing an enclosed pipeline system and its potential impact on trade, logistics, and sustainable development.*

Keywords- water treatment plant, construction project management, drinking water, construction industry, public sector projects.

I. INTRODUCTION

1.1 General

The enclosed pipeline system is gaining popularity as a viable alternative to traditional canal systems for transporting water. This innovation offers numerous advantages in efficiency, environmental impact, and overall cost-effectiveness. This article will explore the subpoints related to the benefits of the enclosed pipeline alternative to canal systems.

The enclosed pipeline alternative to a canal system is a modern and innovative approach to transporting goods and resources. Canals have long been utilised to move bulk commodities, but the enclosed pipeline system offers several advantages over traditional canals. This concept involves the construction of a network of pipelines enclosed within a structure, enabling the efficient and secure transport of various materials.

The enclosed pipeline system offers numerous benefits regarding cost-effectiveness, environmental impact, and operational efficiency. Unlike open canals, enclosed pipelines are not susceptible to weather conditions such as heavy rain or freezing temperatures, ensuring a more reliable and uninterrupted transportation route. Additionally, the enclosed structure minimizes the risk of unauthorized access, vandalism, and theft of valuable resources being transported.

Another advantage of the enclosed pipeline system is its versatility. It can accommodate different materials, ranging from liquids like oil, natural gas, or water to solid commodities such as ores or grains. The pipelines can be designed with appropriate coatings and insulation to transport corrosive substances or temperature-sensitive goods safely.

Furthermore, the enclosed pipeline alternative offers significant environmental benefits. Compared to traditional canals, which require extensive excavation and modification of natural landscapes, the pipeline system has a smaller footprint and causes minimal disruption to ecosystems. It reduces the need for water resources and avoids the negative environmental impact associated with large-scale canal projects.

From an operational standpoint, the enclosed pipeline system provides greater control over the transportation process. It allows for precise monitoring, maintenance, and regulation of the flow of materials, ensuring efficient and optimised logistics. The enclosed pipelines can incorporate advanced sensors and automation technologies to detect and address potential issues promptly.

In conclusion, the enclosed pipeline alternative represents a promising advancement in transportation infrastructure. Its advantages over traditional canal systems in terms of reliability, security, versatility, environmental impact, and operational efficiency make it a compelling option for transporting goods and resources. As this innovative concept continues to evolve, it has the potential to revolutionize the way we move commodities, offering a more sustainable and effective solution for our evolving transportation needs.

1.1.1 Increased Water Conservation:

Efficient Water Delivery: Enclosed pipelines minimize water loss due to evaporation and Seepage, ensuring more water reaches its intended destination.

Reduced Leakage: The pipeline system's design reduces the risk of leakage, leading to substantial water conservation and reduced maintenance efforts.

1.1.2 Enhanced Efficiency:

Optimal Flow Control: Enclosed pipelines allow for precise control over water flow rates, enabling efficient distribution and meeting specific Irrigation or industrial needs.

Reduced Energy Consumption: Compared to canal systems, enclosed pipelines require less energy for water transportation, resulting in cost savings and reduced carbon footprint.

1.1.3 Environmental Benefits:

Preservation of Natural Habitats: The enclosed pipeline system reduces the need to disrupt natural habitats by avoiding the construction of canals and associated structures.

Minimized Water Contamination: The enclosed pipeline design minimizes exposure to pollutants and contaminants, ensuring a cleaner water supply.

1.1.4 Improved Flexibility and Scalability:

Easy Expansion: Enclosed pipeline systems offer greater flexibility for future expansion or modification, allowing for easier integration of new areas or increased water demand.

Reliable Water Supply: The pipeline system ensures a steady and reliable water supply, reducing dependency on natural water sources and their vulnerability to droughts or seasonal variations.

1.1.5 Cost-effectiveness:

Reduced Maintenance Costs: Enclosed pipelines require less maintenance than canal systems, resulting in long-term cost savings.

Enhanced Resource Allocation: An enclosed pipeline system's efficient water distribution and reduced losses contribute to optimised resource allocation and economic benefits.

