

# Design of Pond Inlet Structure to Increase Capacity (A Case Study of Akheraj Pond, Jodhpur)

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**Abstract:** In the last two decades the demand of water is increasing rapidly as the population has been increased and resources of water supply has been decreased resulting in the scarcity of water in many areas for domestic as well as irrigation purposes. It is necessary to implement the use of some device and structure which are better solution for prevention of water and water supply problem. This paper describes about the case study of Akheraj Pond to increase its capacity by providing an Inlet Structure situated at Jodhpur in Rajasthan. At the end a comparative assessment & modification before implementation of the proposed system in the concerned area is done.

**Key Words:** Akheraj Pond, Kaylana Lake, Pond Inlet Structure

## I. INTRODUCTION

Rajasthan is known as a dry state, especially the west region. A large amount of area of this region is covered by sand desert. There is a huge scarcity of water for drinking and irrigation purpose, because this area has less rain fall and ground water level. The main source of water is Indra Gandhi canal, but it is not sufficient to complete the requirements of local bodies in some areas. Study area concerned is Akheraj pond situated nearby Kaylana Lake at Jodhpur in Rajasthan. This area is selected for the project because it is situated in the west region of Rajasthan state which is suffering from a vital scarcity of water for irrigation as well as domestic purposes.

Kaylana Lake is situated 8 kms to the west of Jodhpur in Rajasthan. Pratap Singh, king of Jodhpur, got the lake constructed in 1872. This artificial lake is spread over 84 square km with average depth 35feet. It located at 26°17'N and 72°58'E. It receives water from Hathi Canal which is connected to Indra Gandhi Canal. Primary outflow of Kaylana Lake are Takhat Sagar and Umaid Sagar. It is situated between igneous rock land formations. Many migrating birds like Siberian Cranes come here in winter seasons.



Fig (1): Kaylana Lake



Fig (2): Akheraj Pond

The Akheraj Pond is situated 26°17'51"N and 72°58'54"E about 7 Km west of Jodhpur besides Kaylana Lake surrounded by croplands and commercial buildings .This water body is a very good bird watching site, which supports several resident birds like purple moorhen, white breasted waterhen ,Indian moorhen, and many other reed loving birds. The floating vegetation is mainly water hyacinth and submerged vegetation is mainly Vallisneria spirals.

## A. BACKGROUND

The practice of pond structures is roughly 30 years old. Construction of Pond Inlet and Outlet structure was started in the United Kingdom with area wide studies in London and Manchester. Since then, the practice has progressed through various schools of thought. It has changed the environment in which such analyses are carried out. Thereafter many researches were carried out in pond structures using numerous methods and software.

## B. NEED OF INLET STRUCTURE

Today one of the most critical problems in India is availability of water and effective supply system to provide fresh, hygienic and pure water to the users. In some regions water supply system is very complex and tedious; we need to improve the supply system to maintain the quality and quantity of water. This will help in reducing the scarcity of water and increasing the availability of water for domestic as well as irrigation purpose.

To keep this problem in mind this project is dedicated to Design of pond Inlet structure to increase the capacity of Akheraj Pond.

The scope of work will be adapted on a case study, according to site conditions, project scale design requirements and specifications of pond inlets. They allow water to flow in the pond and take out the water for use. It also limits the rate at which water flows along the system. There are many different variations available in the design of pond and canal. They can easily be designed to add interest to the urban landscape. The overriding design considerations for inlets, outlets and are ease of access and maintenance.

Need of an Inlet Structure, Inlet structures are built to control the amount of water flowing into the pond at all times. The need for an inlet structure varies with the type of water supply being used to feed the pond.

1. These structures are used to provide proper drainage of pond water and utilize the water in irrigation work.
2. Inlet structure helps to ensure that water coming in the pond is well aerated and can help to mix incoming water well with existing water.
3. An inlet structure may be built for a pond supplied through a feeder canal, for example by diverted stream water, a spring outside the pond, a well or a pumped water supply.
4. To feed water into two adjacent ponds, a division box can be used to regulate water flow toward the two pond inlets.
5. There is no need for an inlet structure for a pond supplied entirely by rain, surface runoff, groundwater or a spring which emerges within the pond, nor for a barrage pond built directly on the stream.

### C. TYPE OF INLET STRUCTURE

There are three main types of inlet structures:

1. Pipe inlets can be made from various materials, depending on the water supply required and the inside diameter of the pipe. If the pipes you have are too small to provide the required water flow, you may have to use more than one pipe at each pond inlet.
2. Gutter inlets usually extend for about 1 m over the water surface when the pond is full. They can be made up of various materials such as:
  - Bamboo
  - Wood
  - Metal
3. A small open canal can be built to connect the water feeder canal to the pond, usually from a division box.

### D. Advantages of the Proposed System:

The water flow would be smoothed and easy after the application of the proposal. Scarcity of water would be reduced as the significant amount of water is put into the Akheraj Pond from Kaylana Lake. Future demands of water could be easily met by using inlet structure. Decrease in the dependency of local public on the rain water. Decrease in irrigation cost for local people. Impact of system on environmental quality and quantifiable public health benefits.

