

ACTIVITY 4: Building a Model Wind Turbine

Activity Objective: Create a plan on how to build a model wind mill and either build the actual model wind mill or create a presentation on how to build it.

Definition: Wind energy like solar energy is used to generate electricity and promising renewable energy because its energy source is the WIND, which is all around us. Electricity is created through the use of airflow through wind turbines and the two types of wind turbines used: HAWT (horizontal axis wind turbines) and the Gorlov-type wind turbine. Wind power is generating electricity using air flow through wind turbines, which are mechanically power generators driven by a large propeller blade.

A wind turbine is designed to extract energy from the wind. It is simply an AC generator driven by a propeller that is driven by wind passing over it instead of a steam turbine driven by steam generated from the burning of fossil fuel or a turbine driven by falling water as in hydroelectric systems. A wind turbine installation consists of the necessary systems needed to capture the wind's energy, point the turbine into the wind, convert mechanical rotation into electrical power, using other systems to start, stop, and control the turbine.

There are different size classes of wind turbines. Small wind turbines with power production less than 10 kilowatts are used in homes, farms and remote applications. Intermediate wind turbines generating 10 to 250 kilowatts are used for small city power, hybrid systems and distributed power. The largest wind turbines 600 kilowatts to more than 2 Megawatts are used in central station wind farms, distributed power and community wind.

You can use a HAWT (horizontal axis wind turbines) or a Gorlov-type wind turbine. The Gorlov helical turbine (GHT) is a water turbine evolved from the Darrieus turbine design by altering it to have helical blades/foils. The GHT was invented by Professor Alexander M. Gorlov of Northeastern University. The GHT turbine solved pulsating torque issues by using the helical twist of the blades. The term foil describes the blade shape cross-section at a given point. In the helical design, the blades curve around the axis, which evenly distributes the foil sections throughout the rotation cycle, so there is always a foil section at every possible angle. So, the sum of the lift and drag forces on each blade do not change abruptly with rotation angle. The turbine generates a smoother torque curve, so there is much less vibration and noise. It also minimizes peak stresses in the structure and materials, and facilitates self-starting of the turbine. In testing environments the GHT has been observed to have up to 35% efficiency in energy capture reported by several groups.

REVIEW VIDEOS:

<https://www.youtube.com/watch?v=5Lq2RBGvwoM>

<https://www.youtube.com/watch?v=Po5eGC4CLOY>

https://www.youtube.com/watch?v=YY1oCNhD8_0

Materials: Chapter 9, paper, computer, printer, Internet Access, MS Power Point

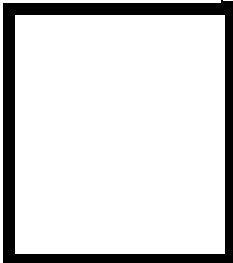
Procedure:

1. Work as partners or small teams.
2. Review the above video and Chapter 9 information from www.sus101.com and then research the design and construction of a model wind project.
3. Either build the actual wind turbine model or create a Power point presentation on how to build it.



RUBRIC

4 World-Class Learner	3 Proficient Learner	2 Developing Learner	1 Emergent Learner
Learner at this level has gone beyond mastery of knowledge, skills, & attitudes described in project. World-class learner consistently exhibits high-quality performance.	Learner at this level has had opportunities to apply knowledge, skills, & attitudes of component of project. Proficient learner has mastered essential attributes, thus proving mastery.	Learner at this level has been exposed to & had opportunity to apply knowledge, skills, & attitudes of project. Developing learner may have only a few essential attributes to master before mastery.	Learner at this level may or may not have been exposed to knowledge, skills, & attitudes required by academic standards of the project.



- 1= Emergent Learner
- 2 = Developing Learner
- 3 = Proficient Learner
- 4 = World-Class Learner