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Design of Canal Section using LDPE lining and Canal Automation for Irrigation system

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Abstract: *Design of a minimal fee canal section involves minimization of the sum of fees per unit length of the canal, challenge to uniform flow circumstance in the canal. In this project, the price per unit length of the canal for lining and the water loss due to seepage are minimized by the usage of Low-Density Polythene (LDPE) sheets. For minimization seepage losses generally, concrete lining is adopted in India. But Concrete requires very heavy initial expenditure. India is an agriculture-based country, 70% of humans are engaged in agriculture and via thinking about the history of our Maharashtra it has been determined that this type of undertaking has not been established in our region, this challenge will be extra beneficial to agriculture. Our authorities additionally spends loads of cash for improvement of irrigation amenities and as a consequence we have to make positive use of such tasks besides water wastage. Canal Automation for Irrigation Systems focuses on the technical aspects of modernizing irrigation structures via use of automated canal manipulate systems. Canal automation saves water and improves the effectivity of irrigation water supply initiatives or of irrigation district operations. Recent technological and engineering advances now enable extra accurate manipulate of water deliveries at some stage in all components of an irrigation undertaking*

Keywords: ***LDPE*** (Low-Density Polythene), Canal Automation, SCADA(Supervisory Control and Data Acquisition)

1. INTRODUCTION

In this project study about importance of lining and offer an alternative for canal lining. Apart from traditional method of lining i.e. (concrete lining), to provide innovative method of lining. Going beyond traditional method of lining, the new method of LDPE lining. It is flexible lining and more economical than concrete lining. It is plastic membrane lining; LDPE lining is more beneficial against traditional method of lining i.e. (concrete lining) because of advantages it offers its main aim is to prevent percolation. LDPE lining helps to make effective use of water without wastage. Commonly it is observed that, there is overuse of water by initial command blocks (near the dam), and leaving less supplies to the areas down the canal. Canal Automation will eliminate this discrepancies and equal benefits of irrigation will be available to entire command area. Actually, main objective of SCADA based RMCS is to make system more efficient, responsive, flexible and safe.

1.1 LDPE :-

Low-density polyethylene (LDPE) is a thermoplastic made from the monomer ethylene. It was the first grade of polyethylene, produced in 1933 by Imperial Chemical Industries (ICI) using a high pressure process via free radical polymerization.

Merits-

1. Reduction of seepage loose.
2. Reduction in water logging that is salt efflorescence.
3. Maintenance cost is less.
4. Additional advantages that it offers over concrete lining is that is economical, as compared to concrete lining.
5. And second is repairs are easy.

Demerits-

1. It has life span of 10-15 years.
2. Care against the crawling animals

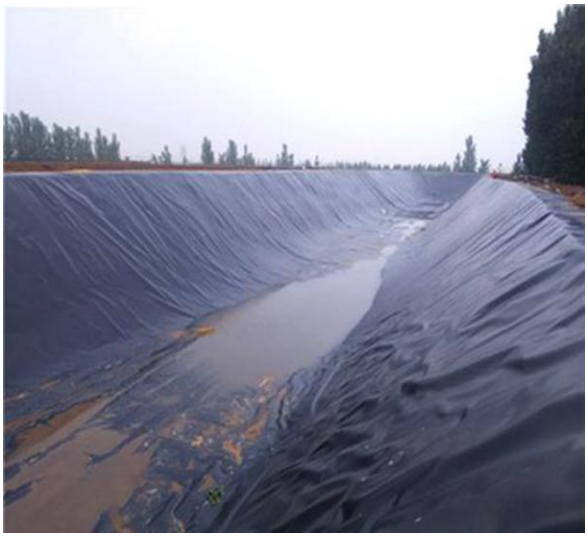


Fig -1: LDPE Lining

2. LITERATURE REVIEW

Anour Shebani1, Abdalah Klash1, Rabea Elhabishi1, Shalh Abdsalam1, Hassan Elbreki2 and Wael Elhrari1 (2018) Mechanical properties of blend of high density polyethylene (HDPE) and low density polyethylene (LDPE) have been investigated. Four different HDPE/LDPE blends with various ratio (80/20, 60/40, 40/60, and 20/80) were prepared by melt-mixing technique using mini-twin-extruder at 200 °C and 90rpm. Characterization tests including tensile and impact strength tests as well as hardness have been performed in order to better understand the behavior of these blends. Blends-rich with LDPE showed to have lower strength and hardness and higher elongation, impact strength, ductility and toughness than blends-rich with HDPE.