## II. METHODOLOGY

The project is focused on the CADD designing of Pond inlet structure at Akheraj Pond near Kaylana Lake at Jodhpur in Rajasthan. It is very necessary to build these structures at that place due to huge scarcity of water in that area. Survey of that particular area is the first task of the project, which will help to know and understand the present problems of that area related to water.

On the basis of these surveys and the data collected from local bodies, govt. offices and physical survey calculation has been done. CADD designing and modeling of any structure gives an indication of the problems to be faced during real construction of that structure and an approximate idea of construction cost and time spent on that project. AUTO CADD is very useful in designing of any project at initial level. Basically it is software to make or to create a 2D as well as 3D model of any structure.

A designed proposal is suggested to design an Inlet structure on Akheraj Pond to increase its capacity. Designing is made on a scale ratio to the project prototype. It will lead to no error in the construction of the structure in future.

The project is divided into following stages-

First stage is dedicated to article review. For this purpose 4 to 5 articles have been reviewed such as Davis pond on the west bank of the Mississippi River and Hunter Acres pond in city of Charlotte.

Second stage consists of site visit, data collection from site survey and govt. bodies of Jodhpur.

From the survey following data has been collected-

Area of pond = 32438 m<sup>2</sup>, Avg. depth of pond = 3.05 m, Population of area = 2000-2500, Per capita demand = 140 Liters and Land for irrigation = 450000 m<sup>2</sup>.

In the third stage is calculation based stage in which following terms has been calculated-

- (a) Total volume of Akheraj Pond = 32438×3.05 = 98936 m<sup>3</sup> = 98936000 liters
- (b) Time needed to fill the pond = 6 hours = 21600 seconds
- (c) Inlet capacity required = 98936/21600 = 4.58m<sup>3</sup>/s

For the design of canal trapezoidal section is adopted because is most economical section and has high resisting against scouring of canal. Design of canal is based upon Lacey regime theory according to which various factors of canal are as follows-

- (a) Velocity of flow = 0.56 m/s
- (b) Area of channel = 8.09 m<sup>2</sup>
- (c) Perimeter of channel = 10.16 m
- (d) Depth of channel = 0.946 m
- (e) Width of channel = 8.04 m
- (f) Hydraulic mean radius = 0.784 m
- (g) Slope of the channel = 1 in 4300

In the fourth and final stage is CADD designing of canal section through AUTO CADD software.

### III. RESULT AND DISCUSSION

#### Comparison of Current and Proposed Systems

In our research area in the present system people are getting water from municipal water supply for domestic purpose not for irrigation purpose, but in proposed system water will be collected from Akheraj Pond. The proposed system will increase the availability of water for irrigation as well as domestic purpose. It will reduce the dependency of local bodies on the rain water and municipal water supply. The proposed system will provide a more efficient and smooth flow of water over the current system.

For the final outcome of the project, the analysis would be detailed out from the statistical study and the suggestions that would be provided by the local authorities and the people commuting from that area.

The present scenario clearly states that there is high scarcity of water in that region and basically they are dependent on the rain water for irrigation purposes. There is a weak management system for the water supply and water control. So in order to make the system efficient and worthy the construction of Pond inlet and outlet structure is necessary. It is fact that there was improper utilization of the water channel that wasn't allowing the use of resources.

The efficiency and the use of any particular water channel or the channel can only be used to the fullest when the proper analysis and the research has been carried out. Moreover, there are ways or methods that can be deployed to find out the present and the future population, amount of water used for the irrigation and domestic purposes. With the onset of connecting the Kaylana Lake and Akheraj Pond, people will learn the value of water and discipline and hence they will have ease in the transportation of water from one place to another. And the strict conditions should be followed for each and every water supply path and thereby making the entire area desirable for living conditions by having a certain and suitable amount of water for irrigation as well as domestic purposes.

### IV. REFERENCES

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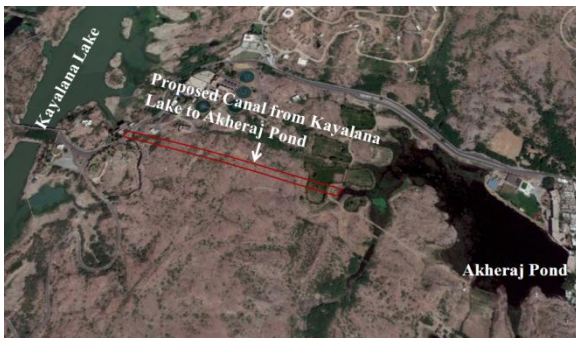


Fig (3): Proposed Canal System

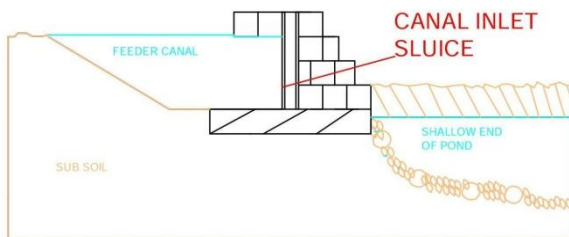


Fig (4): Proposed Design of Canal

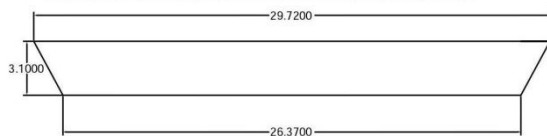


Fig (5): Trapezoidal Channel of Canal