International Journal Of Advance Research, Ideas And Innovations In Technology

ISSN: 2454-132X
Impact factor: 6.078
(Volume 6, Issue 2)
Available online at: www.ijariit.com

Design and fabrication of ceiling fan

Kiran Thorve
kiran.9870@gmail.com
IETES's Bharat College of Engineering, Thane, Maharashtra

Sachin Gadhave
gsachin4444@gmail.com
IETES's Bharat College of Engineering, Thane, Maharashtra

Prasad Gaikar
prasad.gaikar32@gmail.com
IETES's Bharat College of Engineering, Thane, Maharashtra

Amol Desai
amoldesai1996@gmail.com
IETES's Bharat College of Engineering, Thane, Maharashtra

Amey Sakre
sakreamey7@gmail.com
IETES's Bharat College of Engineering, Thane, Maharashtra

ABSTRACT

The project runs on the concept that when electric generator rotates at some appropriate speed it produces electricity. So, here we proposed a device which can be assembled to a system which having rotary motion and produces electricity. The idea behind it was to give relief to farmers by using the same rotary motion of the water pump and generate the electricity by using the device and charge the battery so that during cut-off of electricity we can run the pump using the same electricity. So, to show the device will work, here we made the device which is fixed with the fan and due to rotary motion of the fan the device generates the electricity and charge the battery and can use that stored electricity again when required. So, this will give little bit relief to the farmers if more research is done on it, but this device can be very useful in homes as it connects to fan it can generate sufficient amount of electricity on which one can use led light bulbs which will reduce the electricity consumption. This will help in completing the need of electricity of all. The fan rotates at 300 rpm at normal and when we attach our device it rotates at the speed of 275 rpm and simultaneously produce 9.87 volts which can be used to run other appliances which we need to run on electricity.

Keywords*— Electricity, Generator, Ceiling fan*

1. INTRODUCTION

As today the need of electricity is increasing and we are not able to fulfill this need and due to usage of more and more fossil fuel we are polluting our environment. Due to this there is imbalance in the nature due this the farmers are mostly affected. We all know that energy can neither be created nor be destroyed but can be transformed from one form to another. But we are wasting resources that can produce energy as if they are limitless. If we can renew and Reuse the energy we waste, it would help in some way to the problem of scarcity of energy, which is the major threat of present world. By using the concept of electricity generation from ceiling fan can be used for bulb charging and for any other appropriate work where electricity required is less. Beside every fan there is a tube light by a mechanism inside the fans motor or a belt that rotates and light up the bulb or store the energy in a battery which could be used to power up other machines.

2. LITERATURE REVIEW

The study of different aspects that have influence on the performance of grinding process has been carried out from the beginning of this type of machining. In fact, it is still difficult to understand all the aspects concerning grinding due to its strong stochastic nature and multiple parameters of process. Some research lines can be found easily in this literature survey.

MD Saquib Gadkari et al [1] concluded that the rotational energy of the dynamo can be used to operate several small powered devices. Both dynamo and alternator can be used. The various applications where this power can be used are charging of laptops, cell phones etc.

Vinay Pattanashetti et al [2] concluded that the mechanical energy of the rotating ceiling fan is used to generate power. Renewable energy is being encouraged so this is, been designed to generate and contribute some amount of energy. This design can reduce the domestic load up to some extent and is economic. Charge can be stored in battery and used whenever needed.

Nihar Shah et al [3] concluded that the improved blade design and AC induction motor materials, and the increased use of BLDC motors, are identified as cost-effective options to improve the efficiency of ceiling fans. Adaptation of these technologies could provide ceiling fan power consumption savings of more than 50% .Even if the entire incremental cost of the highly efficient fans is covered by the financial incentives, the cost of the conserved electricity for efficiency improvements over 50 % is just 0.7 rupees per kilowatt hour (US$ 0.014/kWh) which is about one sixth of the cost of supplying electricity in India.

Galvez et al [4] concluded that its simple design, low cost, easy to find, are some of the qualities which make these generators a practical alternative in applications where low energy consumption does not justify more expensive solutions. Also, they can be a realistic option in places where manpower costs (rewinding the motor, cleaning and lubrication…) are negligible compared to the manufacturing cost. Another aim of this work is to motivate students, joining both recycling techniques and renewable energies, which are essential for a sustainable development.

David J. Perreault et al [5] concluded that the new approach enables dramatic increases in output power and efficiency to be achieved as compared to conventional methods while retaining low cost and preserving the existing manufacturing infrastructure. Experimental results are provided demonstrating factor of 2.5 (peak) and 1.9 (average) increases in output power capability from a conventional Lundell machine using the new design; idle-speed performance remains unchanged. Efficiency improvements of up to 25% at high power are also demonstrated. The new design thus overcomes the power limitations of present-day Lundell alternators, and allows significant improvement in vehicle fuel economy to be achieved. The new design approach also provides additional functionality and performance improvements of particular importance for high- and dual-voltage electrical systems. Two major challenges to the introduction of 42 V electrical systems are the need to achieve load dump transient control and the need to provide a mechanism for jump charging the high-voltage battery from a low voltage source development. In addition to providing the benefits that result in single-output alternators, it is shown that one can achieve large reductions in filter size and improvements in control bandwidth as compared to conventional implementations.