1.2 Need to study

Many losses are observed in the canal system, which does not provide the required water quantities to the irrigation field. This leads to the preservation and conservation of water resources. As the population is ever-increasing, it has led to the exploration of resources. With diminishing water supplies, India is being promoted to investigate alternative water resources, of which water supply through the pipeline has great potential to fulfil the ever-increasing demand. The Water for Irrigation through CCDN will increase water use efficiency. It will ensure that almost all the water released from dams is available to the end users. It will also bring more land under Irrigation with available water storage, especially in recurring water scarcity.

1.3 Scope of Project

The two primary limitations for the replacement of canals with pipelines are:

1. Cost
2. Capacity

In the future, there will be a great need to replace the existing canal system with a pipeline for water conservation. The cost ofthe pipe depends on the pipe diameter and the distance between the installation site and the factory. The cost per acre can be estimated by dividing the estimated quantity of water in cumec by the cost per acre of the system. Considering all these factors for the installation of pipelines over the canal, the entire work is divided into tiny stages,making the work much easierand faster and output for understanding.

Objectives

- Develop an enclosed pipeline system as an alternative to traditional canal systems.
- Enhance the efficiency and reliability of transporting goods and resources through an enclosed pipeline.
- Minimise water loss and environmental impact associated with open canal systems.
- Optimise the pipeline design to accommodate different types of cargo and maximise throughput.

- Ensure the safety and security of the enclosed pipeline system to prevent unauthorised access or disruptions.
- Evaluate the economic viability and cost-effectiveness of implementing the enclosed pipeline alternative.
- Conduct thorough research and feasibility studies to assess the enclosed pipeline system's technical, environmental, and social aspects.
- Collaborate with relevant stakeholders, including engineers, environmental experts, and policymakers, to develop a comprehensive plan for the enclosed pipeline alternative.
- Promote awareness and understanding of the benefits and potential drawbacks of the enclosed pipeline system among the general public.

II. LITERATURE REVIEW

1.Skogerboe V. Gaylord, Walker R. Wynn, Austin H. Lloyd (1969)"Analysis of Small Water Management Structures in Irrigation Distribution System"This paper describes the procedures and constraints for administering a water structure that has deteriorated over time. In addition, it describes the variables that influence the water storage systems. The highly successful steps for preventing damage from occurring. Limiting the amount of wear and strain. In this article, we investigated the oversight methods and oversight provided for water buildings.

***2.*Swamee Prabhata K., Mishra Govinda C., Chahar Bhagu R. 2003**"Design of Minimum Water-loss Canal Sections."The research reveals that canal water losses comprise See page and evaporative losses, which rely on the channel shape and available surface area—the shape and size of the canal aid in creating canal sections with minimal water loss. Loss of Water constitutes a significant portion of usable water. In addition, it provides methods for avoiding losses that are mainly to blame for the reasons for failure over time. The paper provides an easily understood summary of the canal and the system's impacts. We analysed the effect of irrigation canal losses and how to quantify them.

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3.Choo Sivapan and Kaseamsawat Srisuwan(2007)"Factors Influencing Kwame-om Canal Water Quality, Smut Songkran Province."The factors influencing the water quality within the Kwae-om Canal in Samut Songkram are investigated. It emphasizes the character of released water and the contaminants that degrade its quality. In this study, we studied that it gives the factors and measures for maintaining water quality.

4. Gupta Gangopadhyay Sumita and Gupta Janmejoy (2008)"Rejuvenating The Kestopur Canal System InThe Kolkata Metropolitan Area" This paper provides an overview of the plan to meet the water supply needs of a forthcoming new town in Rajarhat, situated on the eastern outskirts of Kolkata. The delivery of water in the correct amount and of the correct quality to the river and the area of the proposed city via the existing Kestopur canal has been favored over a transfer via pipelines. In this study, we analysed the provision of water to the new settlements of Kolkata through efficient water use reduction.

5. Rogers David J.(2010)" Innovative Solution for Water Warsin Israel, Jordan and Palestinian." The case study gives an innovative solution for the water war in Israel, Jordan and Palestinian, which has exploited limited water resources using pipelines and canals. These solutions increase efficiency, reduce disputes, and create calm conditions. In this study, we studied that Israel's multifaceted approach to water resource development through pipelines is seen as significant.

