Hybrid Energy Generation By Using Solar And Wind Energy System

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ABSTRACT

In india more than 200 million people are living in without power of electricity power is part of human life electricity is need for every option or application of human in daily life the main purpose of this project to provide maximum electricity in rural area and economical and pollution free the using of this hybrid energy we can achive the our goal the provide electricity longtime without any problem or minimum operating cost or eco-friendly

Keyword: - *Hybrid Energy Generation by Using Wind And Solar Energy Sources.*

1. INTRODUCTION

In the worldwide there are billions of population ,which uses energy like electricity to perform daily work . therefore there are rapidly increase the requirement of electricity. There are many power plants like steam , diesel, nuclear power plant ,for this reason resources of fossil fuel are going to end.
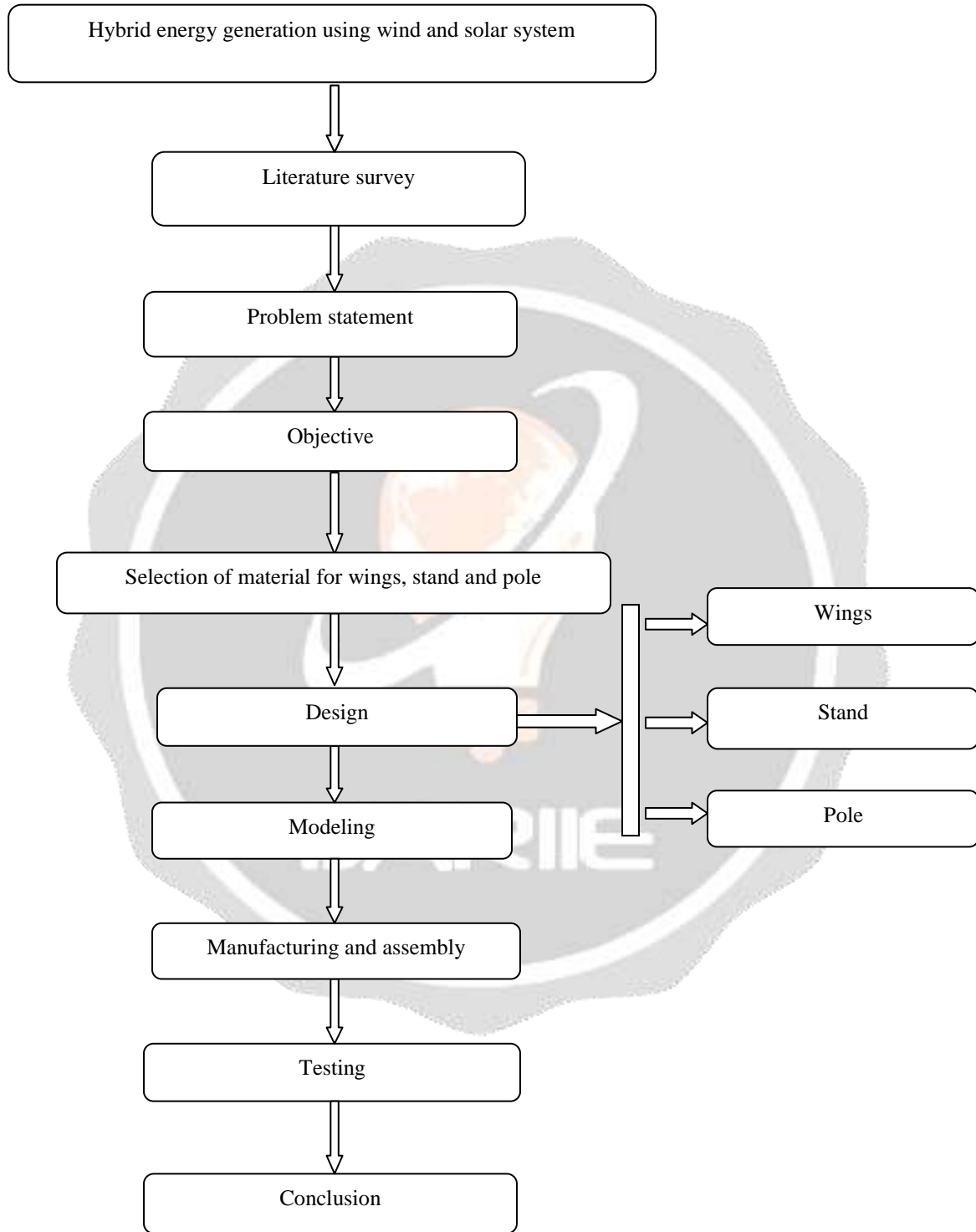
In our project there generation of electricity by using conventional resources like wind and solar. We using both of them simultaneously or at the same time. For this reason we can generate electricity more than single resource. The electricity demand is very rapidly increase in India that is natural because electricity is part of human life. Without electricity of any system can not operate daily working life.

