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Study of Micro Hydro Power Plant Installed on Kanher Canal

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Abstract: ***Hydropower project may be used as one of the option for achieving energy target in developing nations where government do not have many resources to put in a large projects. Micro-hydropower system is a system that is used to produce electricity. Its main concept is to transfer the kinetic energy of flowing water into electrical energy by a generator. When the water flows from a head it contains kinetic and potential energy and when it knocks the turbine bucket, turbine rotates and turns the generator to produce electricity.***
Advantage of the project is that private parteners get attracted due to low investment and quicker returns in comparison to large projects. The most eco-friendliness of micro-hydropower plant is its serious concern in case of thermal, nuclear. Micro-hydropower potential in India is underutilized and there is a need to tap this potential for utilisation of natural resources. This paper aims to identify challenges faced in hydropower plant of not getting desired amount of electricity and solutions to them.
Keywords: Recent status, detailed study of Onsite plant, Design parameters, Problems and their solutions, Probable sites

I. INTRODUCTION

Hydropower is a renewable, non-polluting and environment friendly source of energy. It is the oldest energy technique to convert mechanical energy to electrical energy. 22% of the world's electricity supply generates from hydropower. Due to small gestation period, small capital investment and good returns involved, in recent years micro-hydro plants have become point of attraction over large hydropowers. Micro-hydropower plant provide maximum benefit in minimum time and offers the fastest economical means to enhance power supply, improve living standards and enhance agriculture with the least environmental impact and without heavy transmission losses. It provides cheap distribution cost due to less transmission losses.

In India, Jamshedji Tata built first hydropower dam in western ghats of Maharashtra to provide electricity to textile mills and industries. For more than century this technology of creating hydroelectricity using falling water has existed when Greeks used to turn wheat into flour using water wheels. Principle is based on generation of mechanical or electrical energy as per demand of surrounding locality. In a typical MHS (Micro Hydro-power System) the water from the source is diverted by weir through an opening intake into a canal. Water then enters into forebay tank and passes through penstock pipe which is connected to lower end of turbine. The turning shaft of the turbine then rotates and generates electricity.

Also there is kinetic energy present in the flowing water so, it is profitable to use water from canal to convert into electric energy. But due to floating wastes flowing with the flow in channel (plastics, bottles, vegetables etc.) and other technical and non-technical defects (these problems will be illustrated below) the plant generates less electricity than its capacity so, this project will cover all the challenges being faced on site and some remedies to them. Also this project aims to find similar sites where this type of plant can be installed.

II. AIM AND OBJECTIVES

To study Micro-hydropower plant installed on Kanher Canal.
To study recent status of Micro-hydropower plant.
To study detailed analysis of Onsite power plant.
To find out challenges faced in plant and give solutions.
To find suitable locations for similar type of hydropower plant.

III.STUDY AREA

This project is installed in Arale village of Satara district. The kanher LBC Hydro Electric Project is based on kanher left bank canal. There is canal fall structure at channel 19.971km from Venna river where constant water head of 8.43 m is available. To utilize this

head a power scheme with capacity 1 unit of 1200 KW is proposed to be constructed in the acquired land on the right side of existing canal. The gradient available for this canal is 1:3000.

A visit was conducted in the month of October in 2017 to the power plant. In these visits the power plant was studied in detail and all the specifications were noted. All the information regarding civil works was collected. All the problems affecting the generation of electricity of plant were found out and solutions to these problems were made with design parameters.

Also the visits were conducted to nearby region where this type of power plant can be installed. This include visit to Takari Canal near Takari in Sangli district and also to Aarphal canal in Satara district. In these visits, Geology of the sites was considered.

TABLE I
PLANT SPECIFICATIONS

1.	Water Tank Size	40m x 30m x 2.2m
2.	Type of Turbine	Kaplan
3.	Head	8.43m
4.	Plant capacity	1.2MW
5.	Speed of generator shaft	750 rpm at 1200 KW
6.	Gear box Ratio	1:3.26
7.	Efficiency	40%
8.	Power Factor	0.92