Miguel A. Hidalgo-Salazar, José H. Mina, Pedro J. Herrera-Franco(2013) The dynamic mechanical response and performance to short-term creep of composites made from mats of fique and low-density polyethylene–aluminum (LDPE–Al) obtained from recycled long-life Tetra Pak packages were studied. A relationship was observed between the creep mechanical response of LDPE–Al–Fique with respect to both the untreated fibers and the fibers treated with NaOH. Additionally, the four parameters of the Burger's model were calculated from the creep curves.

Asad Zia, Majid Ali (2017) Seepage of 15–20% has been observed even in the cement–concrete conventional sections. The performance of canals decreases with an increase in the rate of cracking in concrete canal-lining. The overall aim of the research program is to explore materials for better performance of canal-lining in terms of reduced water losses by controlling its rate of cracking due to alternate wetting and drying, and due to differential settlement, etc.

Karen Meijer, Eline Boelee, DenieAugustijn, Irna van der Molen (2006) The effects of lining on the availability of water for multiple uses were investigated by field measurements of water levels and by an inventory of the perceptions of changed water availability by the population through focus group discussions. From the measurements it was determined that canal seepage provides an important contribution to groundwater recharge. However, in the currently irrigated areas lining will have negative impacts by lowering groundwater levels due to a reduction in seepage from canals.

Joao Figueiredo, Miguel Ayala Botto, Manuel Rijo(2013) This paper applies a model predictive controller (MPC) to an automatic water canal with sensors and actuators controlled by a PLC network (programmable logic controller), and supervised by a SCADA system (supervisory control and data acquisition). This canal is composed by a set of distributed subsystems that control the water level in each canal pool, constrained by discharge gates (control variables) and water off-takes (disturbances). All local controllers are available through an industrial network managed by the SCADA system, where the centralized predictive controller runs. In this paper a complete new platform connecting the SCADA supervisory system and the MATLAB software (named SCADA–MATLAB platform) is built, in order to provide the usual SCADA systems with the ability to handle complex control algorithms. The developed MPC-model presents a novelty in the control of irrigation canals as it allows the use of industrial PLCs to implement high complex controllers, through the new developed SCADA–MATLAB platform. Experimental results demonstrate the reliability and effectiveness of the proposed strategy in real-life typical situations, including gate malfunctioning and extreme water off-take conditions.

S. Deepika* and B. Krishna Rao (2018) The harvested runoff water in a farm pond creates salinization / water logging problems so, it has to be lined to control the seepage losses. The article presents a review on the type of lining materials viable and to explore for a cost effective sealant which can be adapted. Whereas alfisols, luvisols of arid and semi-arid regions require lining materials with diversified crops.

IoannisKougias, Katalin Bódis, Arnulf Jäger-Waldau, Magda Moner-Girona, Fabio Monforti-Ferrario, Heinz Ossenbrink, SándorSzabó (2016) In the present research an integrated approach to increase solar photovoltaic (PV) systems' (SPVS) share in the energy mix of Mediterranean islands is presented, through installations on the available surface near existing water infrastructure. Accordingly, we have analyzed the

potential of existing dams to accommodate SPVS on their downstream face as well as the option of SPVS over irrigation canals.

Brian Wahlin and Darell Zimbelman(2015) Studied on Canal automation always has had the potential to save water and improve efficiency of irrigation water supply projects or of irrigation district operations. Recently, there have been a number of technological and engineering advances in the field of canal automation. While these advances have been documented via conference proceedings and peer-reviewed journal articles, a comprehensive document outlining the state-of-the-art in canal automation was lacking

3. METHODOLOGY

3.1 LDPE Lining

A) Construction of canal lining and Laying Technic for LDPE sheet -

Canal construction: -

1. Preparation surface for canal and remove the rocks, vegetation which are near thecanal site.
2. The canal is made by excavating the land surface with the help of bulldozers.
3. The proper is been provided at the sides of the canal.
4. The mini excavator machines are used for digging another trench.
5. And, hence the canal is being constructed.

B) Laying the LDPE Sheet -

1. The fabric is unwrapped and loaded up.
2. It is unrolled to cover the entire canal prism.
3. When necessary, the fabric is cut to fit in the canal.
4. Using a small torch, the fabric is mewled together.
5. Small angular and pointed objects should be removed.
6. LDPE sheets should be properly attached by gun-hitter.

