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Smart Power Generation in Urban Areas

[1]Prashantha.K, [2]Tejas Naik, [3] Sachin, [4] Harshita.H, [5] Archana.P
[1]Assistant professor
[1][2][3][4][5] Electrical And Electronics Engineering SSCE ,Bangalore India
[1]prashantha.eee@sairamce.edu.in

Abstract: -- **Electrical energy demand has been continuously increasing. Depleting fossil fuel reserves, environmental concerns, and insufficiency of conventional generation techniques in meeting growing demand, renewable energy use has been widely adopted in the world .The main motive of this project is to generate dc power from low head water source and low wind .Water is an essential requirement for human being as like air, food etc. It is used for many purposes but it has one more advantage is, it is used for domestic power generation for other uses. Consumer wants to reduce the electricity bills so we use this type of power generation. Hydropower and wind power is renewable energy source that doesn't cause global warming because it does not releases dangerous greenhouse gases**

Keywords -Micro hydro turbine, DC generator, Pelton turbine, Inverter. renewable energy resources; wind energy; wind turbine prototype; urban use

1. INTRODUCTION

Hydro and wind power is a renewable, non-polluting and environmentally source of energy. Moving water fall and wind on turbine the turbine spins a generator and electricity is produced. It is like the oldest renewable energy technique known to the mankind for mechanical energy conversion as well as electricity generation. In this work, by using micro hydro turbine and micro wind turbine with dc generator generate electricity and it distributes to the domestic use.

Hydro power in building apartement It consists of water storage tank, pipe, nozzle, turbine, dc generator, battery etc. Tank is placed on the multi storey building at height 11.25 meters. The various turbines are available out of which we use the pelton wheel turbine. Potential energy of water is converted into kinetic energy. The water from the pipe moves vanes of the turbine, then turbine rotates and it provides it's mechanical output to generator. This generator converts mechanical energy into electrical energy and produced electrical energy stored into battery.

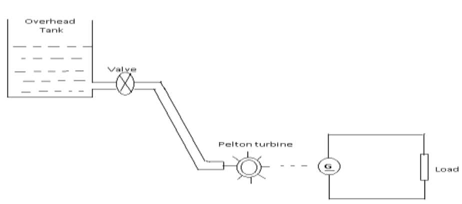


Fig (a) micro hydro plan

Potential energy of water

Mass that has been raised above the Earth's surface has a potential energy relative to the same mass on the Earth's surface. Running elevated water over a turbine, some part of this potential energy can be converted into kinetic energy. This kinetic energy is then converted into an electrical energy. The amount of electrical energy that can be generated is equal to the potential energy of stored water[1]. This gravitational potential energy is equal to the product of mass, height, and gravitational constant (9.81 m/s2).

Wind energy outshines all other renewable energy resources due to the recent technological improvements. Electrical energy generation from wind power has increased rapidly and due to the increased interest many studies on efficient wind turbine design have been performed. There are several studies about improvement of wind turbine performance in literature. Ameku etc all. designed a 3 kW wind turbine prototype focusing on blade design [1].

