Theme - Science and Technology for society

Sub Theme - Communication and Transport

Category - 2nd category

No. of participating student - 1

Name - N T Keerrthana

Std - Class 11

School - P S Sr Sec School, Mylapore, Tamilnadu

Project Guide/ Teacher - Mr. P Gurumoorthy

Project Title – Roadside wind turbine

Theory – The wind turbine gets its power from an unconventional source, it is designed to capture wind power from highway traffic. It transforms highways to a remarkable source of renewable energy. Solar panels on top of the turbine capture additional electricity. It rotates with the help of moving air from passing vehicles on the highway. Natural wind speed normally does not exceed several miles an hour. To commercially adopt a wind powered electricity generator, it requires a large-scale wind impeller. Using small roadside wind turbines, energy can be captured by wind draft generated by high speed moving vehicles.

A centre of the road wind turbine is able to capture wind draft in opposite directions from each side of the road. The road centre wind turbine has two air flow conduits, one for each side of road. Each conduit has an inlet opening, an outlet opening and a middle opening. The inlet opening faces toward the opposite direction of roadway traffic. The outlet opening faces toward the direction of roadway traffic on its side. The middle opening allows wind turbine blades to work with air flow traveling through this conduit.

A road side wind turbine is similar to the road centre apparatus, except that it only faces one side of traffic, therefore it only has one air flow conduit and only one set of inlet and outlet openings.

Advantages:

* Measurement tool built in sensors (used to measure – humidity, climate conditions, wind speed and temperature).
* Generate approximately 1 KW energy per hour.
* As it has a small size it can be assembled/ disassembled in minutes
* They can produce electricity in any wind direction
* Strong supporting tower in not needed because generator, gearbox and other components are placed under the ground
* Low production cost and low maintenance cost
* Easy to transport from one place to other

**PARTS OF TURBINE**

Here are some common parts typically found in a turbine:

* Rotor: The blades and hub together form the turbine's rotor.
* Generator: The generator is driven by the high-speed shaft. Copper windings turn through a magnetic field in the generator to produce electricity. Some generators are driven by gearboxes (shown here) and others are direct-drives where the rotor attaches directly to the generator.
* Rotor blade: It has a different type of shape known as air foil. It converts kinetic energy to lift. It generates a life because of velocity difference on one side of the air foil compared to the other. This velocity difference creates a pressure difference and pressure difference causes a force. Made up of glass, carbon fibre.
* Gearbox: The drivetrain on a turbine with a gearbox is comprised of the rotor, main bearing, main shaft, gearbox, and generator. The drivetrain converts the low-speed, high-torque rotation of the turbine’s rotor (blades and hub assembly) into electrical energy.
* Low speed shaft: To increase the speed the shaft is rotating, the low-speed shaft is connected to a gearbox.  The rotor turns the low-speed shaft at about 30 to 60 rpm.

Construction with diagram –

Working –

When wind flows across the blade, the air pressure on one side of the blade decreases. The difference in air pressure across the two sides of the blade creates both lift and drag. The force of the lift is stronger than the drag and this causes the rotor to spin. The rotor connects to the generator, either directly (if it's a direct drive turbine) or through a shaft and a series of gears (a gearbox) that speed up the rotation and allow for a physically smaller generator. This translation of aerodynamic force to rotation of a generator creates electricity.

Usefulness to society –

* This wind turbine uses the available wind in the atmosphere and generates electricity.
* The solar panel that is available in addition absorbs the available sunlight and generates electricity.
* The electricity generated by this windmill can be used to power highway lights at night (street lights).