6. Fort Denise and Nelson Barry (2011)"Pipe Dreams: Water Supply Pipeline Projects in the West."The research paper concisely introduces several recently proposed pipeline developments in the West of Mexico. In addition, it provides a synopsis of problems frequently disregarded in planned pipeline projects, as well as suggestions addressing a wide range of problems such as "New Water Supply Projects, Federal Funds, A Beneficiary-Pays Strategy to Funding Water Programs. “This article examined the minute details regarding current and future pipeline developments.

7.Zaccaria S.A. Daniele (2011)"A Methodology to Conduct Diagnostic Performance Assessment and Simulation of Deliveries in Large –Scale Pressurised Irrigation Systems "The computerised research enables the watered region of Southern Italy to examine its irrigate system for delivery and its impact on crop management through Irrigation and aquifer salinisation increase. The alternative delivery situation for diagnosis in a pressurised water distribution system. This study determined that this paper provides creative solutions for a pressurised water distribution system to maximise crop yield.

8. Aldakheel Yousef and Zeineldin Faisal. (2013) "Improving Conveyance and Distribution Efficiency" By Converting an Open Channel Lateral Canal to A Low-Pressure Pipeline at The Al – Hassa Irrigation Project in Saudi Arabia. The case study describes a field research investigation regarding applying a semi-buried PVC conduit system in Al – Hassas Oasis, Saudi Arabia, and how it contributes to water conservation. Due to the pipeline installation, the conveyance

and delivery rates grew by 25.3% and 25%, respectively, and other siphons' unlawful water use decreased by 29.2%. In this research, we examined the preservation of Water in Saudi Arabia's arid regions by enhancing the efficacy of utilising water.

9. Kolhe P. S, Shinde J. K. and Thorat V. B. (2015)"Closed Conduit Irrigation Water Distribution System For Improving Water Use Efficiency To Migrate Water Scarcity Crisis In 2050" This work includes the sustainable development and efficient management of water using closed conduit distribution network for fulfilling the needs and water demand of the population by increasing the efficiency by 70% - 80% of the available water capacity. Also, it emphasizesthe water crisis in India, and to meet this problem Case Study of CCDN is done in this paper. In this research, we studied how to increase the efficiency of the pipeline canal and how it can be obtained.

10. Kulkarni Maya S. and Patil K. A. (2015) "Optimisation of Pipe Distribution Network for Irrigation by Genetic Algorithm." This paper works on the cost Optimisation of Investment in Irrigation in water scarce region of Aurangabad District. Also, the cost optimisation is carried out by computer-aided programs like Genetic Algorithm and Spread Sheet, which satisfies the discharge requirement by the set of diameters of pipes for the network. In this paper, we studied that cost minimization is done by computer-aided software.

III. METHODOLOGY

In this work, we selected the Nashik Left Bank Canal (NLBC) of Gangapur Dam. It was observed that areas at the end of the canal (tail) were not properly irrigated to the required amount. We have carried out the field visit for the reconnaissance survey. We have a detailed investigation of the main canal and distributaries to know the existing canal's basic parameters, such as the canal's length, catchment area, submergence area, controlling levels, etc. Interviews with the farmers revealed their reviews and opinions explaining our project system and finding suitable solutions to meet the requirements. After studying the parameters and the details about the existing canal, it was found that a gravity flow closed conduit was selected.

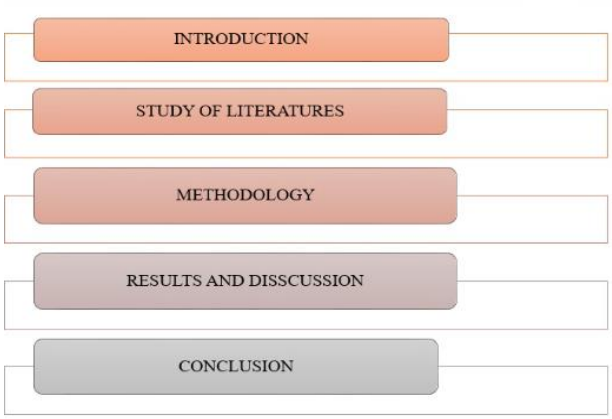


Fig 3.1 Flow Chart

3.2 Estimation

The State Government of Maharashtra estimates the cost for various categories. After every 5-7 years. The government also launches a new irrigation scheme,"Jalsandharan Yojna" Govt. allows 500 cr. For every district. The central Govt. also going to launch "Pradhanmantri Krishi Jal Yojna" Estimation of irrigation projects in Maharashtra is shown in Table No. 1

