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Novel Technology for Hydropower Generation by Water Recycle Process

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ABSTRACT: The main aim of this project is to develop a new technique for generation power by applying pressure supply and water recycles process. This focuses on parameters such as height of the container, rotational speed of the turbine, water in the funnel, pressure, storage volume capacity, pump performance, water turbine performance. This project discovers how such parameters affect the performance of the complete system. The ideal presentation of this new system has the following advantages: a simple, highly effective and low cost structure, which is similar to the efficiency of a traditional pumped hydro storage system.

KEYWORDS: Water recycles process, pressure supply, turbine, flow rate of water, rotation of rotor, funnel container

I. INTRODUCTION

Water use in power plants has two components: withdrawal and consumption. Water withdrawal is the act of removing water from a local water source; the withdrawn water may or may not get came back to its source or made available for use elsewhere. H_2o consumption is the use water in a power plant in a way such that water is not came back, usually because it is lost to evaporation. Some power plants use cooling techniques that attract h_2o from a pond, river, aquifer, or ocean to cool vapor and then return virtually all of it although at higher temperatures to the source. Such techniques, known as once-through cooling systems, have high distributions but low consumption. Coal and nuclear plants, for example, may attract 20 to 60 gallons of h_2o for every kilowatt-hour of electricity they produce, based on how they are cooling. Mostly because of older power plant using this approach, electrical energy generation is responsible for more than 40 percent of fresh water distributions in the United States on the order of 100 billion dollars gallons per day in 2008 primarily to cooling.

H2o withdrawal by power plant can become a major task during times of famine or other water stress, when water is simply not available in the needed amounts or at the needed temperature ranges. Illustrating bulk of cooling water through techniques of pushes and pipe joints can also trap and destroy fish, pest eggs, and other creatures.

II. PHYSICAL MODEL AND WORKING PRINCIPLES

The physical model for power generation has shown in above fig1. The physical model is equipped with reversible pumps or generators connecting an upper and a Lower ends. During off-peak hours, the pumps utilize relatively cheap electricity from the grid to move water from the lower end to the upper one in order to store energy. During off-peak time, the pumps utilize relatively cheap power from the grid to move water from the lower end to the higher one in order to store energy. Meanwhile, during periods of high power demand (peak-hours), water is released from the higher end to generate power at a more expensive. The significant issue of this system is that it requirements unique geological conditions with wealthy long-life rivers and relatively low mineral water loss. How is this technological innovation to be employed in a famine place or plain? The system proposed in this project shows a good solution to the problem as shown in the Figure 1.

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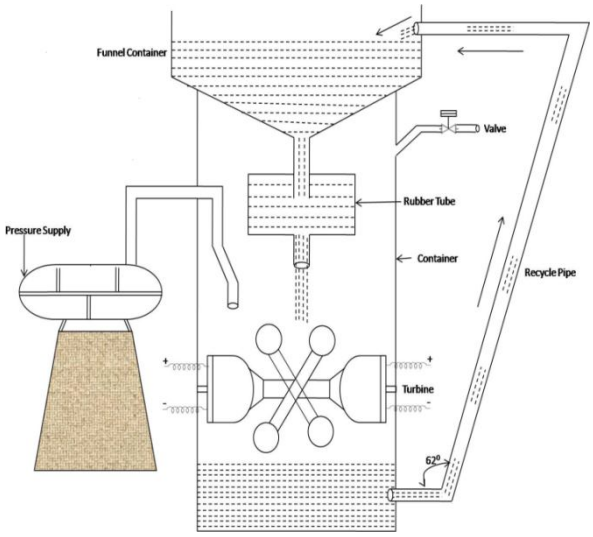

Figure 1. Physical model of the generation of power

First we have to design a container which is in vertical in shape. And also we are arranging another container which is in the shape of funnel, this funnel is arranging in the top of the vertical container. This funnel is used to store the water .this funnel is also having another end this end of this funnel is inserted into the vertical container, which is input of the device. The other end of the funnel is connected to the one rubber tube. This rubber tube is does not allowed the pressure or air passing through it. This is present inside the vertical container. When this device is keep empty then it occupied by the air. Rubber tube is allows water which is falling from upper arrangement. At that time we have some pressure inside the device. We are arranging one pipe at the bottom of the vertical container is called recycle pipe.

