Ilkogretim Online - Elementary Education Online, 2021; Vol 20 (Issue 1): pp. 4781-4789
http://ilkogretim-online.org
doi: 10.17051/ilkonline.2021.01.515

Regen Electricity

Premkumar R[1] , Karthikeyan R[2] , Sunil Kumar P[3] , Jagadesh S[4] , Sri Ganesh M[5]

[1]Assistant Professor, Department of EIE Sri Sairam Engineering College Chennai India,

[2,3,4,5]Student, Department of EIE Sri Sairam Engineering College Chennai, India

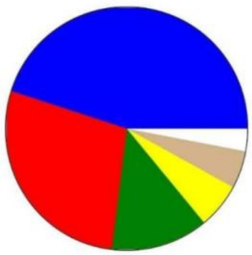
Abstract

Hydroelectric power generation is one of many ways in which electricity can be generated. In 2009, the three most heavily used sources for generating electricity were coal, natural gas and oil. These sources not only release emissions that are harmful to the environment, they are resources that are quickly running out. Therefore, different ways of generating power will need to be explored. Hydroelectric power works to harvest the inherent energy of moving water by directing the water through turbine converting the energy of the moving water into mechanical energy. The mechanical energy is then converted into electricity in the generator. In order to choose the appropriate generator for a specific application, the flow rate and pressure head of water source must be known. Hydropower on a small-scale is one of the most cost-effective energy technologies to be considered for rural electrification in less developed countries. It is also the main prospect for future hydro developments in Europe, where the largescale opportunities have either been exploited already, or would now be considered environmentally unacceptable. Small hydro technology is extremely robust and is also one of the most environmentally benign energy technologies available. The development of hydro-electricity in the 20th century was usually associated with the building of large dams. Hundreds of massive barriers of concrete, rock and earth were placed across river valleys worldwide to create huge artificial lakes. While they created a major, reliable power supply, plus irrigation and flood control benefits, the dams necessarilyflooded large areas of fertile land and displaced many thousands of local inhabitants. In many cases, rapid silting up of the dam has since reduced its productivity and lifetime. There are also numerous environmental problems that can result from such major interference with river flows.

INTRODUCTION

RENEWABLE ENERGY:

Renewable energy is useful energy that is collected from renewable resources, which are naturally replenished on a human timescale, including carbon neutral sources like sunlight, wind, rain, tides, waves, and geothermal heat. The term often also encompasses biomass as well, whose carbon neutral status is under debate. This type of energy source stands in contrast to fossil fuels, which are being used far more quickly than they are being replenished. Renewable energy often provides energy in four important areas: electricity generation, air and water heating/cooling, transportation, and rural (off grid) energy services.



Renewable electricity generation breakdown (+nuclear) as of 2018.[2]

At the national level, at least 30 nations around the world already have renewable energy contributing more than 20 percent of their energy supply. National renewable energy markets are projected to continue to grow strongly in the coming decade and beyond. At least two countries, Iceland and Norway, generate all their electricity using renewable energy already, and many other countries have the set a goal to reach 100% renewable energy in the future. At least 47 nations around the world already have over 50 percent of electricity from renewable resources. Renewable energy resources exist over wide geographical areas, in contrast to fossil fuels, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy efficiency technologies is resulting in significant energy security, climate change mitigation, and economic benefits. In international public opinion surveys there is strong support for promoting renewable sources such as solar power and wind power. While many renewable energy projects are large-scale, renewable technologies are also suited to rural and remote areas and developing countries, where energy is often crucial in human development. As most of renewable energy technologies provide electricity, renewable energy deployment is often applied in conjunction with further electrification, which has several benefits: electricity can be converted to heat, can be converted into mechanical energy with high efficiency, and is clean at the point of consumption. In addition, electrification with renewable energy is more efficient and therefore leads to significant reductions in primary energy requirements