The solar and wind energy inexhaustible in nature and pollution free. Capital cost is high but operating and maintenance cost is negligible. The climate of India nature of solar energy out of 365 days is clearly suny days and wind also provide better support more than 300 days, that purpose we are using hybrid power generation by using wind and solar energy.

1.1 OBJECTIVE

1. To provide better electricity in rural areas town area.
2. To increase efficiency by using hybrid energy generation.
3. Maximum use of renewable sources to generate electricity.
4. Use hybrid energy generation system for street lamping.
5. In india electricity generation plant are going to finish way because sources of energy generation is rapidly increases. This purpose combination of this energies are use.
6. Provide better electricity and low operating cost.

1.2. Methodology

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2. Theory
Renewable energy sources-
In India there are various renewable sources like solar energy , wind energy, tidal energy, geothermal energy etc**.**

2.1 solar energy
There are great energy source of solar energy in India, we can generate maximum electrical or any other energy from solar System.in world wide there are various application to generate solar energy like water heater for converting energy into form of heat, solar plant to converting solar energy into electrical energy etc. In India there are big capital invest by Indian government to produce maximum energy from sun radiation. In india there are average solar radiation 5 Kw hr per meter square. Which is very big deal to generated electricity.

2.2 Wind energy system
In India there are average wind velocity is 5.76 meter per second which wind velocity is used to generate electrical energy by using various applications like wind power plant etc. In India there are many plant are running to produce electrical energy. Wind power generation capacity in india increases by last few year and as 31st jan 2017 the capacity of install is 2887169 MW. India is ranked as 4th no. installation of wind power plant in the world. In India in ratnagiri (Maharashtra) there 1st installation of wind power plant.

2.3 Hybrid energy system-
Hybrid energy system is the combination of two or more renewable energy system. It is use to both wind and solar energy system to generate more electricity compare to other single renewable energy system .this energy easily available on earth . this energy we can buy at low cost compare to other electrical unit rate. This system are completely eco-friendly and generate more electricity. We can generate electricity through out in year their fore this plant is continuously in running conditions.

3 Design of hybrid energy system-
3.1 Actual Cad modeling of Hybrid energy system-
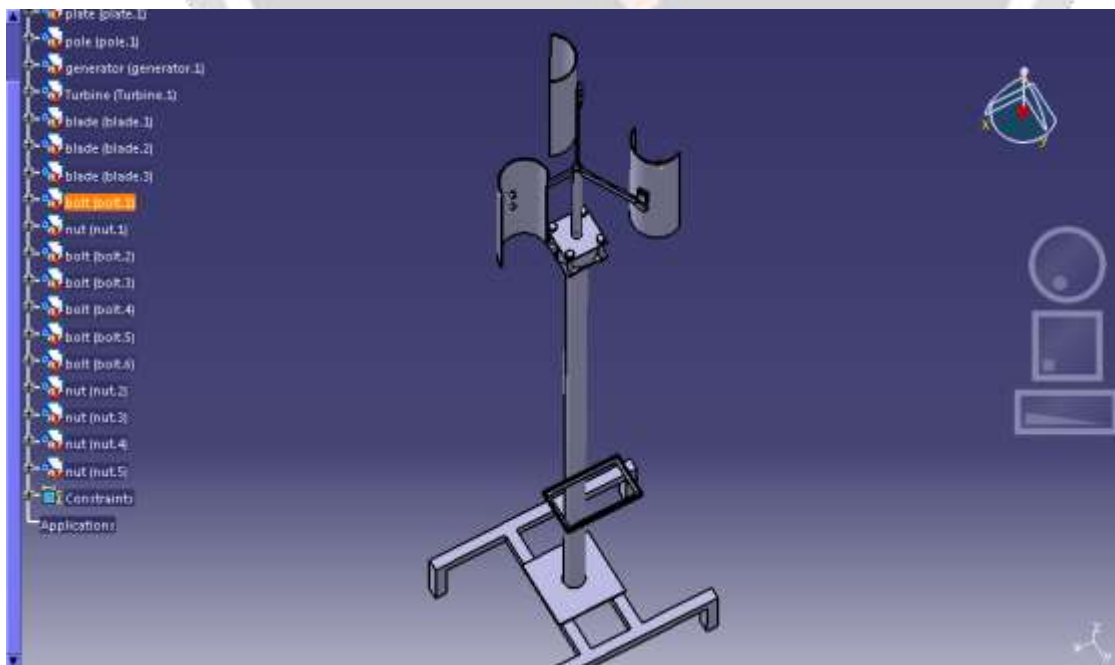
3.2 Selection of material-