3.2 CANAL AUTOMATION

Automation can be defined as the technology by which a process or procedure is performed without human assistance. Automation has been achieved by various means including mechanical, hydraulic, pneumatic, electrical, electronic devices and computers, usually in combination. Complicated systems, such as modern factories, airplanes and ships typically use all these combined techniques. The benefit of automation includes labour savings, savings in electricity costs, savings in material costs, and improvements to quality, accuracy and precision. The methodology for automation is done by SCADA system precisely and then after its functioning is co-related with Canal Lining and Solar Power Generation. The whole system can be operated by using mobile phones, tablets, etc. and can be atomized each and every part of Canal Automation. Canal automation schematic diagram should explain all the working procedure of canal gates opening, the water provisions to farms and then the economy generation through it.

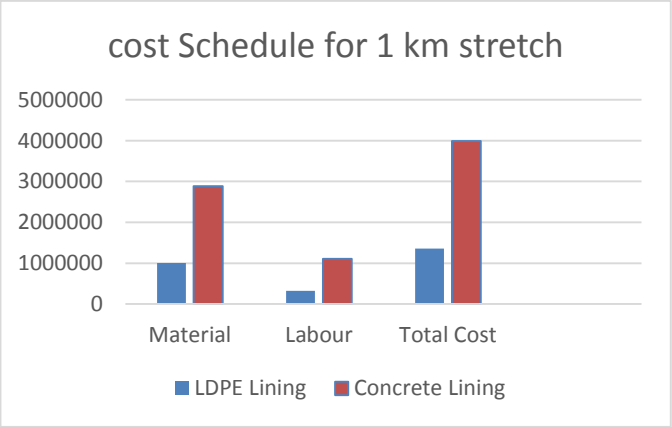
4. RESULT & DISCUSSION

4.1 Difference between LDPE lining and Concrete lining -

Difference = 39,88,926 – 13,55,000

= ₹ 26,33,926 /-

Thus, we can see that there is giant distinction in phrases of costing between LDPE lining and Concrete lining. Through this we can make sure that LDPE lining provides higher financial system than concrete lining and additionally enterprise presents years guarantee of LDPE sheets maintenance. The difference calculated is given as to be ₹ 26,33,926 /-



Graph -1: Cost Comparison Graph

Discussion :-

- Picking Points to be considered whilst designing canal system the use of LDPE from farmers perspective
- Discussion with farmers in 'Mahisal Canal

Irrigation' place which is vital for learn about of proper situation of irrigation and water requirement usage of water.

- By considering canals at the centre for the development of farmers & water cultivation land some platform questions occur at some stage in dialogue with farmers & civilians as properly as staff of the irrigation department.

Points to be considered at some point of interview of farmers,

1. Utilization of water .
2. Requirement of canal water.
3. Sources of water for canal network.
4. Is that clear farmers are truely taking or selecting water legally?
5. There is loss in manufacturing of agricultural plants due to lack of water?
6. Way of water lifting or water lifting techniques.
7. Duration of canal beneath working for water supply.
8. Serviceability of canal lining and automation.
9. There is expand in productivity or improvement in cultivation efficiency.
10. Cost comparison between concrete lined and LDPE lined canal.
11. Is LDPE truly useful or no longer advantages and limitations
12. Automation methods improves strength of agriculture
13. Components and automation techniques.
14. Water theft and social troubles concerning canal water.
15. Water distribution on meter basis.
16. Cost estimation for photo voltaic panel blanket on canal pinnacle width

5. CONCLUSION

By using LDPE sheets canal lining can be made economical as compared to concrete lining. From cost comparison we have concluded that LDPE canal lining is of less cost RS 26,33,926/- than concrete lining for 1 km stretch. Combination of canal lining and canal automation using gives most economical hydraulic structure. Also, the water logging problem will be reduced as compared in concrete lining. Ultimately the canal section over which we have to establish all this thing will have to be maintained with greater care which will finally lead us to expected results using LDPE lining, canal automation and solar panel for power generation. The percolation losses using LDPE sheets are minimized and hence lot of water should be saved per day and per capita capacity of water will increase. The trio logy of using Canal lining, and automation will lead to better functionality of project and therefore economy will increase and finally the whole system will have brought future days of agricultural aura in sustainability.

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