LITERATURE REVIEW

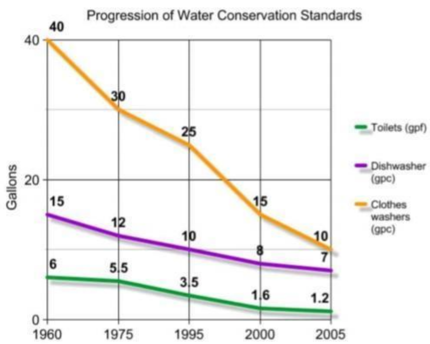
Nowadays, the world is moving towards the exploitation of renewable energy sources instead of the non-renewable energy that will be vanished one day. There are many energy sources in nature that can be divided to non-renewable and renewable [6]. Non-renewable Energy is unclean energy contributes to environmental pollution and can't be re-grown at a scale comparable to its consumption such as coal, petroleum, and natural gas. Conversely, renewable energy is clean energy which can be replenished naturally and indefinitely, and thus is not going to run out such as solar, wind, geothermal, and hydropower energy. Harnessing of kinetic energy in the running waters that is converted into a suitable mechanical form able to generate electricity by using a generator is called hydro power [7]. In eighteenth century, hydropower has taken a place in electrical power production over the world. The conception of generate electricity through harnessing running waters was begun in Wisconsin in 1882 at the Fox River when water wheel was introduced [8]. Hydropower generation is certainly one of the ultimate mature technologies and it offers a superior performance than the conventional fossil fuels to meet the energy needs and contributes in decrease of greenhouse gas emission and better flexibility in the grid operation [9, 10]. It is one of the green energy sources supports in the decreasing the exploitation and dependence of fossil fuel. It is green, sustainable, and renewable energy source. Furthermore, flexibility of hydropower generation and its storage capacity give the ability to improve stability of grids and to be integrated with other discontinuous renewable energy sources such as wind and solar power [10]. Moreover, hydropower also supports price stability because, unlike natural gas and fuel, it is not affected by market fluctuations.