This pipe is used to flow the water from bottom of the device to upper funnel by the help of the pressure inside container. This process is called recycle process. The water which is flowing through the pipe is again reached to the upper arrangement nothing but funnel .this process is continued. And then we are arranging turbine inside the vertical container at exactly bellow of the other end of the funnel. Turbine is coupled with generator for power generation .high pressure of water is fall on the turbine. Turbine is rotating and we some power from the device.

The water falling on the turbine reached to the bottom of the container and then starts to flow through the lower arrangement pipe to certain level in the pipe. And then the concentration of the pressure increases inside the container on the water then the resultant is flow of water is also increases in the recycle pipe and reaches to the upper funnel , which is nothing but input to the device. When he turbine is rotating there is no another way to escape the pressure or air from the internal of the container. There is no another way to escape the pressure or air from other side, there is only one way to recycling pipe. When the air is passes only this pipe, then the water is compulsory passes through this pipe only, the pressure is totally concentrated on the water which present at the bottom of the container. Resultant recycling process is increases.

It is sufficient to the small amount of water, but we using huge amount of water in the reservoir for these we are arranging pressure supply from the outside, direct on the turbine. The pressure supply is take the small amount gives the high amount of output. Pressure supply provides two advantages. These are:

1) Rotational speed of the turbine is increases.
2) Recycling process is also increases.

III. PARAMETERS

If we want to increase the rotation of the turbine then considers the fallowing parameters.

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1. The height of the container is increases then the rotational speed of the turbine is also increases.

$C_H \alpha RS_T$

Where C_H is height of the container.

2. Water container in the funnel increases then the rotation speed is also increases.

$CF_W \alpha RS_T$

Where CF_W is the water container in funnel.

3. Pressure supply in the outside directly proportional to the rotational speed of the turbine.

$S_P \alpha RS_T$

Where S_P is the pressure supply.

4. Pressure supply is also directly proportional to the recycle process.

$S_P \alpha R_w$

Where R_w water recycle process.

Example:

Let length of the container is 24cm, length of the recycle pipe is 34cm, diameter of the pipe is D=4mm, radious is r= 2mm,funnel diameter is 14cm and radius is 2cm, other end of the funnel has d=4mm and r=2mm.

Total mass in tank of the liquid level

Total mass=$\rho V=\rho Ah$

Where ρ the density of liquid,V volume of liquid then, A the cross sectional area of tank ,and h the height of the liquid level.

Total energy of the liquid in the tank:

E=U+K+P

Since the tank is does not moving, $\frac{dK}{dt}=\frac{dp}{dt}=0$ and $\frac{dE}{dt}=\frac{dU}{dt}$.

For liquid system

$\frac{dU}{dt} \cong \frac{dH}{dt}$.

Where H is the total enthalpy of the liquid in tank. Furthermore

H=$\rho Vc\rho$(P-Pref)= ρAHcρ(P-Pref)

Where $c\rho$=heat capacity of the liquid in the tank

Pref=reference temperature where the specific enthalpy of the liquid is assumed to be zero

State variable: h and P

Constant parameters: ρ, A, $c\rho$, Pref

Are characteristic of the tank system

$\frac{d(\rho Ah)}{dt}=\rho$Fi—$\rho$F

Where Fi and F are the volumetric flow rate for the inlet and out let pressure,

A$\frac{dh}{dt}$= Fi—F

Total energy balance

$\frac{d[\rho Ahc\rho(\mathrm{P-Pref})}{dt}$= ρFi(P-Pref)-- ρF$c\rho$(P − Pref)+ P`

Where P` is the amount of the pressure supplied per unit of time.

