# Design of Canal Section Using LDPE and Automation in Canal Section

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***Abstract-*** ***An irrigation canal is a waterway, often man-made or enhanced, built for the purpose of carrying water from a source such as a lake, river, dam or stream, to soil used for farming. Huge quantities of water from Monsoon rainfall & melting of snow can be stored in reservoirs during summer season. Irregular supply of water in the rivers is then regulated by construction of dams & barrages. But river and dam irrigate only near bank area only. Canal system irrigates a vast area. Even the deserts, low rainfall area have been made productive. So, canal lead main role in irrigation system of India. Design of a minimum cost canal section involves minimization of the sum of costs per unit length of the canal, subject to uniform flow condition in the canal. In this project, the cost per unit length of the canal for lining and the water loss due to seepage and evaporation are minimized by using respectively Low-Density Polythene (LDPE) sheets and erecting solar panel over the canal. For minimization seepage losses generally, concrete lining is adopted in India. But Concrete requires very heavy initial expenditure. Also, when concrete lining gets old, it generally develops cracks and Leakage through cracks is very often happens. While shifting outlet points it gets difficult due to rigid concrete lining. Also joints in canals always create problems. So, we will replace concrete by Low Density Polythene (LDPE) sheet lining because of above mentioned disadvantages of concrete lining and economical use LDPE sheet lining in our project.***

***Indexed Terms-*** ***canal lining, LDPE sheets, solar panels, automation.***

## I. INTRODUCTION

In this project we are going to study about importance of lining and offer an alternative for canal lining. Apart from traditional method of lining i.e. (concrete lining), we are going to provide innovative method of lining. Going beyond traditional method of lining, we have looked forward the new method of lining. It is flexible lining LDPE lining is 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. Next Generation of solar power over canals, this is an effective project. In this project we have placed the solar panels over the canals. Electricity is generated through these panels and used for domestic use. Its main aim is to prevent evaporation losses and generate electricity. It helps to maintain the level of water, placing of solar panels over canal saves the land. It is renewable source of energy. Considering history of our Maharashtra it has been observed that this type of project has not been established in our region, and as we all know that that India is an agriculture-based country and 70% of people are engaged in agriculture. Our government also spends lots of money for development of irrigation facilities and thus we have to make effective use of such projects without water wastage. LDPE lining and solar project helps to make effective use of water without wastage. We can also establish use of water without wastage.

## II. AIM

To facilitate Canal by using LDPE (Canal Lining) using automation technique and solar power generation for further growth of project.

## III. OBJECTIVE

- To achieve in economy in canal lining
- To reduce seepage of water.
- To reduce canal maintenance cost.
- To use recycled LDPE

## IV. ADVANTAGES OF CANAL LINING

- Reduction in seepage losses
- Low maintenance cost
- Minimizes the possibility of breaching of canals
- Prevents weed growth
- Improved hydraulic efficiency of canals
- Reduces cross sectional dimensions of canal
- Improvement in command

## V. DISADVANTAGES OF CANAL LINING

- Higher initial investment
- Repair is costly
- Shifting of outlet is costly because it involves dismantling and relaying of lining.
- Longer construction period
- Sophisticated construction equipment and labour is needed.

## VI. CONSTRUCTION TECHNIQUES

There are presently several solutions for lining canals with concrete. They range from the more traditional ones, using no formwork and often lacking appropriate compaction, to the modern and sophisticated ones which can build a seamless cross-section. Usually, the banks of a canal with a trapezoidal cross-section are built before the invert, with the natural exception of sliding formwork solutions, where the LDPE is laid across the whole section. The main techniques before laying a LDPE sheets is to compact the below base properly and Also care should be taken that angular stones and pointed things should be removed properly. Then after LDPE sheets are to be laid down properly and to be attached by gun-hitter which should adhere the sheets properly. The ends of LDPE sheets are to be covered with concrete side-by-side so that water can't flow from inside the sheets. Then after Sheets should be covered by some amount of soil so as to maintain the stability of sheets.

## VII. SOLAR POWER GENERATION

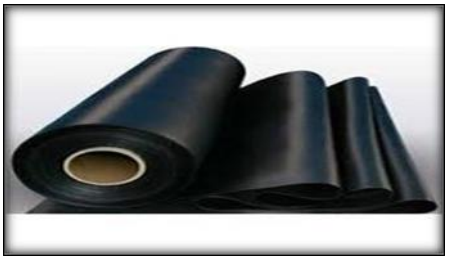
To generate solar energy using solar panels over the stretch of canal section we are guided by Prof. Gattani and further a firm had given us the following rates of Solar Panel:

- Size of Panel: 100ft x 100ft
- Rate of Panel: ₹ 70,000T

Then comparison between acquiring cost of land for solar power generation and cost of solar panel over canal stretch is done.

