

Designing of Pool hydropower plant

Abstract - This article introduces the hydroelectric pool power plant and provides a general concept and design principles of these types of power plants. This power plant is built on slope part of a river, where a river flows from the mountains and most parts of a rushing river. This is a novel plan, and instead of storage water for power plant in the behind the concrete dam, one deep pool with 35 meter depth, and two underground tunnels excavated and constructed to transfer passing water to ground surface. Therefore, for such power plants do not need to construct huge and expensive concrete dams. The hydroelectric pool power plant is much cheaper than concrete dams, and constructing the power plant in terms of time and dimensions is smaller and more appropriate, which is one of the advantages of these types of power plants.

1. Introduction

Praise Devine God: Exploitation of the energy of running water of river is the best clean and inexpensive energy production methods. It is a better and cheaper method of generating electricity from running and moving water without construction of tall concrete dams of a few tens of meters and large lakes behind it. This innovative idea is introduced in this article, which there is no need to build a dam and store this huge volume of water behind the dam to generate electricity.

The hydroelectric power plant only uses the energy of passing water and its reservoir is in the size of a swimming pool, which is built by excavation. The amount of produced electricity by this power plant depends on the volume flow of passing water through turbine, height of pool and the 15 meter height of soil dam.

2. Dam and hydroelectric pool power plant

Consider a medium-sized river is flowing in a slope path and we have a plan to build a medium-sized hydroelectric power plant on this river. The site of dam can be located in mountainous areas, foothills and alongside of River. This power plant can be established on path of many rivers in the country. This dam no needs any mountain. Its high is 15 meters above the ground, clod body, in which a bent concrete wall is built in it and under the engineering design of the dam, the height of the water on the hydro turbine is 50 meters.

The important point is that this dam is not a reservoir of water, and river water is constantly flowing from within the dam's power plant.

3. Dam's Drawing and calculations of the power plant

At the top of the place of dam, length of 30 meters, width of 20 meters and a depth of 35 meters are dug. Then excavated soil is used for the body of dam. The body of the dam is a 20-meter long arc and the lateral wall is 15 meters high, the length of the side wall depends on the slope of the river. Of course, to prevent water leakage into the dam, a concrete wall is also built in front of the dam and the walls.

If the turbine is mounted at a height of 5 meters from dug ground, the height of water from the turbine will be 50 meters. Assuming the Debi of water is about 150 m³/s approximately equal to the size of Aras river then can generate energy from a 68-megawatt turbine.

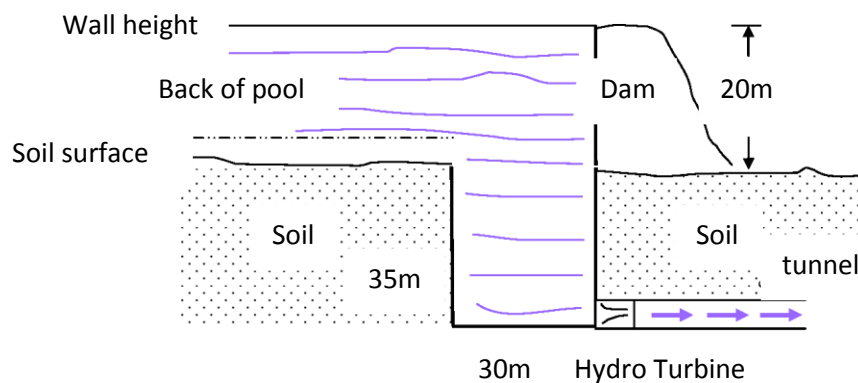


Fig 1-Pool Hydropower Schematic drawing

The hydroelectric power generation capacity is calculated from this formula:

$$P = \eta \cdot \rho \cdot g \cdot h \cdot q \quad (1)$$

In this formula: h is water height on turbine, q is water discharge, ρ water density, g gravity acceleration, and η is power plant efficiency

$$P = 0.9 \times 1000 \times 9.8 \times 150 \times 25 = 68 \text{ MW}$$

The discharged water from the turbine is transmitted through two vertical and horizontal underground tunnels to the surface, and this tunnel is opened to the ground where its height is equal to the water turbine and to the mainstream of river.

Considering that the height of the dam is 15 meters and its width is about 20 meters, the design and construction of the dam structure is relatively simple, and it is not massive and heavy. Also, the construction of the pool does not require serious construction and developing work.

Of course, , the height of the dam can be taller, where it is possible, in which case the length of the lateral wall will be longer, and it is depend on the slope of river and environmental conditions.

The geographic location and water requirements for this hydroelectric power plant are a river on the slopes and like rivers of mountainous areas. And as mentioned earlier, the important advantage of this power plant is that there is no need for mountain wall or strait.

Considering that rivers often originate from mountain heights and in their path come down, for example, 2000 meters in height, and with their own Debi and due to any limitation about space for construction of this kind of pools hydrocarbon power plant in almost the entire Several hundred kilometers route of rivers, there's a lot of potential for generating clean energy at the right price with this plan.

4- Advantages of this dam and pool power plant

This dam is cheap, and it is easy to construct in terms of structural and construction work compared to large concrete dams. It also has the simplest technological equipment and technology than other types of power plants. And its time of construction is short and will soon be exploited. In addition, the required size of the pool and dam are also smaller and more suitable than common and existing dams, while producing the same amount of electricity. Meanwhile, compared to fossil fuel thermal power plants, power generation at this hydroelectric plant is free and clean and can be constructed in most areas and in large numbers.

The following figure shows a river to be capable of generating a large amount of energy and is suitable for a hydroelectric plant.



Figure 2 - River in flow with high electricity generation potential by hydroelectric pool power plant

Another advantage of this plant is no need for short wall of mountains or mountain ranges to build a dam. And the possibility of constructing a pool and turbine room for these types of power plants is on the high stream of rivers in the foothills.

Particularly in countries such as China, the USA, Russia and Brazil, with large potentiality for generating hydroelectricity and have high-water rivers in the mountain range, by establishing making these simple and capital-intensive power plants will be able to significantly reduce fossil fuel consumption and provide the country's electricity from a cheap, permanent and available supply. This innovative plan of dam and hydro power plant will revolutionize production of electric power in the world.

5-Conclusion

According to this paper, construction of a hydroelectric pool power plant, has low costs much less than large dams and would produce the same amount of electricity, especially in countries with high water rivers is very profitable. It can supply large amount of necessary electricity for these countries and will save a lot of fossil fuel consumption also.

Thank

It is my great pleasure to invite experts and companies who are active in the hydroelectric power industry to execute this graceful, inexpensive, and productive design. And I am sure they will have good interests by doing this plan. Certainly, in addition to the consent of God and at the service of people, I would agree to the legitimate and customary benefit. That all beneficiated innovations influenced the country's industry have begun on such highly innovative articles and projects.

Reference

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