3.2.1 Wing (Polyvinyl Chloride)

- Strength– PVC combines tensile strength and stiffness for the toughest   applications.
- Chemical Resistance – PVC is resistant to most acids and alkali solutions.Workability – PVC can be machined, cut, welded and glued for   fabrication versatility.
- Low Cost– PVC is an economical choice for fabricating equipment, tanks, pumps etc.
- Consistency– PVC is extruded through most of the available gauges for dimensional consistency.Flammability – PVC is self-extinguishing.

3.2.2 Pole & Stand

4.2.1 Duplex stainless steel have:

- Excellent corrosion resistance.
- Increased resistance to chloride attack.
- Good resistance to stress corrosion cracking.
- Tensile and yield strength higher than austenitic or ferritic grades.
- Good weldability.
- Good formability.

Physical Properties of Stainless Steel

The reason for choosing stainless steel is normally due to advantages given by physical properties such as corrosion resistance.

In addition to corrosion resistance, the advantageous physical properties of stainless steel include:

- High and low temperature resistance
- Ease of fabrication
- High Strength
- Aesthetic appeal
- Hygiene and ease of cleaning
- Long life cycle
- Recyclable
- Low magnetic permeability

Extreme Temperature Resistance

Some stainless steel grades can resist scaling and retain high strength at very high temperatures. Other grades maintain high mechanical properties at cryogenic temperatures.

Simple Fabrication of Stainless Steel

Most grades of stainless steel can be cut, welded, formed, machined and fabricated using standard methods and equipment used for other types of steel

Aesthetic Appeal

Stainless steelcan be supplied with a range of surface finishes. It can also be polished after fabrication to give the desired finish. The finish of stainless steel is easy to clean and maintain.

Hygiene and Ease of Cleaning

Stainless steelis non-toxic and readily cleaned. This makes stainless steel the material of choice for use in hospitals, kitchens, food, drink and pharmaceutical processing plants.

Long Life Cycle

The durability and corrosion resistance of stainless steel means it will outlast many competing products. The low maintenance characteristics also add to stainless steel often being the lowest cost choice in a life cycle cost comparison.

Recyclable

80% recycled material. Scrap stainless steel can be stored without degradation to its value as a raw material.

3.2.3 Solar Plate

Specifications:

- Number of Cells = 36
- Output Voltage = 12
- Type = Polycrystalline
- Material = Silicone, Aluminum
- Solar Power = 20-30Watt.

