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FEASIBILITY STUDY OF GENERATION OF ELECTRICITY BY USING RAIN WATER IN ANY TYPES OF ROOFING

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ABSTRACT

Now a days we are living in a Global Village. We are very conscious about our environment and nature. The most common fuels that we use globally for full filling our energy needs are non-renewable. In Indian scenario also, coal is the main source of commercial generation of electricity. And the coal reserves in India as well as in the world are very limited. The day-to-day consumption of those resources will ultimately lead to their depletion or complete exhaustion. For that the world is incessantly trying to find substitutes of those resources and the main focus is shifting to the use of readily and abundantly available natural resources. In our planet there are many places where rain fall is significant. In this research the areas with heavy rainfall were targeted. The study was conducted in Shimla region which has the second highest recorded rainfall in Himachal Pradesh. In this research a mini hydro plant technology was employed to produce electricity by utilizing rain water falling on Multi-Storey Buildings or any type of roofing in APG Shimla University. The rain water from the roof area of 1500 square feet was utilised to check if it was sufficient to generate electricity. Highest recorded rain fall in last five years in Shimla is 280mm and average rain fall is 120mm. A well constructed model would suffice to produce just enough electricity to support a common household needs.

Keywords – Rain Water, Producing Electricity, Multi-Storey Building and any types of roofing.

INTRODUCTION

Using Rain force producing electricity is effective process. By developing mechanical hydro power plant system it can easily establish. When rain strikes on the surface of any height (h) of roofing it contain energy for it's wait and gravity (g). At this point we have Height (h) and gravity (g) ,

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Now according law of power

$$P = h\rho g$$

Where ,

P = Power

h = Height of roofing

g = Gravitational constant

Rain Water Potential (m^3) = Rainfall (m) X Catchment Area (m^2) X Collection efficiency

The Power Equation is modified by an efficiency Factor (η):

$$P = Q \times H \times g \times \rho \times (\eta)$$

This equation provides an estimate of the power output of a hydroelectric system.

This paper has been organized as follow :

1. The problem description and the model overview where the iterative procedure is explained.
2. Mathematically solve the problem .
3. Making a demo plant and collect the data and analyse the data.

When we make a demo plant for this purpose we use single storey building. If we increase flows to a usable rate hopefully we will get increased viable energy production. By using some technique for iterative solution of non linear equations will be calculated for a multi storey building.

Rainfall- Data on rainfall periodicity and duration measure in meters.

Catchment Area- Estimated Surface areas and options available for rain water , measured in m^2

Collection Efficiency – Data estimating the runoff coefficient for a given catchment surface.

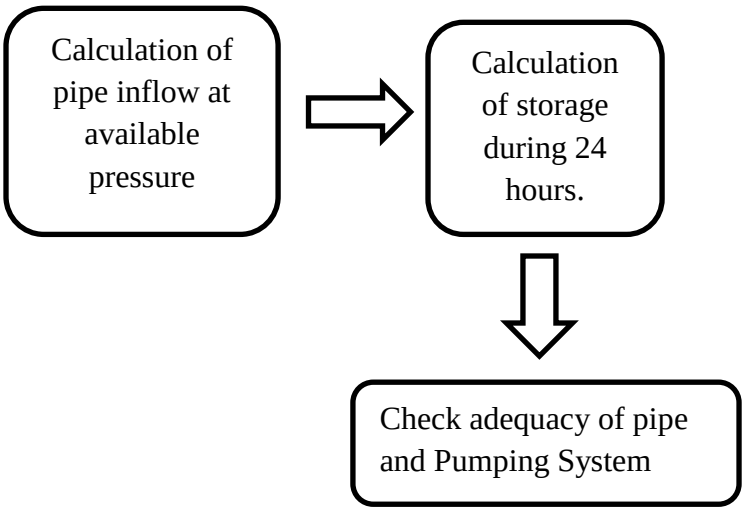
Head- Estimated vertical distance from roof top to the generation in meters.

Potential of harvested rain water (Qmax/Qmin) measured in cubic meters.

Calculated Power for a particular (mm) of a state in Shimla in KW.

Depending upon power generated it can be concluded that the system is suitable for Mini/Micro Power Generation.