Table 01. Estimation of irrigation projects in Maharashtra for the year 2015-16

DIVISION NAME	NO OF PROJCTS	AMOUNT(CR.)
Krishna Basin	65	913
Tapi Basin	39	358
Godavari Basin	72	1083
Vidarbh Irrigation	172	3303
Konkan Irrigation	56	403
Total	404	6061

3.1 Efficiency

The efficiency of any procedure is the ratio of output obtained in the process for some input provided. Similarly, in this method, the efficiency of the method is 0.47. Therefore, nowadays, it needs to rise the efficiency of this method. The Graph of Distance Vs Losses is shown in Fig. 3.2.

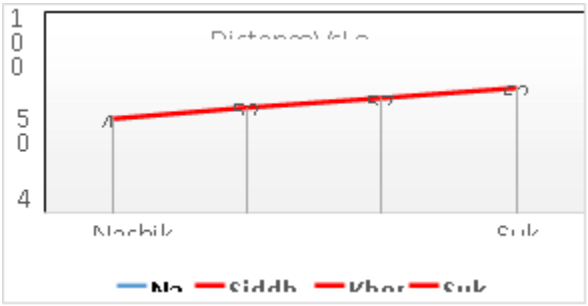


Fig 3.2 Graph of Distance Vs Losses

3.2 Irrigation by pipeline method (Closed Conduit Distribution Network)

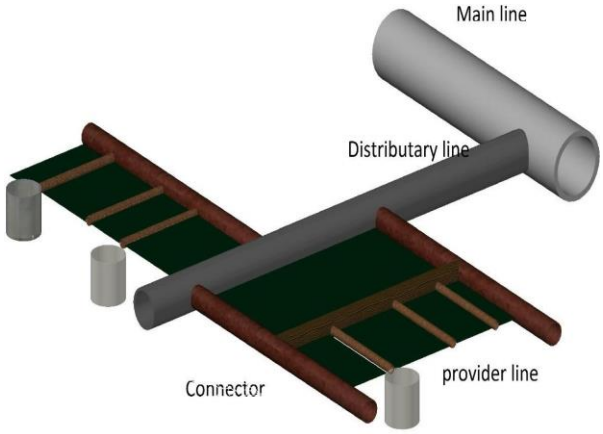
As we see in Irrigation by canals,the working procedure, losses details, advantages and disadvantages of method in Irrigation by pipeline canal. It is an under-controlled system in which water discharge from the reservoir to the actual water given to the area is recorded manually and automatically. The losses like evaporation from the canal and seepage losses are getting eliminated. There are many advantages of this method. Now a day, 's water is one of the most valuable things in the world, so the efficient use of water has become an important parameter as we have seen in the canal irrigation system a large amount of water is in used than the required amount, to overcome this research work is going on. Providing water through the canals causes many losses, and much water is wasted. This all curies are overcome by the method of Irrigation by pipeline canals. As the diameter is more than 1.5m, we can call this pipeline a conduit. For the case study, we consider the Left bank Gangapur Canal. Some information regarding the canal is givenintableno.2

NAME OF CANAL	LEFT BANK GANGAPUR CANAL
Source	Gangapur
Starting Point	Gangapur Dam,Gangwadi,Nashik
End Point	Kothure ,Niphad
Total Length Of Canal	63.8km

Table.02 Features of Right Bank Gangapur Canal

3.3 Diagrammatic Representation

Using the CCDN system in the endeavor is depicted schematically in the accompanying diagram. The diagram illustrates the operation of the system's many parts, from the storage tank to the consumers' PowerPoint. White is employed for the primary line, grey depicts the path of a distribution line, chocolate is used for the connection line, and a light pink color is utilised for the supplier line, as seen in the diagram.fig .3.3