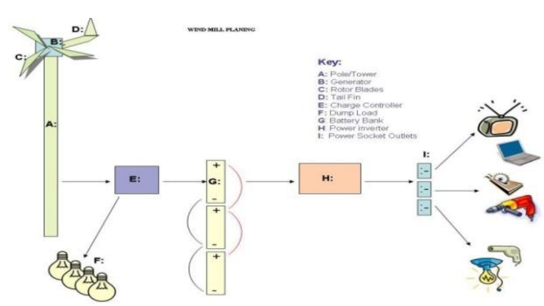


Fig (b) wind mill planning

Kosasih and Tondelli analyzed a low power turbine that has a conical structure to speed up air flow through the wind turbine in the laboratory environment [2]. Chong et al. presented a vertical axis wind turbine for high buildings [3]. A. Ali et al. developed a new vertical axis wind turbine.
In India, the wind speed value lies in between 5km/hr (1.3889ms-1) to 15kmph. These low and seasonal winds simply a high cost of exploitation of wind energy. This means the electric power generated or derived from the windmill is lesser than the cost invested and required to maintain the same. This is not fully applicable in certain rural places of India. There is always a possibility of reducing the cost by suitable design of the windmills.
Bangalore is a capital city of Karnataka ,name we call it as silicon city and software city in india.Here the average wind speed of 0.5 to 4ms-1 is observed. At such wind speed the large scale wind turbines cannot be operated.
The topography of the bangalore shows it surrounded by various mountains. The current model of the wind power generating system is attained by trail and errors. The current study aims at designing a small unit which can be used individually for residences and offices as an alternate power source.
The materials used in the making of these models are the easily available. The blades are made up of commonly used PVC pipes. The use of pipe is preferred because of easy availability, its light weight as compared to other metals and materials. This also gives the curvature to blades making it easy to rotate for lower intensity of wind.
In this study, a new mini wind turbine concept suitable for urban use and low wind speeds is demonstrated. The mini wind turbine concept has a modular structure and can be optimized for different conditions and wind sites. In this paper, performance analyses of the mini wind turbine concept are performed and the results are summarized.

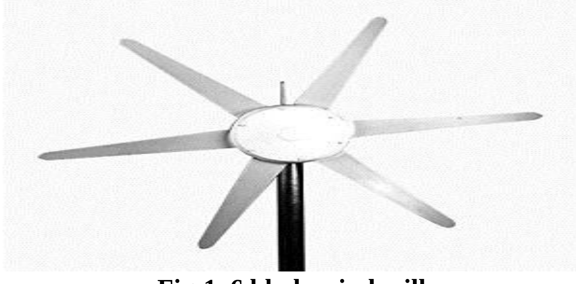
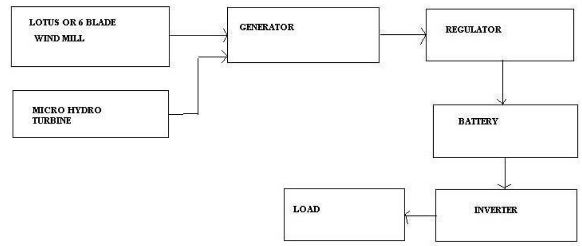


Fig-1 6 blade wind mill

BLOCK DIAGRAM



II. COMPONENTS

3.1 Tank

The overhead tank is fixed storage structure situated at a height of 20-30 meter. The tank is cylindrical in shape and it is made up of plastic or concrete with capacity of 5000 litre. The approximate diameter of tank is 2 meter.

3.2 Pipe outlet

The outlet of the pipe is depends on the following factors:
The flow of water or discharge: The flow of water is simply the amount of water flowing in the water source.
2. Head: Head is the vertical distance from the water source to the generator.

3.3 Pelton turbine

It consists of rotor equipped with buckets along the whole periphery of turbine. The buckets are of elliptical shape as shown in figure. As stated earlier the total available head is first converted into kinetic energy and strong water jet through one or two jets is directed to impact on this buckets. The rotor starts turning due to the impact of jet on the buckets. The buckets are found into two halves with a splitting at the Centre in a such way that the jet after hitting in the Centre, deflects sideways and then falls into the tail race at velocity of 10% to 15% of initial velocity. But in order to utilize the water energy it is necessary that outlet velocity of the water should be minimum[3].
In order to increase the output power 1 to 4 jets may be spaced at equal distance along the circumference of the wheel. Use of number of nozzles is not generally preferred because the water pipe supplying water to these jets has to be bend around which cause disturbance in water flow. At least one jet of water strikes the buckets at atmospheric pressure.

•Maximum jet diameter about 1/3 bucket width
•More jets increase flow and are used at low head.
Speed regulation of Pelton
The quantity of water discharge by the nozzle can be controlled by controlling the nozzles opening by means of needle placed in tip of nozzle. When the speed of pelton wheel increases the needle moves forwards thus the quantity of water impinging on the buckets is decreased and the action result into decreased speed. The reverse action takes place when the speed decreases. The movement of the needle is control by the governor.
Further as the pelton wheel is coupled to the alternator, it is necessary that the speed should remain constant. In addition to the needle for control of speed, deflectors are used. The deflectors simply deflect the water jet totally

Fig -2: Pelton Turbine

Fig.1. The 6-blade Model of Wind Power Generating system.