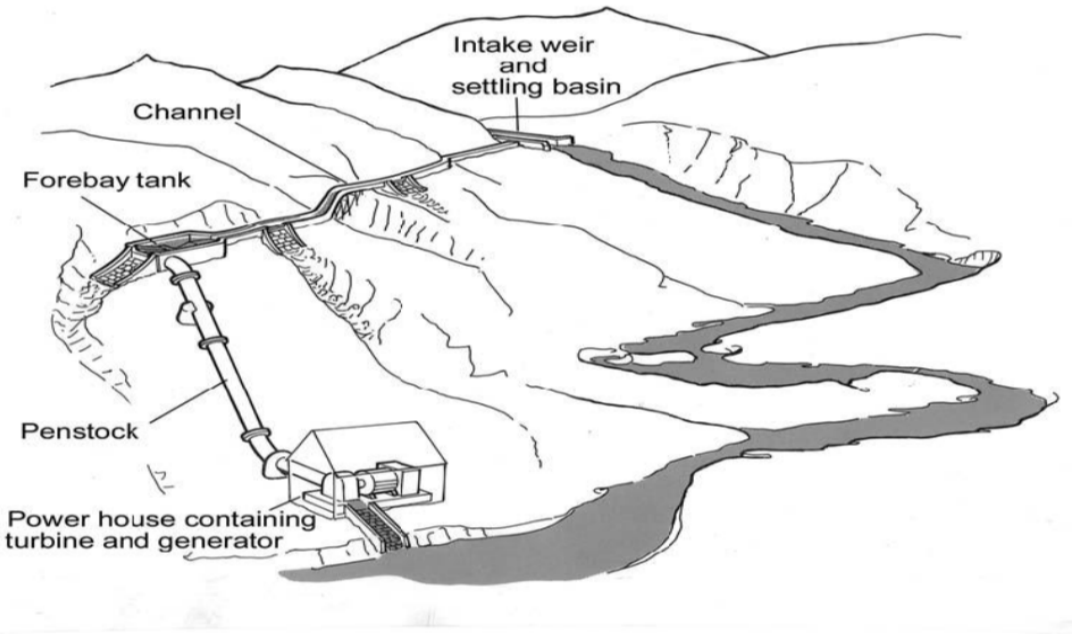

Fig 1. Typical structure of hydropower plant

A. *Specific Problems*

1) *Waste of canal* - It affects head of powerplant therefore produces less electricity than its capacity.

a) This problem will be avoided by providing screen at the diversion of canal

b) Screening will be provided in different ways like non automatic screen, semi automatic and fully automatic.

c) In non automation, screen is provided by connecting vertical bars by welding and waste is restricted within the bar spacing.. This waste is removed manually by labours.

d) In semi automation, waste is restricted by providing two screens of same dimensions in vertically opposite direction resting on horizontal platform which can rotate by shaft. When waste approaches to the storage tank it get restricted to the screen on upper side where screen is holes-free. After some period say 5 hrs the screen is rotated with the help of motor and waste get settled on upper side of horizontal platform. And the waste is collected manually in collector near canal.

e) Fully automation systems are used for large rivers to collect the waste. This system has high initial and maintenance cost so can only be used in large projects.

2) *Canal leakages* - It occurs due to faulty construction or use of poor material. Sometimes water gets leaked from channel through pores present at sideways of it. When water passes through it, it approaches to the surroundings like farms and creates political issue. Also it creates water logging which reduces oxygen in soil.

a) This problem will be avoided by providing lining to the canal. The major advantage of canal lining are reduction of seepage losses resulting in saving of water, prevention of water logging, reduction in areas of cross section due to increase in permissible velocity, reduction of maintenance cost, long economic life and improvement of operational efficiency. There are different types of lining like cement concrete, shotcrete, soil cement, asphaltic concrete etc.

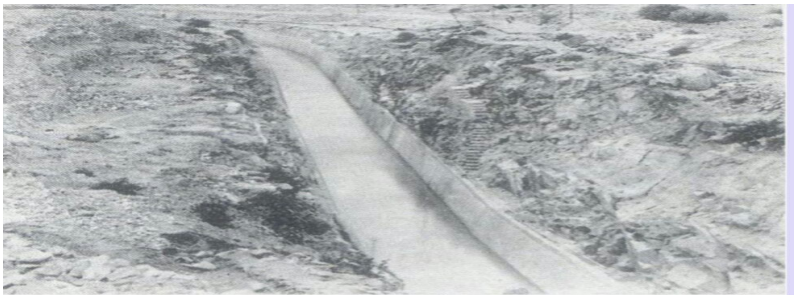

Fig 2. Cement Concrete Canal Lining

b) This problem is avoided by filling black cotton soil in excavated pits of 3-4 m at the leakage of channel helps to reduce this problem as black cotton soil holds water quite well.

