CHAPTER – IV

WIND ENERGY CONVERSION AND STORAGE

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4.1 INTRODUCTION

Electricity generation by using wind mill is called aerogenerator. Because of particular wind velocity rotator rotates and kinetic energy of wind is converted into rotational energy and it is given to aerogenerator which produce electrical energy.

4.2 NEED OF ENERGY STORAGE

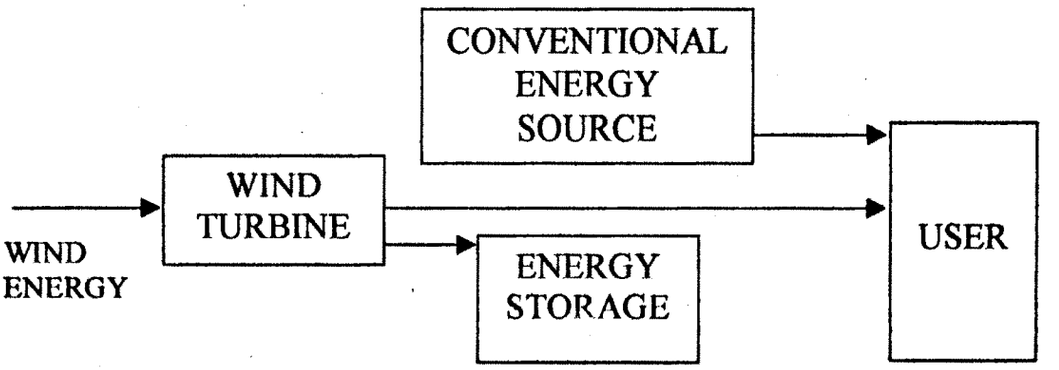


Fig. 4.1 Basic wind energy conversion system with energy storage

Storing devices are necessary because wind is not continuous source of energy.

ENERGY STORAGE

The problem in utilization of wind power is to determine how much power is available ? How frequently and at what reliability at

particular site with a particular wind machine ? The turbine size and rechargeable storage battery is selected according with average wind energy available. Sulphuric acid is used in battery and concentration is adjusted by using distilled water in sulphuric acid.

If there is no wind power, the batteries will have to meet the load. In the time of no wind the batteries will be discharged and during the period of sufficient wind the battery is recharged.

CHARGING OF BATTERY

Sulphuric acid is used in battery. Positive terminal of battery is connected to positive terminal and negative terminal of battery is connected to negative terminal of charger. Then connect all the batteries in series. Stop charging when temperature increases above 50°C and batteries are allowed to cool near about 12 hours.

4.3 BLOCK DIAGRAM OF AEROGENERATOR INSTALLED AT SHIVAJI UNIVERSITY CAMPUS

MEDA in association with Unitron installed horizontal axis wind mill because efficiency of horizontal axis wind mill is maximum than vertical axis. The power of this aerogenrator installed is 3 kW.

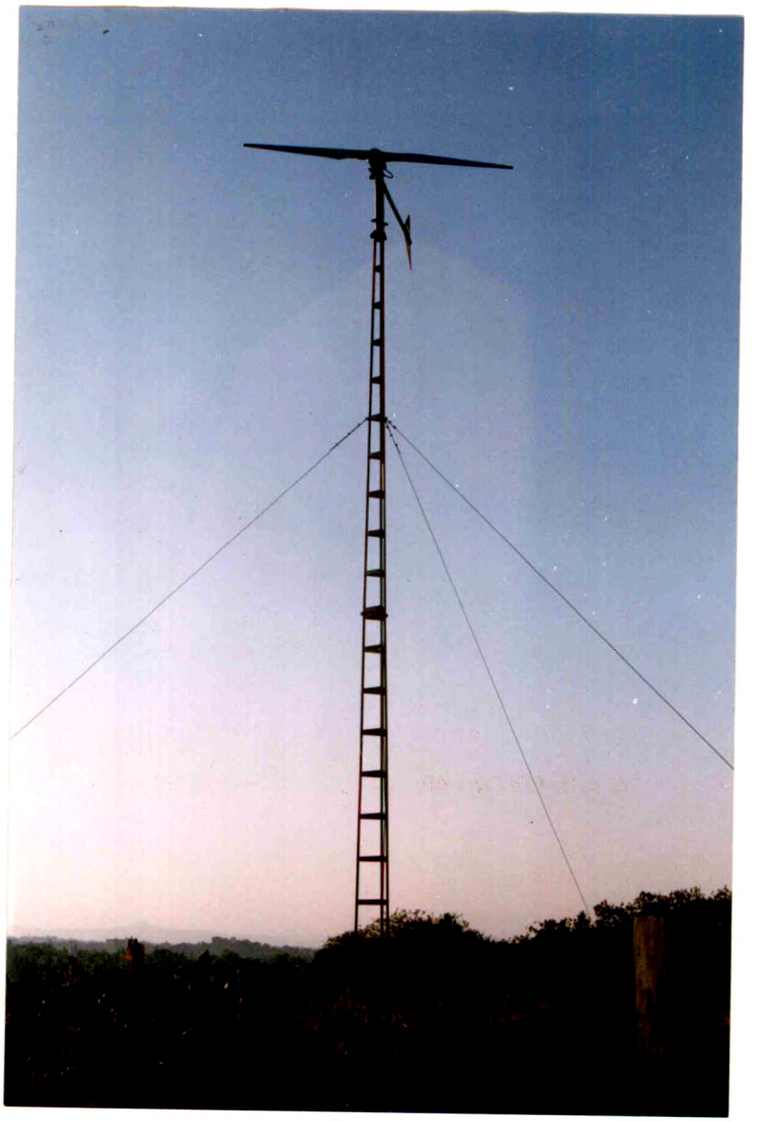
The wind mill has following parts. a) Blade b) Hub c) Generator d) Tail.