Dimensions

- Weight=2.5 kg
- Length=0.560 m
- Width= 0.350 m
- Thickness = 0.025 m

Fig. 4.1 Solar Plate

3.3 DESIGN OF WIND ENERGY SYSTEM-

3.3.1 Theoretical Efficiency-

Theoretical efficiency we can calculated by following formula-

$$K\ E = 1\backslash 2pAV^3 \ldots\ldots\ldots\ldots [1]$$

Where, V-Air Velocity

A-Turbine Swept area

p-Air Density

3.3.2 Vertical Axis Wind Turbine-

Wind Turbine Design Parameters; The vertical axis wind turbine parameters considered in the design process are:

i.Swept blade area

ii.Power

iii. Speed ratio

iv.Length of Blade

v.How many Blade

vi.Solidity of Turbine

3.4. CALCULATIONS

3.4.1 Power calculations-The power generation by wing is perform on the basis of kinetic energy converted in to mechanical energy the equation of kinetic energy is as follows.

$$K.E = \tfrac{1}{2}mv2. \qquad\qquad (1)$$

Where,
K.E = kinetic energy
m = mass
v = velocity,
M is equal to its Volume multiplied by its density of air

$$M = pAV \ldots\ldots\ldots\ldots\ldots.. (2)$$

Substituting eq. (2) in eq. (1)
We get,

$$K\ E = \tfrac{1}{2}pAV.V^2$$

$$K\ E = \tfrac{1}{2}pAV^3 watts.$$

Where,
A= swept area of the turbine.
p= density of air (1.225 kg/m3)
V=wind average velocity

For 15 Watt power, calculate design parameters of turbine, P=12 watts.

Considering turbine efficiency as 85% and generator efficiency 90%,

P = 12/(0.85*0.90)
P=15 watt

 P= ½pAV3

For wind velocity 5.76 m/s

Density of air (1.225 kg/m3)……….(from reference paper 1.)

15 = ½*1.125*A*(5.76)3

A= 0.1281 Sq.m

A = D*H (Sq.m)

D= diameter of the blade
Taking diameter as 0.180 meter, height of turbine can be calculated as

H=A/D =0.1281/0.180

H =0.70 m

Therefore height of wind turbine is 700 mm

3.5 Design of Turbine Blades

Wing width= diameter*0.14
             = 0.180*0.14
             = 0.140m
             = 2.5 mm