Fig 2. Different design and model

The direction of wind is found to be in west direction, with a little variation. The model is designed with three vanes on three sides to make it possible to rotate according to the direction of wind. It is supported on a steel girder which is firmly mounted using concrete, in order to reduce excessive vibrations created by random direction wind.

Fig3 The three vanes for wind direction

The above model can be efficiently used for power generation in small scale, for residential buildings etc. It can be considered as alternate source of energy. It is safe to be mounted on building terraces as no noise is observed, and there is no fear of any damage to human beings. No disturbance is caused to the neighborhood people as well. The system does not affect the aviator habitat on large.

III. NEW REASEARCHED DESIGN OF WIND MILL –LOTOUS TYPE

Fig 3 – Lotus type wind turbine curved aluminum blades

The above wind small model designed for to trial purpose we got 12 volt while running at high speed
If we make this big model we will generate more power
In this study, a new mini wind turbine concept suitable for urban use and low wind speeds is demonstrated. The

mini wind turbine concept has a modular structure and can be optimized for different conditions and wind site and different direction of winds can be utilized

DC generator
The factors where used in selection of DC generator for the project: Number of rotation, Cost and available power.

3.5 Inverter

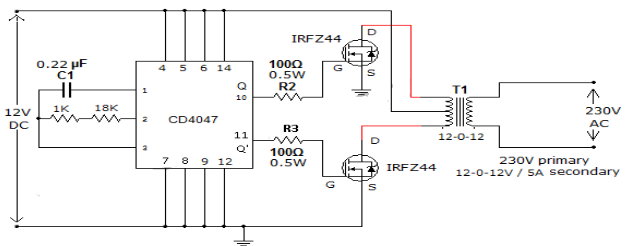


Fig -3: Circuit diagram of DC to AC Inverter

The inverter circuit is built around IC CD4047 which is work as astable multivibrator. The operating frequency of astable multivibrator is set to 50Hz.The power MOSFETs IRFZ44 are directly driven by the Q and Q' output of CD4047.The power MOSFETs are connected in Push Pull configuration (Power amplifier). The MOSFETs will switch according to the pulse from CD4047 astable multivibrator.
Thus an AC voltage is transferred to the primary of transformer; it is stepped up to 230V. The transformer used here is an ordinary step down transformer which is connected in inverted manner. That is, the primary of a 230V to 12V-0-12V step down transformer can be treated as secondary for this inverter. Use suitable heat sinks for MOSFETs

IV. DESIGN CONFIGURATION

1. Tank capacity = 4000 liter
2. Height of water tank = 2. 2meter
3. Height of college building = 15.25 meter
4. Total Head = 18 meter
5. Diameter of tank = 2 meter
6. Length of penstock = 42 meter
7. Diameter of penstock = 0.03 meter

4.1 Calculation

1. Net head (Hn):-
   $Hn = Hg – Htl= 12.22$ m
2. Velocity of jet:
   $Cv\sqrt{2 \times g \times Hn} = 15.17$ m/s
3. Discharge through nozzle (Q):-
   Q = Area of jet × Velocity of jet
   $= 2.6806 \times 10-3$ m3 / s
4. Diameter of jet (Dj) = 1.5 cm
5. Diameter of runner (Dr) = 16.5 cm
6. Jet ratio (m)= Dr/Dj= 16.5/1.5 = 11
7. No. Of buckets on wheel (Z) = 15+ (Dr/2Dj)= 18 nos
8. Depth of the bucket (Bd) = 1.2 ×Dj= 1.8 cm
9. Length of the bucket (Bl) = 3.4 × Dj= 5.1 cm
10. Power input to turbine (Pti) = ρ × g ×(Cn)2 × Hn ×Q
    = 308.55 watts5.