A) LDPE Sheets

- LDPE is a thermoplastic monomer ethylene which is recyclable material.
- LDPE is made using a high-pressure process via Free Radical Polymerization. Figure 9 LDPE SHEETS



B) Properties of LDPE

- According to IS 3875:1993, Clause no.5.4
- Tensile strength-17.5N/sq.mm
- Tear resistance -9.5N/sq.mm
- The recycle number is 4.
- Withstand temperature of $80^0$C to $90^0$C
- Excellent resistance to dilute concentrated acids, alcohols, bases, salts and esters
- These sheets can be heat formed, shaped and welded to fabricate ducts, hoods and much more. Material cannot be cemented but it is easily welded with plastic welder. It can be cut with a carbide tipped saw blade and drilled with regular metal bits.
- White translucent
- Good impact resistance & abrasion resistance
- Semi-rigid
- Excellent corrosion resistance to a wide range of items
- Easily welded with plastic welder

- Not UV stabilized
- Density: .92
- Forming temperature: 245°F
- Temperature range: 0°F - 140°F Meet FDA standards.
- Nature Translucent.
- Very Flexible.
- High impact resistant.
- Good chemical resistant.
- Good water vapour barrier.
- Good stress and crack resistant
- Density -0.910-0.940 G/$cm^3$

LDPE Rates

- Width: 6 meters; Length: 20 meters
- Thickness: 1mm or 1.5mm (Rate: - ₹ 140 to ₹210)
- Installation Charges: ₹25/-sq.m.

## VIII. HIGHLIGHT OF PROJECT

- The electricity is generated from renewable solar energy and hence it is clean and eco-friendly.
- As canals are covered with solar panels these will be no need to acquire land to install solar project.
- The water evaporation form canals will be reduced as the canal which will lead to low transmission losses.

## IX. CANAL AUTOMATION USING SCADA SYSTEM

For the sub-system under modernization (main and lateral canals, all of them concrete lined canals), Rijo & Almeida (1993) presented an estimation of the conveyance efficiency (ratio between delivered and inflow water volumes) of 40%, considering the entire irrigation seasons of the years 1987 and 1988. The main canal systems of these projects are now the focus of a new rehabilitation and modernization policy, with the main purposes of saving water and installing more flexible water delivery rules, like on-demand schedules (Clemmens, 1987). The final objectives are to make possible new irrigation methods and give some degrees of freedom for irrigation water management to farmers. The proposed field implementation of this policy was to maintain the system architecture, to install supervisory control and data acquisition systems (SCADA) and, when possible, to install buffer and control in the form of off-channel reservoirs (Rijo & Paulo, 1998).

The SCADA systems allow the water manager to continuously compare the actual hydraulic state of the delivery system with its optimal hydraulic state, and to take appropriate corrective steps as required. These systems allow the manager to react rapidly and effectively to the changing conditions, thereby accommodating both high and low flow conditions and reducing canal spillage and seepage. The preliminary study of the SCADA of the Sorraia Irrigation Project was already presented by Rijo (1999). This paper describes implemented solutions (control and equipment's) and the correspondent tuning. The Sorraia Irrigation Project (Figure 1) is located along the narrow alluvial valley of the Sorraia River, a tributary of the Tejo River, near Lisbon (Portugal). Water sources are two large dam reservoirs. The main irrigation system is an open lined canal network (main and secondary canals or laterals). AMIL radial gates (Kraatz & Mahajan, 1975) provide potentially good operation conditions for the Neyrpic orifice module intakes (Kraatz & Mahajan, 1975) to tertiary systems (canals or buried low pressure pipes) and to the fields.

## X. RESULTS AND DISCUSSION

Difference between LDPE lining and Concrete lining-Difference = 40, 34, 652 – 11, 72,100 = ₹ 28, 62,552/-

Thus, we can see that there is large difference in terms of costing between LDPE lining and Concrete lining. Through this we can ensure that LDPE lining provides better economy than concrete lining and also company provides years warranty of LDPE sheets maintenance. The difference calculated is given as to be ₹ 28, 62,552 /-

Discussion –Picking Points to be considered while designing canal system using LDPE from farmer's perspective

Discussion with farmers in 'Mahisal Canal Irrigation' area which is essential for study of actual situation of irrigation and water requirement usage of water.

By considering canals at the centre for the progress of farmers & water cultivation land some platform questions arise during discussion with farmers & civilians as well as staff of the irrigation department.
Points to be considered during 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 really taking or picking water legally?
5. There is loss in production of agricultural crops due to lack of water?
6. Way of water lifting or water lifting techniques.
7. Duration of canal under working for water supply.
8. Serviceability of canal lining and automation.
9. There is increase in productivity or improvement in cultivation efficiency.
10. Cost comparison between concrete lined and LDPE lined canal.
11. Is LDPE really useful or not advantages and limitations
12. Automation techniques improves strength of agriculture
13. Components and automation techniques.
14. Water theft and social issues regarding canal water.
15. Water distribution on meter basis.

## XI. 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 28, 62,552/- than concrete lining for 1 km stretch.
- Combination of canal lining, canal automation and using solar energy for power generation gives most economical hydraulic structure.
- Also, the water logging problem will be reduced as compared in concrete lining.
- By using solar energy, we can generate revenue and it will also compensate the maintenance cost.
- 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, solar power generation 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.
- In every year due to evaporation 90 lacs liter of water is evaporated per km and hence due to this method we can optimize save required amount of water.
- Total land cost saves =685.3475 Cr and hence it will bring the usage of land to some other work or forestry resources.

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- Mr. Umesh Sawant –guided about RMC rates

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