In the literature, there are various types of water turbines which work at different water head and flow rate, such as Pelton,Turgo, Kaplan, and Francis turbines, which can be classified into impulse and reaction turbines [10, 11, and 12] as shown in Figure 1. The impulse turbines, which include Pelton, Turgo and cross-flow turbines, do not change the water pressure and keeps it at atmospheric pressure and the energy exchange depends only on the kinetic energy variation. Pelton turbine is consisted of penstocks, furnished with suitable nozzles, and a wheel with curved-shape blades which are appropriately spread around its boundary. The water jet that leaves from each nozzle and directed tangentially at the wheel, hits the turbine's blades. The resulting change in momentum causes a force on the turbine blades. Turgo turbines and Pelton turbines are alike, but Turgo turbines have a different blade shape with different relative dispositions between penstocks and runner. To eliminate the negative consequence between flows discharged by different curved blades which limiting the maximum flow rate, the water jet strikes the surface of the runner at an angle of about 20°. Cross-flow turbines are inexpensive and simple in design comparing to Pelton and Turgo turbines. In Cross-flow turbines the jet water enters on one side of a runner that looks like drum and leaves it on the opposite side after a twice passage through the runner blades. Figure 2 shows different types of runner for impulse and reaction turbines. In reaction turbines, the runner is fully immersed in water. Reaction turbines are encased to contain the water pressure and acted on by water, which changes pressure as it moves through the turbine and gives up its energy. Most water turbines in use are reaction turbines which include Francis and axial turbines. Francis turbines are composed of spiral case, runner, distributor, and draft tube. The water flow is received through the spiral case which dispenses it peripherally to the distributor, in order to control the angle and rate of water flow passing into the runner inlet. Kaplan turbines are axial flow turbines and are constructed from runner, guide vanes, and draft tube. Once the water enters the turbine, it receives a swirl component by the guide vanes, which will be absorbed by the runner, consequently determining the exchange of energy. Kaplan turbines can be used at low flow rate and low water head condition but it affects the pathway of water flow and cannot be well integrated with pipeline [11]. Cross-flow, Pelton, and Kaplan turbines are the best in term of operating range and efficiency; while the Francis turbines when applied in micro-hydropower generation systems their efficiency will be between 30% and 60% and their cost of design and manufacture will be relatively high [15]. Moreover, Pelton and Turgo turbines are generally mounted in open environments and the runner is not immersed in water [16], so these turbines are not appropriate to be integrated with the water pipelines. Based on literature, the cross flow turbines have a good performance when integrated with water pipelines to generate electricity and has low effects on water head. Most of researches in the literature focused on the application of the water turbines in the open environments or . A few of publications talks about the hydropower generation using a fully confined turbines and integrated with the water pipelines In an inline vertical axis water turbine was developed to be connected with 100mm pipelines for supplying the power to water pipeline data monitoring systems and their sensors. The generated power output from the developed vertical axis water turbine with a hollow shaft and a short slanted eye shaped block was larger than 80 W when water velocity is 1.5 m/s. In [20] the feasibility and performance of pump as turbine (PAT), used in water supply systems of high rise building, for electricity generation was investigated. The results show that the proposed PAT is an ideal way for reduction of water head and generation of hydropower in water pipelines with maximum output of power around 100 W at 10 m^3/h and 34 m water head reduction. Lucid Energy Company has recently developed an inline cross-flow water turbine system and called it “Lucid Pipe power system”. Lucid Pipe can harvest renewable energy from gravity-fed municipal water pipelines by extracting the extreme head from water flows in networks of water supply, transforming it into low-cost and renewable energy. However, Lucid Pipe is only fit for generating electricity in pipelines with 24 to 96 inches. This paper proposes an inline cross-flow hydro turbine for small size pipelines (0.5 – 1 inch) that can harvest as much as possible energy from the water flowing inside the pipelines of buildings and converting it to electrical energy which is enough to charge the low-power devices such as mobile phones and LED lights

Why should we use regen electricity?

- It supports the idea of rain water harvesting.

- It also helps in management of rain water.
- It helps to charge mobile phone, torch and etc...
- Economical to deploy.
- Easy to install
- It supports the idea of renewable energy.
- User-friendly (easy to use)
- Their modern appearance & aesthetically pleasing design attract attention.
- It really helps during cyclone, heavy rain.
- Cost-effective



This phenomenon is known as the law of diminishing returns. So where will the next revolution in water conservation take place? We believe we offer services in the areas where this revolution will take place.

Why Is Rainwater Harvesting Important?

Rainwater harvesting is important for several reasons but one of the biggest is the fact that we are tapping out water conservation gains inside our homes so we need to start looking outdoors for more opportunities. The following graph shows the gains that have been achieved with our indoor water fixtures through the combination of governmental standards and innovation by fixture companies. As you can see, we don't have much more room to go in terms of achieving more efficiency gains with our indoor fixtures. What's next... the 0.2 gallon per flush toilet? Probably not!

Tank structure : It acts like a reservoir for storing rainwater in the roof and slowly allows them.

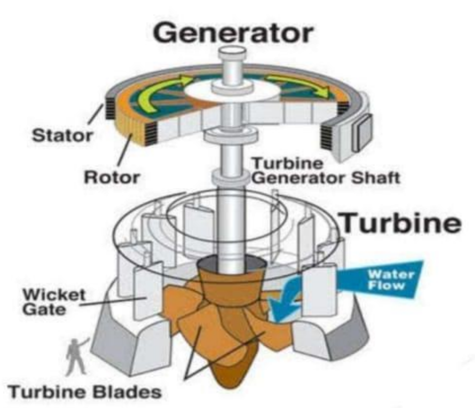
Turbine:

The force of falling water pushing against the turbine's blades causes the turbine to spin. A water turbine is much like a windmill, expect the energy is provided by falling water instead of wind. The turbine converts the kinetic energy of falling water into mechanical energy.