a) Blade : It consists two blade made from fiber glass.

b) Hub : This is central part which divide the wind equally towards two blade. It accumulates large pressure of wind.

c) Generator : It converts mechanical energy into electrical energy i.e. it generates electricity.

d) Tail : Polychrome fiber is used to make tail and it keeps the blade in the direction of wind.



3 KW AEROGENERATOR INSTALLED AT SHIVAJI UNIVERSITY CAMPUS

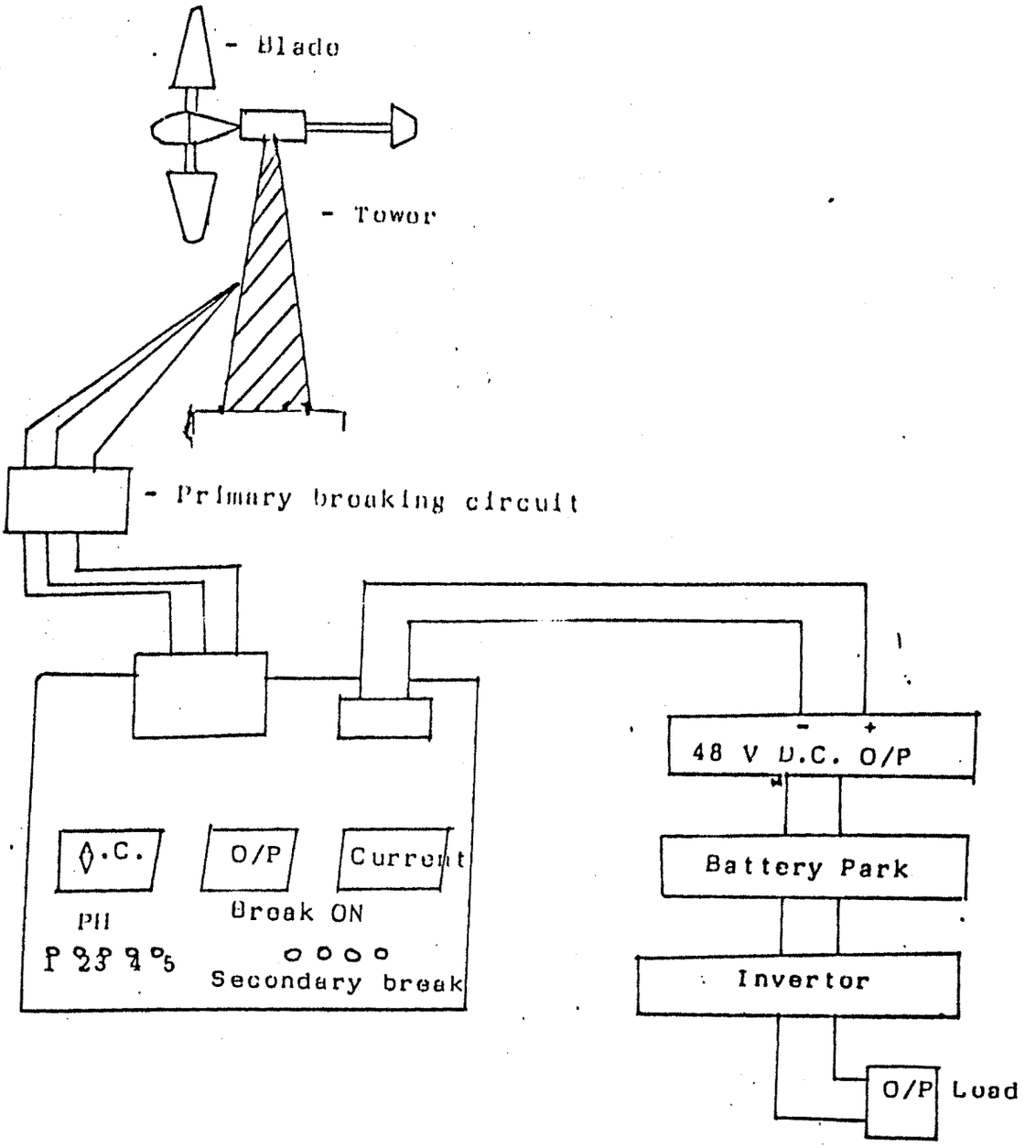


Fig. 4.2 BLOCK DIAGRAM OF AEROGENERATOR INSTALLED AT SHIVAJI UNIVERSITY CAMPUS.

3KW WIND MILL SPECIFICATION

Capacity	3 kW
Start generating wind speed	3 m/s
Survival wind speed	120 mph
Diameter of the blade	4.5 m
Material of blade	Epoxy coated 2 blade carbon/fiber glass
Height of the tower	15 meter
Battery	'EXIDE' 6 E 1130 (12 V, 130 AH)

When rotator rotates kinetic energy associated with wind is converted into rotational energy. The rotational energy given to generator, generates emf. This signal is given to control panel from where we control the operation of blade. This D.C. supply is driven to d.c. batteries which are connected in series and parallel combination so we get 48 D.C. output voltage. During peak demand this storage is useful. At the time of application this stored D.C. is converted into A.C. by using invertor and is given to load.

4.4 ELECTRICITY CONSUMPTION AT 'PATH SANSTHA'

1. No. of tubes being used - 14
2. No of fan being used - 6

Electricity consumption at 'pathsanstha' is = 70 to 80 units per month.

For one unit we have to pay Rs. 1.70

Electricity bill for one month is Rs. 136/-

Electricity bill for year is 136 x 12 = Rs. 1632/-

The electricity supplied by 3 kW aerogenerator = 3 kW x 15 hr/day = 45 units.

i.e. the capacity of 3 kW aerogenrator to supply electricity --- to 70 tubes.

Total power for a day from aerogenrator is :

70 x 40 watt x 8 hour = 22400 watt

= 22.4 kW hour

