

INTERMEDIATE ARTICLE: The New Wind Turbine

The old windmills of Holland are a far cry from the sophisticated wind machines of today. Research is being done all the time at many facilities, including the National Wind Technology Center, to design and build more efficient wind machines.

The basic components of a modern wind machine are:

1. **Blade** Modern blades are specially designed to capture more energy from the wind. They are made from light, but strong, composite materials to enable them to survive gusty winds (over 45 mph). They use aerodynamic controls or 'brakes' to control the speed of the blades.
2. **Rotor Hub** The latest rotor hub designs are flexible. This ability to move allows the rotors to be more efficient, reduces the load on the structure of the machine, and minimizes the risk of damage to the power train.
3. **Generator & Power Train** Innovative low-speed, direct-drive designs allow new wind turbines to produce power at changing rotor speeds. These new designs allow researchers to make machines more efficient and easier to control, reducing the size of expensive gear boxes, or eliminating them altogether.
4. **Tower** Advanced construction materials and special tower designs allow researchers to use taller towers that place the turbine higher, where the wind is stronger and more energy is available.
5. **Power Control System** Advanced power control systems improve the control of the wind turbine in constantly changing wind conditions, continually optimizing the power produced while minimizing wear and tear on the machine.

Today, entire systems can be modeled using computer programs that allow designers to try out advanced components in different configurations. Data on wind variations at specific sites can be incorporated so that machines can be designed to produce the most power in a given location. Then tests with prototypes (models built for experimentation) help refine the design by suggesting where final changes should be made.

The National Wind Technology Center is part of the National Renewable Energy Laboratory of the U.S. Department of Energy.

For more information on advanced wind technologies, go to NWTC's website at www.nrel.gov/wind and the American Wind Energy Association website at www.awea.org.



INVESTIGATE WIND ENERGY IN YOUR STATE

1. Find out if there are any wind machines in your state. If so, how many are there, where are they located, and how much power do they produce? Are there plans to install more in the near future?
2. Find out what areas of your state have wind resources that would produce power economically if wind machines were installed.