Generator:

It is Connected to the turbine by shafts and possibly gears so when the turbine spins it causes the generator to spin also. Converts the mechanical energy from the turbine into electric energy.T he generated electrical energy is stored in a battery which is in the form of direct current(DC). This is then converted into alternating current(AC) using an inverter and is supplied to the appliances. The farther the water falls, the more power it has. Generally, the distance that the water falls depends on the distance between the roof and the turbine. The power of falling water is directly proportional to the distance it falls in other words water falling as for has twice as much energy. More water falling through the turbine will produce more power. The amount of water available depends on the amount of rainfall. Power is also directly proportional to the pressure in which water flows.

HYDROELECTRIC PROCESS

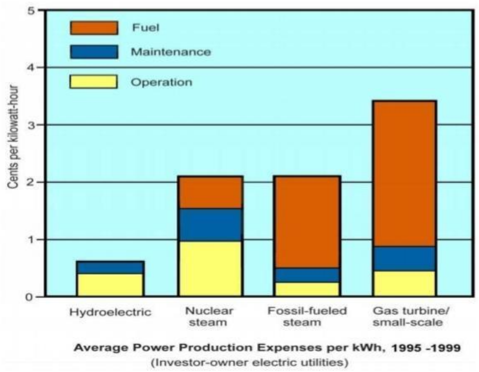


Hydropower plants capture the energy of falling water to generate electricity. A turbine converts the kinetic energy of falling water into mechanical energy. Then a generator converts the mechanical energy from the turbine into electrical energy.

and mine. The water continues past the propellor

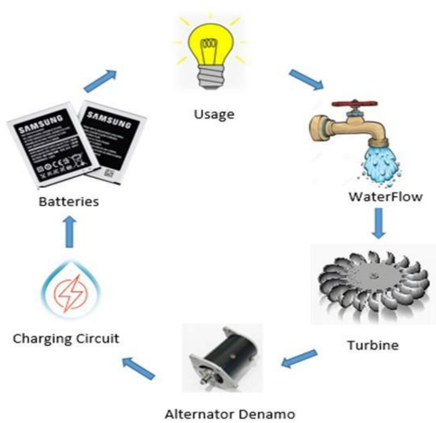
through the tailrace into the river past the dam. By the way, it is not a good idea to be playing in the water right below a dam when water is released! "A hydraulic turbine converts the energy of flowing water into mechanical energy. A hydroelectric generator converts this mechanical energy into electricity. The operation of a generator is based on the principles discovered by Faraday. He found that when a magnet is moved past a end it causes electricity to flow. In a large generator, electromagnets are made by circulating direct current through loops of wire wound around stacks of magnetic steel laminations. These are called field poles, and are mounted on the perimeter of the rotor. The rotor is attached to the turbine shaft, and rotates at a fixed speed. When the rotor turns, it causes the field poles (the electromagnets) to move past the conductors mounted in the stator. This, in turn, causes electricity to flow and a voltage to develop at the generator output terminals."

Hydroplants range in size from "micro-hydros" that power only a few homes to giant dams like Hoover Dam that provide electricity for millions of people. So just how do we get electricity from water? Actually, hydroelectric and coal-fired power plants
produce electricity in a similar way. In both cases a power source is used to turn a propeller-like piece called a turbine, which then turns a metal shaft in an electric generator, which is the motor that produces electricity. A coal-fired power plant uses
steam to turn the turbine blades; whereas a hydroelectric plant uses falling water to
turn the turbine.