3.3 Components of Irrigation by pipeline canals

IV. RESULTS AND DISCUSSION

After studying the important parameters, we get the result as follow,

- The evaporation losses are calculated from the detail given in the preform 6C. Graph of Evaporation Vs rotation period, i.e., months, is plotted. (Fig. 4.1) The graph shows that the evaporation rate increases from the kharif season to the rabbi and hot weather seasons. The quantity of evaporation rate finds out from the details varies from 7mm to 9mm

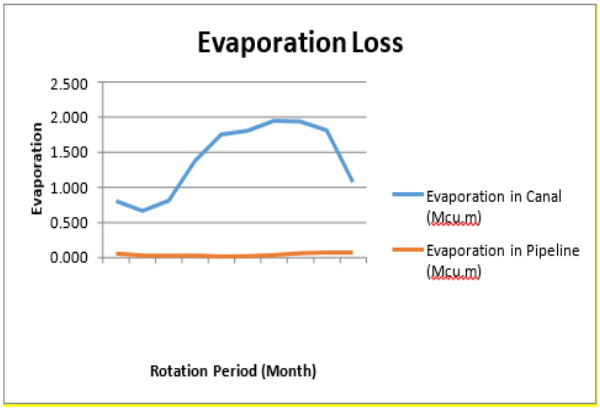


Fig.4.1 Graph of Evaporation Loss

- The seepage losses are calculated from the detail given in the proforma 6C. A graph of Seepage Vs rotation period,i.e., months, is plotted (fig.4.2). The graph shows that the seepage loss rate decreases from Kharifto the rabbi and hot weather.The quantity of evaporation rate from the details is about 40 % of the total canal losses.

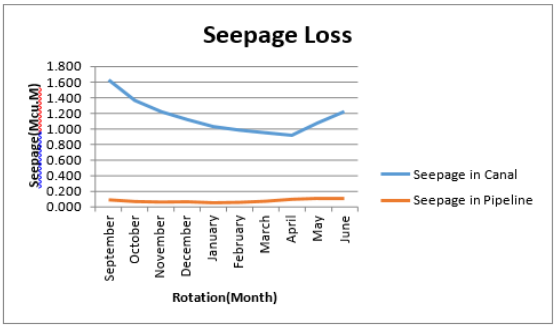


Fig 4.2 Graph of Seepage Loss

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. 4.3). The graph shows that the Conveyance loss rate increases from kharif season to rabbi season and hot weather season. Conveyance loss mainly includes losses due to transpiration, water theft and other losses.

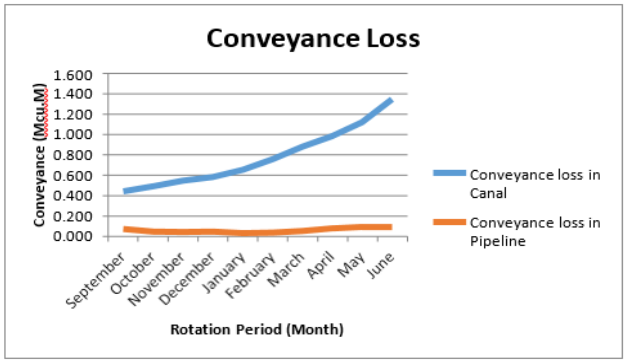


Fig 4.3 Graph of Conveyance Loss

V. CONCLUSION

From the project's findings, it can be inferred that pipeline watering is more helpful than canal irrigation. Observations reveal that losses such as evaporated water, transportation, and water seepage are greater in the system of canals and can be eliminated in a closed pipe distribution system. Evaporation losses account for 1.5% of total losses. Seepage losses account for 39% of total losses, while conveyance losses account for 12%. Enclosed Tube Distributing The network has a cost-benefit ratio of 1.48, while canal systems have a ratio of 0.953. In Closed Conduit Distributing Network, the yielding efficacy of the region is improved.

Using the same volume of Water, the Enclosed Tube, the network Distribution system irrigates 45% more agricultural land than the network of canals.

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