IV. CONCLUSIONS

The aim of this project is rural development and giving boost to industrial sector which uses renewable source of energy for generation of electricity. Micro hydropower plants needs less capital investments, have less gestation period and involves less risks than large hydropower plants so micro hydro power plants needs to be installed on large scale in India. These power plants are beneficial as they make less land use since, the water used in this power plant need not to be stored in large reservoirs. The trash gate designed in this project helps to restrict the waste with minimum head loss. Semi automatic system designed in this project is advantageous over the previously used non automatic system. The requirements for this kind of projects i.e. minimum head, gradient, accessibility, distance from load center etc. can be easily fulfilled.

V. ACKNOWLEDGMENT

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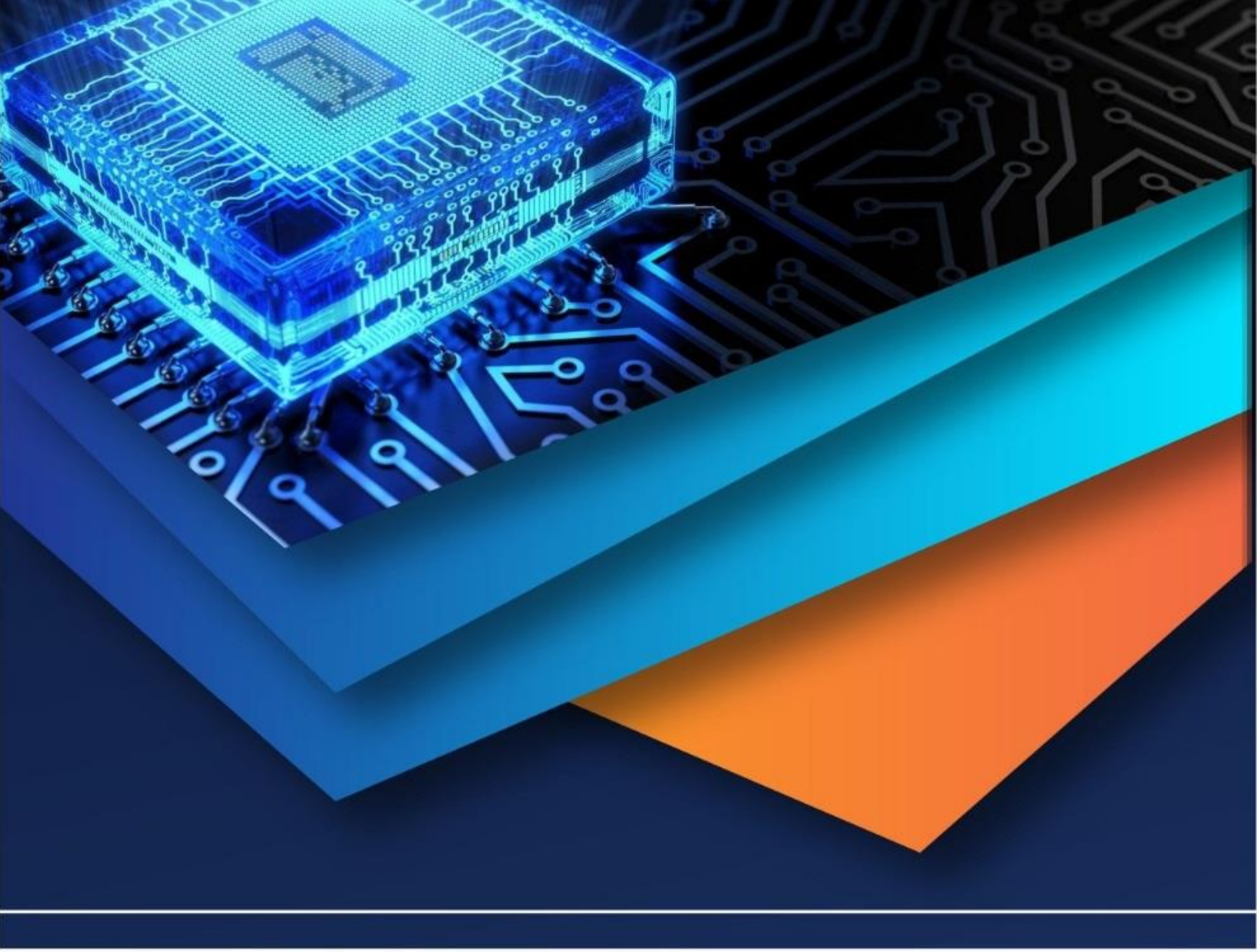

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