A $\frac{d(hP)}{dt}$= FiPi-FP +$\frac{P`}{\rho c\rho}$

Ah $\frac{d(P)}{dt}$= Fi(Pi-P) +$\frac{P`}{\rho c\rho}$

State variables: h, P

Output variables: h , P

Input variables:

Disturbance: Pi,Fi.

Manipulated variable: P` F (for feedback control)

Rule for finding the complementary function

$(D^n+K_1D^{n-1}+K_2D^{n-2}+\text{------}+k_n)\ y=0$.(1)

$(D-m_1)(D-m_2)\text{--------}(D-m_n)y=0$ ..(2)

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$(D-m_n)\ y=0$ i.e by $\frac{dy}{dx}-m_n y=0$ ...(3)

This is a Leibnitz's linear and I.F.=e^{-mnx}

$ye^{-mnx}=c_n$,i.e $y=c_n e^{mnx}$

Similarly

$(D-m_1)y=0$,$(D-m_2)y=0$ etc

$Y=c_1e^{m1x}$,$y=c_2e^{m2x}$ etc

This is complete solution of (1)is

$Y=c_1e^{m1x}+c_2e^{m2x}+$---------c_ne^{mnx}

$(D-m_1)(D-m_2)y=0$

Putting $(D-m_1)=z$,it become

$(D-m_1)\ z=0$

This is Leibnitz's linear in z and I.F. = e^{-m1x}

$\therefore ze^{-m1x}=c_1$ or $z=c_1e^{m1x}$

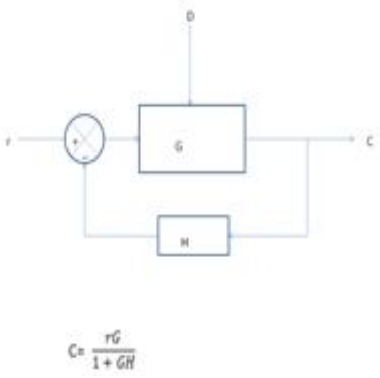
$(D-m_1)y=z=c_1e^{m1x}$

$\frac{dp}{dt}-m_1p=c_1e^{m1x}$

It is transfer function being e^{m1x}

$pe^{-m1x}=\int c1e^{m1x}\ dx$

$p = (c_1t)\ e^{m1t}$



$C=\frac{rG}{1+GH}$

$p(s) = c_1[\frac{1}{(s-1)2}]$

$\frac{y(s)}{u(s)}=\frac{1}{(s-1)2}]$

$1/s^2-2s+1$

$X(s)=[\ s^2-2s+1]=u(s)$

$S^2x(s)-2sx(s)+x(s)=\ u(s)$

Apply I.L.T

$X^{\cdot\cdot(t)}=2x\ (t)+x(t)=u(t)$

$X_2=\ u(t)+2x_2-x_1$

$$\begin{matrix} x1 \\ x2 \end{matrix} = \begin{matrix} 1 & -1 \\ 0 & -2 \end{matrix} \begin{matrix} x1 \\ x2 \end{matrix} + \begin{matrix} 0 \\ 1 \end{matrix}$$

$\frac{y(s)}{u(s)}=1$

$Y(s)=x(s)$

Apply I.L.T

$Y(t)=X(t)$

$$Y = \begin{matrix} 0 & 2 \end{matrix} \begin{matrix} x1 \\ x2 \end{matrix}$$

Convert in to state space

$$A = \begin{matrix} 1 & -1 \\ 0 & -2 \end{matrix} \qquad B = \begin{matrix} 0 \\ 1 \end{matrix}$$

$C=1\quad 0 \qquad D=0$

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$[SI-A]=\begin{matrix} s & -1 \\ -2 & s+1 \end{matrix}$

$[SI-A]^{-1}=\frac{1}{(s-1)^2}\begin{matrix} s+1 & 1 \\ 2 & s \end{matrix}$

$T.F=C(SI-A)^{-1}B$

$1/s^2-2s+1$ TRANSFER FUNCTION

IV. CONCLUSION

The performance and its working principles are fully explored in this project. By using water recycle process, the power is generated. It has some advantages simple, highly effective and low cost structure.

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