3. MODEL AND LIST OF COMPONENTS

Fig. 1: Actual Model

Table: List of Elements used

S. no.	Name of the Parts	Qty
1	Magneto	1
2	Fan	1
3	Spring	3
4	MS Round Rod (d= 42mm & l= 440mm)	1
5	Universal Joint	1
6	Bearing (6202)	2
7	Cover	2
8	Fasteners (Diff. size)	20
9	Wire, Capacitor, & Other Electricals	5

4. DESIGN CONSIDERATION

Following design consideration were considered while designing the system.

- Design of Rod
- Power Calculations
- Battery Charging Calculations.
- Actual Performance Calculations.

4.1 Design of Rod

Yield Strength of mild CS =370 N/mm^2

Assuming Factor of Safety= 5

Load = 10kg=10*9.81=98.1 N

Tensile Stress = Syt/FOS = 370/5

Tensile Stress = 74 N/mm^2

Tensile Stress = Bending Stress = 74 N/mm^2

4.1.1 Tensile Failure of Rod

$$\text{Tensile Stress} = \frac{W}{\frac{\pi}{4}d^2} = \frac{98.1}{\frac{\pi}{4}11.94^2}$$

= 0.8761 N/mm^2

0.8761<74 N/mm^2

Therefore, the design is safe.

4.1.2 Bending Stress

Bending Stress = (Bending moment*Distance from neutral layer to the outer most layer)/ Moment of Inertia

= (W*y)/ I

= (98.1*6.81)/167.11

= 3.997 N/mm^2

3.997< 74 N/mm^2

Therefore, the design is safe

4.2 Power Calculations

4.2.1 Voltage

V= π x z x P x N/ (Ax60)

Where, pi= area of magnetic field

z= no. of conductors

P= no. of poles

N= speed in rpm

A= no. of parallel path.

V= [(84π)(4)(4)(300)]/ (2*60)

V=10.55 Volts

4.2.2 Power

P= τ x 2 x π x ω

Where, τ = Torque

ω = Rotational speed $^{-1}$

Torque = P x 60 / (2πN)

= (98.1*60)/ (2*π*200)

= 4.86 N/mm^2

ω = (rpm^{-1})

= (200^{-1})

= 5*10^{-3} rad.

P= 4.683 x 2 (84π)(5 x 10^{-3})

P=12.358 watt

4.3 Battery Charging Calculations

Charging Time of Battery= Battery Ah/ Charging Current

Therefore,

T=Ah/A

As, we know that the charging current should be 10% of the Ah rating of the battery.

So, Charging current for 30Ah battery=30*(10/100)=3 ampere

So, for the charging there might be some loss is there while charging so the charging current is to be taken as 3-5amperes.

Here, consider the charging current as 4 amperes.
Then the charging time for the 30 Ah battery = 30/4 = 7.5 hours
Considering Losses about 40%.
So, 30 Ah batteries will take
30*(16.63/100) = 12… 30Ah*40% of losses)
Therefore, 30+12=42Ah (30Ah + losses)
Now the charging time is
42/4 = 10.5 hours or 11 hours

4.3 Actual Performance Calculations

The power produced by the magneto when the test run was taken as below.

Voltage: The voltage produce in the test run is produced was around 9.87 volts which was produce ate the same speed of the fan but the ampere produced at that speed is around 0.917 ampere.

Battery Charging Time: So now to calculate the charging time for 30Ah battery. Considering all losses
30 Ah batteries will take
30*(40/100) = 12… (30Ah*40% of losses)
Therefore, 30+12=42Ah (30Ah + losses)
Now the charging time is
42/0.917 = 45.80 or 46 Hr or 1 day 22 Hrs

Efficiency of the device On the basis of the power production is

$$\eta = (\text{Actual power produced / theoretically produced}) * 100 = (9.87 / 10.55) * 100 = 93.55\%$$

5. CONCLUSION

From the above result, it has been observed that the setup tried is very efficient and affordable source of electricity using the rotational motion of rotor.

6. REFERENCES

[1] MD Saquib Gadkari et al, "Generation of Electricity from Fans," (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (3) , 2014, 3294 – 3297
[2] Vinay Pattanashetti et al, "Utilization of mechanical energy from rotation of ceiling fan to generate electricity," International Journal of Science, Technology & Management Volume No 04, Special Issue No. 01, March 2015.
[3] Nihar Shah et al, "Efficiency improvement opportunities for ceiling fans," Energy Efficiency (2015) 8:37–50 DOI 10.1007/s12053-014-9274-6 Received: 26 April 2013 /Accepted: 11 June 2014.
[4] A. Galvez et al, "Recycling of small electrical machines and its applications for low cost wind turbines," International Conference On Renewable Energy And Power Quality. (ICREPQ'03).
[5] David J. Perreault et al, "A New Design for Automotive Alternators." 2000-01-C084.