Wing chord = circumference*.09

             = π*0.180*.09
             = 0.508 = 508 mm

3.6 Cad Modeling

3.6.1 Turbine
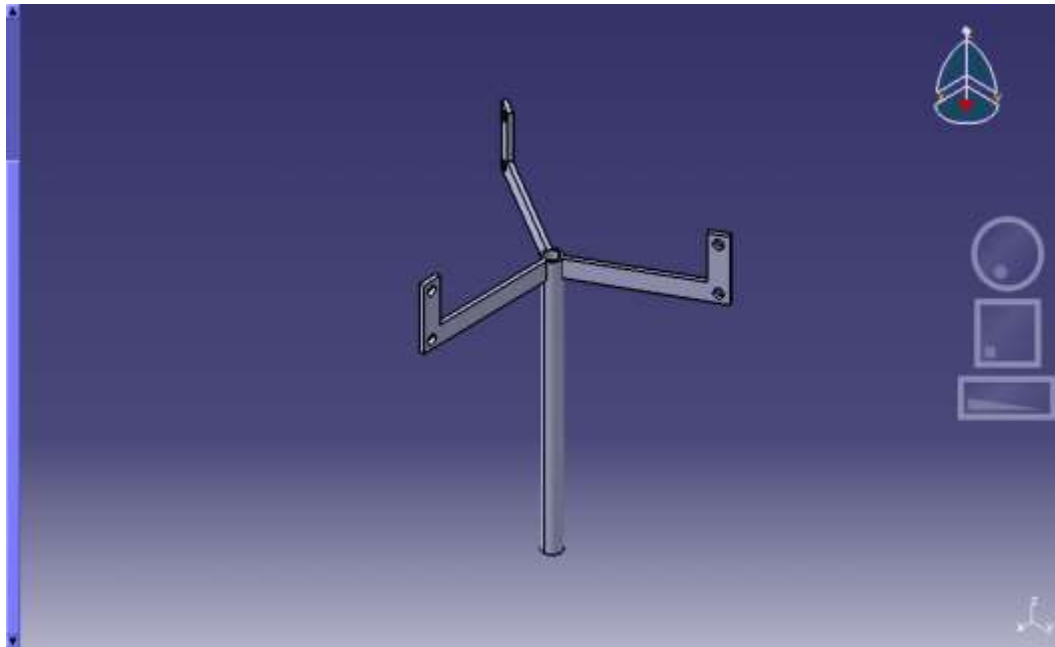
3.6.2 wings
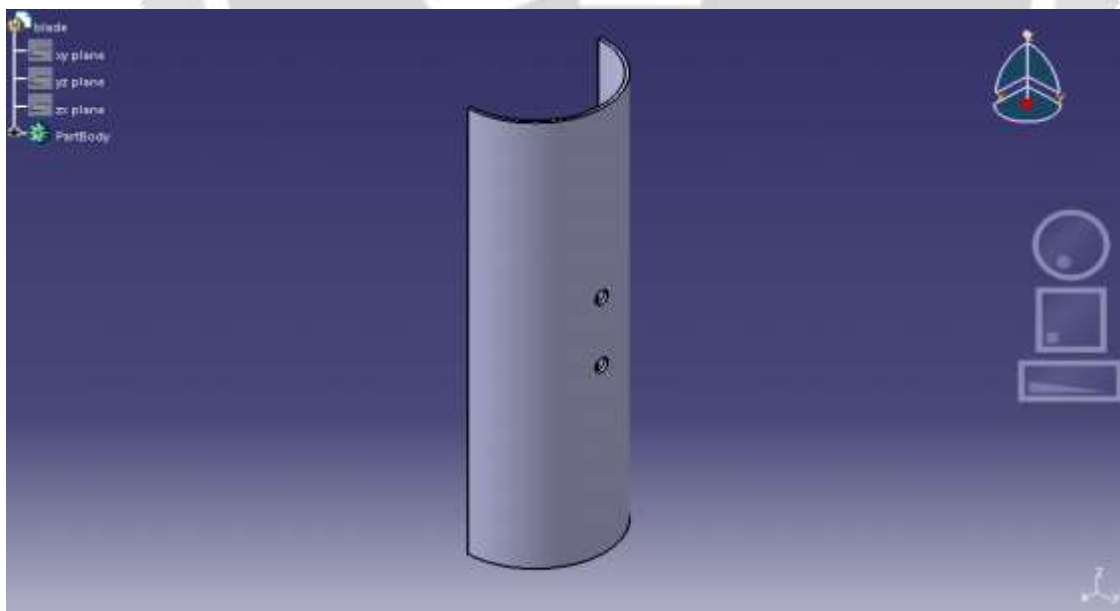
4 CONCLUSION

- By this hybrid energy generation we can generate electricity effectively high rate than single energy renewable energy system

- Due to high generation rating we can sell it with minimum price compare to other price

- This energy system having a negligible running cost compare to other non-renewable system

- This system can generate electricity throughout the year

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6 REFERENCES

[1] ISSN 0976 – 6340 (Print) ISSN 0976 – 6359 (Online)Volume 5, Issue 10, October (2014), pp. 148-155 © IAEME: www.iaeme.com/IJMET.asp Journal Impact Factor (2014): 7.5377 (Calculated by GISI) www.jifactor.com

[2] Kavita Sharma and Prateek Haksar, Designing of Hybrid Power Generation System Using Wind Energy Photovoltaic Solar Energy- Solar Energy with nano antenna India, Jan-Feb 2012.

[3] Vivek Dixit and J.S.Bhatia Analysis and Design of A Domestic Solar-Wind Hybrid Energy System for low wind speed, India, June 2013.

[4] Chaitanya marisarla, k. Ravi kumar, Hybrid Model of Solar-Wind Power Generation System , India, August 2013.

[5] Sandeep kumar and Vijay Kumar Garg A Hybrid Model of Solar-Wind Power Generation System, India, August 2013.

[6] Swati negi and lini mathew International journal of electronic and electrical engineering, Hybrid Renewable Energy System, India, 2014.

[7] Ashish S. Ingole and Prof. Bhushan S. Rakhonde International journal of scientific and research publications, hybrid power generation system using wind energy and solar energy, India, volume 5, issue 3 , March 2015.