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V. WIND MILL DESIGN

The optimum achieved design consists of the blade size 15inches (3.18m). It is installed at a height of 30ft (9.14m) from ground level (above first floor). It is connected to battery of 200AEH, through a break circuit.
Which is in turn connected to a inverter (load). This generates a voltage of 15-20V. The model is designed with three blades, 15inches each. The blades of this model are also made up of PVC pipes of diameter 120mm. Three blades can be made from a length of pipe.

VI. RESULT

Testing setup is implemented on college BCET building using pipeline which is going to the several units of college . The test results are as shown in the Table:

Parameters						
Sl no	Head (m)	Water Power Available (kW) Discharge (m3 /s)	Water Power Available (kW)	Current (mA)	Voltage (Volt)	Output Power (kW)
1	14	0.00268	308.5	.250	19	0.047
2	13	0.0025	287.8	.220	18	0.039
3	13	0.0022	253.2	.200	18	0.036

VII. CONCLUSIONS

From this project we conclude that by using this technology electricity can be produced and is stored in battery which can be used whenever and wherever required. Hydro-electric power AND wind power has always been an important part of the world's electricity supply, providing reliable, cost effective electricity, and will continue to do a new urban wind turbine concept that can be mounted on roofs, is presented. With the developed urban wind turbine system, wind energy potential can be used more efficiently in supplying city demands
All components of the mini wind power wind turbine are manufactured based on modeling and design studies. Analysis results show that increasing both blade and gearwheel numbers increases the turbine mechanical power output. The maximum performance is obtained when a six blade three gearwheel structure is used for the given wind speed profile.
Due to its modular structure, the proposed design can be adopted for different buildings
so in the future.

VIII. FUTURE WORK

Since, renewable energy is the future of the power generation as electricity to all by Shri Narendra Modi. A small micro hydro turbine and dc generator set should be developed so that it can be fixed in water pipe line like this sets fixed on each floor of multi storey buildings.
, a new urban wind turbine concept that can be mounted on roofs, is presented. With the developed urban wind turbine system, wind energy potential can be used more efficiently in supplying city demands
All components of the mini wind power wind turbine are manufactured based on modeling and design studies. Analysis results show that increasing both blade and gearwheel numbers increases the turbine mechanical power output. The maximum performance is obtained when a six blade three gearwheel structure is used for the given wind speed profile.
Due to its modular structure, the proposed design can be adopted for different buildings

ACKNOWLEDGMENT

We gratefully acknowledge the indispensible contributions of many coworkers and students.”.

ADVANTAGES

- Clean, Noise less #, Cost is less #This is a Non-conventional system # #No fuel is require #Easy maintenance # portable#
- Promising technology for solving power crisis to an affordable extent.# Simple in construction.
- Pollution free.# Reduces transmission losses.
- Wide areas of application# Required less space
- It can be use at any time when it necessary.
- Less number of parts required

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DISADVANTAGES

- It depends on wind speed

APPLICATIONS

- Small /large electricity production
- Alternate source when power load shedding
- Production of energy in train

LIST OF ABBRIVATION

Bd = Depth of Bucket
Bl = Length of Bucket
Cn = Velocity Constant
Dj = Diameter of Jet
Dr = Diameter of Runner
g = Gravity Constant
Hg = Total Head
Hn = Net Head
Htl = Total Loss In Head
m = Jet Ratio
Pti = Power Input To Turbine
Q = Discharge Through Jet
Vj = Velocity of Jet
Z = No. of Buckets.

REFERENCES

[1] Shaleen Martin, K. K. Shrivastava, "Feasibility of Rainwater Harvesting in Highrise Building for Power Generation", IJETT-Volume4Issue4- 2013.

[2] Shaleen Martin, Abhay Kumar Sharma, "Analysis on Rainwater Harvesting and itsUtilization for Pico Hydro Power Generation", IJARCET Volume 3 Issue 6, June 2014.

[3] Kunal Roy, S.Sreevidya, S.Sai Siri, "Hydro Hybrid Power Plant and Control System Feedback",IJESI-Volume 2 Issue 11, November 2013

[4] K. Tejaswini Gharge, Supriyashintre, "Design development of micro hydro turbinre and performance evaluation of energy generation for domestic application". IJRSET Volume 2, Issue 2.