Aerogenrator supplies power = 22.4 unit/day

Total units of electcity for a month is = 22.4 x 30 = 672 units/month.

Total costs of electricity per month = 672 x 1.70 = Rs. 1142.4

For year total bill = 1142.4 x 12 = Rs. 13,708.8

i.e. Rs. 13,708.80/- per year we can save. The cost of aerogenerator is Rs. 7/- lakh. From above calculation it is seen that this amount will be reimbursed in next 50 years.

MEDA has provided subsidy of Rs. 6 lakh and Shivaji University has paid only 1 lakh rupees. According to MSEB's present electricity charges it will be reimbursed in next 6 years.

The required maintenance is only to change, distilled water in storage batteries. In laboratory distilled water is easily available. At the time of high wind speed the rpm angle of blades changes and there is cutoff in primary circuit. If no output is drawn and batteries are fully charged then input is to be cutoff from control panel called secondary breaking.

4.5 WIND DIRECTION STUDIES

Wind direction was studied in January 2000. The conclusions are :

1) From morning to afternoon (up to 3.00 pm) the wind direction is from east to west.
2) During evening to late night wind direction is from west to east.
3) However, in the morning the wind direction slightly turns towards south and sometimes towards north and in evening the wind slightly turns from west to south.

This is attributed to changes due to local climate in the surrounding atmosphere of aerogenerator. The local climate is microscopic concept and is because of temperature difference between energy plantation on western side and civil campus on eastern side of aerogenerator.

REFERENCES

1. 'Non Conventional Energy Sources' by G.D. Rai, Khanna Publishers, 1995.

- TIDE 3(2) June, 1993 "Small Scale Wind Electricity Generation Sign Criteria". by C. V. Nayar Electronic Research Unit. Curtin University of Technology, Bentley Australia.