

Summary

- Basic Engineering Science

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Department of Mechanical Engineering 1

1. ENERGY SOURCES: Wind Energy, Tidal Energy, Wave
Energy Conversion Devices, Solar Thermal Energy
Conversion

1.1.

- Mass flow rate of air is given

by the continuity equation;

=

where ρ is the density of incoming wind, A is the cross sectional area of stream,

$$3$$

$$=1$$

$$2()2=1$$

$$2(3)$$

Maximum Power

Total Power cannot be converted completely to mechanical power.

- The maximum mechanical power conversion capacity of a turbine is given by ;

$$=8$$

$$273$$

and the velocity of leaving air from the turbine blade at maximum mechanical power conversion capacity , v_2 is given by;

$$,=$$

$$3$$

The ideal or maximum, theoretical efficiency $\{ \}$ (also called power coefficient) is given by;

$$\{ \}=\{ \}$$

$$=8$$

$$27=0.5926$$

- Some of the features of HAWT estimated at wind speed of 12 / and $\approx 30\%$ are given below:

SN Features Class

Small Medium Large Very Large

1 Rated

Power,

kW 10 25 50 100 150 250 500 1000 2000 3000 4000

2 Rotor

Diameter,

m 6.4 10 14 20 25 32 49 64 90 110 130

3 Rotor,

RPM 200 150 100 67 55 43 29 19 15 13 11

(A) Horizontal Axis Wind Turbine (HAWT)

- Another, closed water circuit

picks up the heat from the collector and dissipates it inside the building: the water that is circulated through the pipes of this circuit may supply the tank of a water heater and maintain it at the typically required temperature of 40-50 °C, or it may circulate via space heaters to supply the heat required to maintain a comfortable condition in the building.

- 5) Ability to live grid free if all power generated provides enough for the home/building and excess power can be sold back to the power company if the grid is not tied

6) Renewable clean power that is available every day of the year, even cloudy days produce some power

7) Solar energy can be converted into other forms of energy; hence it can be used for a wide range of applications from household, industrial to electricity production.

- The selection of particular type of drive depends on the application, i.e., the amount of power transmitted, distance between the two shafts, etc,

2.2 COMPONENTS OF BELT DRIVE

The belt drives are used to transmit power or motion from one shaft to another by means of a

inextensible belt running over two pulleys (Fig. 2.1).