Hydroplants range in size from "micro-hydros" that power only a few homes to giant dams like Hoover Dam that provide electricity for millions of people. So just how do we get electricity from water? Actually, hydroelectric and coal-fired power plants produce electricity in a similar way. In both cases a power source is used to turn a propeller-like piece called a turbine, which then turns a metal shaft in an electric generator, which is the motor that produces electricity. A coal-fired power plant uses steam to turn the turbine blades; whereas a hydroelectric plant uses falling water to turn the turbine. The results are the same. Take a look at this diagram (courtesy of the Tennessee Valley Authority) of a hydroelectric power plant to see the details: The theory is to build a dam on a large river that has a large drop in elevation . The dam stores lots of water behind it in the reservoir. Near the bottom of the dam wall there is the water intake. Gravity causes it to fall through the penstock inside the dam. At the Power lines are connected to the generator that carry electricity to your home conductor stored water through turbines in the same manner as a conventional hydropower station.

Pumped storage Reusing water for peak electricity demand:



Pumped storage is a method of keeping water in reserve for peak period power demands by pumping water that has already flowed through the turbines back up a storage The reservoir acts much like a battery, storing power in the form of water when demands are low and producing maximum power during daily and seasonal peak periods. An advantage of pumped storage is that hydroelectric generating units are able to start up quickly and make rapid adjustments in output. They operate efficiently when used for one hour or several hours.

Because pumped storage reservoirs are relatively small, construction costs are generally low compared with conventional hydropower facilities. Pumped hydroelectric storage facilities store energy in the form of water in an upper reservoir, pumped from another reservoir at a lower elevation. During periods of high electricity demand, power is generated by releasing the stored water through turbines in the same manner as a conventional hydropower station.

RESULT:
In this project, we have learnt how we can generate electricity using hydroelectric process It is a clean and non-polluting. source of energy. No fuel is required. Water is the source of energy, and it does not consume water. Dams are constructed near rivers. As the water level rises, the kinetic energy of water gets changed to potential Hydroelectricity is stored during low usage and used when demand increases energy.

CONCLUSION:
In this paper, the concept of development a micro hydroelectric generation system, in order to generate electricity from the potential energy of water running inside building's water pipelines was briefly introduced and described. The system depends on generating electricity through converting the kinetic energy of flowing water of water supply systems into electrical energy that can be stored in batteries to be used as power supply for LED lighting, network routers, and for charging mobile phones. The idea of this proposed system can also be applied on a wider scale so that this system with big turbine can be connected with municipal water pipelines, which ensures
greater flow of water and generating more energy

that can be used for road lighting and other uses. The proposed system is not only support stopping our dependency on fossil fuel for generation electricity, but it also can support our

dependence
on the green energy and provide an easy generation of electricity in places with continuous power shortage.

REFERENCES:

1. https://chainomad.com/why-is-there-power-cut-during-rain/
2. https://www.watercache.com/education/rainwater-harvesting-101
3. https://www.elprocus.com/electric-generator-and-its-working/
4. Bahadori, A., Zahedi, G., &Zendehboudi, S. (2013). An overview of Australia's hydropower energy: Status and future prospects. Renewable and sustainable energy reviews, 20, 565-569.
5. Saket, R. K. (2008, October). Design, development and reliability evaluation of micro hydro power generation system based on municipal waste water. In Electric Power Conference, 2008. EPEC 2008. IEEE Canada (pp. 1-8). IEEE.
6. Pobering, S., &Schwesinger, N. (2004, August). A novel hydropower harvesting device. In MEMS, NANO and Smart Systems, 2004. ICMENS 2004. Proceedings. 2004
7. International Conference on (pp. 480-485). IEEE.
8. Wang, D. A., & Liu, N. Z. (2011). A shear mode piezoelectric energy harvester based on a pressurized water flow. Sensors and actuators A: Physical, 167(2), 449-458.
9. Nasir, B. A. (2013). Design of micro-hydro-electric power station. International Journal of Engineering and Advanced Technology, 2(5), 39-47.
10. Smith, Z. A., & Taylor, K. D. (2008). Renewable and alternative energy resources: a reference handbook. ABCCLIO.