Pipe Network – Flow and head loss in the pipe network will be calculated using Hazen-Williams formulae. Available minimum pressure is assumed to be constant through a complete cycle and it will discharge water at atmospheric pressure through the pipe. The whole analyses follow the flow chart as shown below.

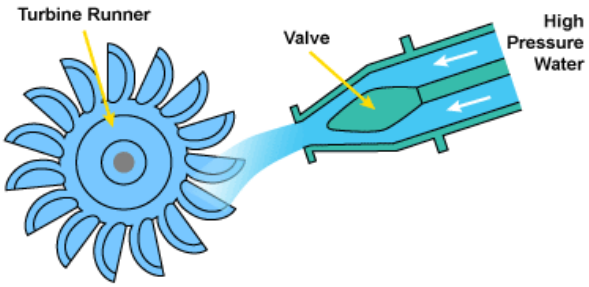


Using Bernoulli's Energy Equation and Hazen William formula only flow in pipe will be studied.

$$Z_1 + \frac{P_1}{Y} + \frac{V_2}{2g} = Z_2 + \frac{P_2}{Y} + \frac{V_2}{2g} + h_L$$

$$h_L = \frac{10.65 \times Q^{1352} \times L}{Q^{1352} \times D^{637}}$$

GENERATION MODEL OVERVIEW



Fig(1) : Model of Turbine and Water Jet.

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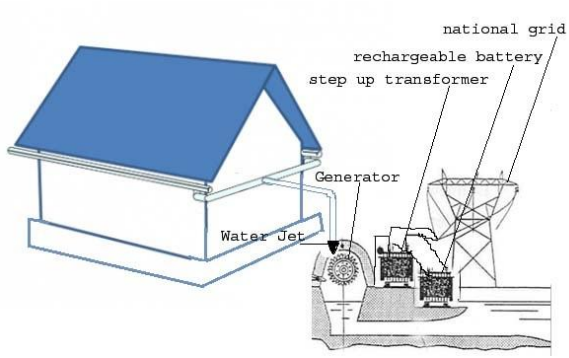
By using a common outlet pipe total Rain Water have to eject. To increase the force of ejecting Rain Water a water jet have to use. When high forced rain water strikes on a turbine plate the generator is being rotate which is directly connect with the turbine plate. As the generator being start to rotate electricity being start to produce. By using step up transformer produced electricity can be step up in voltage and prepare for farther use. This electricity can use directly or store in a rechargeable battery. Excessive electricity can be transfer to National Grid.



Fig(2) : Producing Electricity at Simple Roofing.

Fig(3) : Producing Electricity at Multi-Storey Building.

RESULT

Assuming average rooftop area 1500 sq feet and 3 meters per floor, the total amount of power generated for AREA A_1,A_2,and A_3 is 1500 Square Feet.

	Case-1 A sample House	Case-2 Apg Boyes Hostel	Case-3 Apg Admin. Building
Gravitational Constant	9.81 m/s^2		
Height	3.00	15.00	21.00
Surface Area	139.35 m^2	1114.38 m^2	1560.77 m^2
Rainfall	0.12m	0.120m	0.120m
Rain mass (1000 kg m^3)	16722 kg	133725.6 kg	187292.40 kg
Potential Energy (J)	2.94 $\times 10^4$	1.47× 10^5	2.05× 10^5
Potential Energy (KWh)	8.16 $\times 10^7$ 8.16 $\times 10^4$	4.02 $\times 10^{14}$	5.69 $\times 10^{15}$

CONCLUSION.

Now this position of energy reservation we must consider natural source of power energy. By using my analysis it can be possible to produce 5KW power at wettest area. This article shows basic calculations and estimates for the amount of energy that could potentially be harvested from rain. In moderate scales, there is little potential for energy generation using either the potential or kinetic energy of falling water. In the gigantic scale, however, where nature has carved out a large bas in to catch rainfall, dams and turbines can be installed to produce significant amounts of electricity. On small sensors, the kinetic energy of rain can provide enough energy in order to sustain operation. Overall, using precipitation to generate electricity can be used situational to compliment other technologies, but is not an end solution.

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