

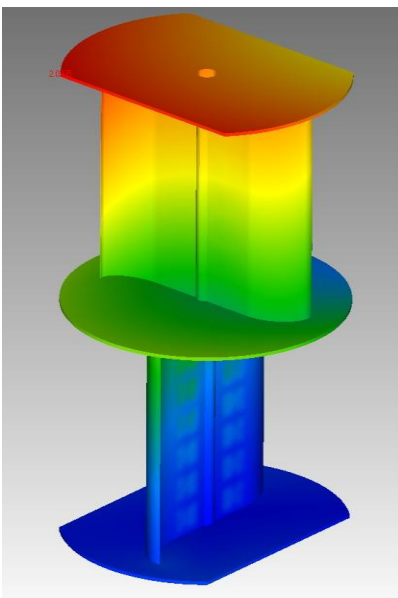
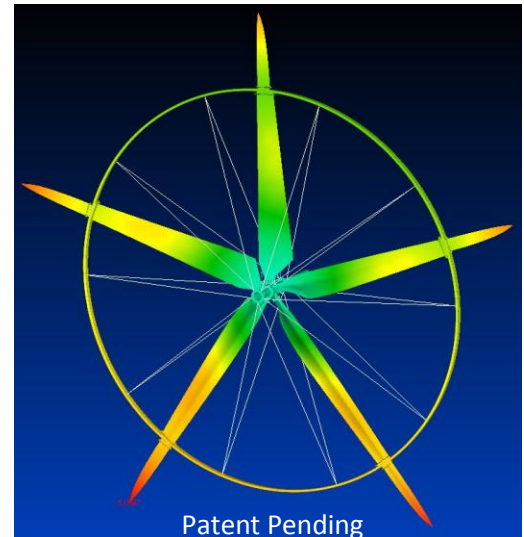


Wind Energy Consulting Services: Structural Design

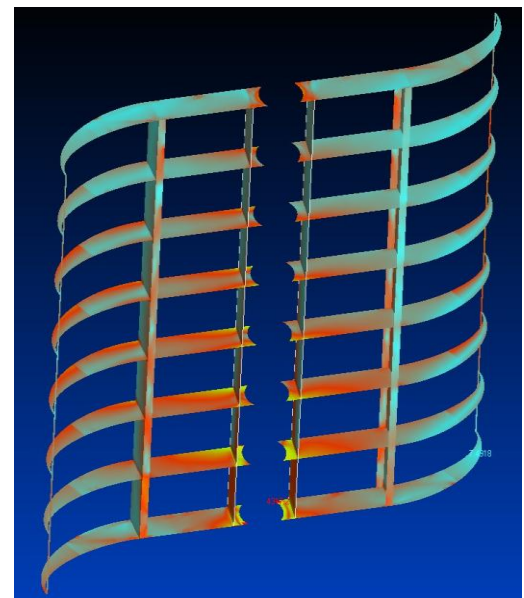
DARcorporation has been offering aeronautical engineering software and consulting services since 1991. In 2004 we designed, built and tested our first Horizontal Axis Wind Turbine (HAWT), which was followed by a Vertical Axis Wind Turbine (VAWT) and many since. Over the years DARcorporation has developed a unique expertise in structural design of wind turbines.

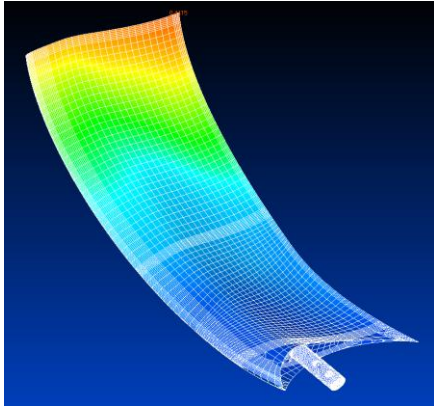
Structural Design & Analysis

Structural design is carried out after the aerodynamic design is finished. Aerodynamic loads in the form of pressure distributions from Computational Fluid Dynamics (CFD) or experimental data are mapped into a finite element model. Load cases are determined based on IEC design standards for load factors and typical wind cases. DARcorporation utilizes NEi NASTRAN to analyze the structure. Linear and



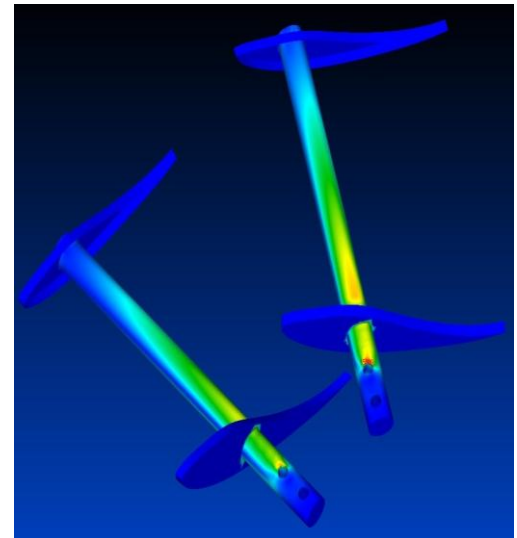
non-linear cases are analyzed. The structure can be made out of steel, aluminum, glass fiber and/or carbon fiber or any combination thereof. A unique method has been developed by DARcorporation engineers to analyze the harmonic behavior of wind turbines. Unwanted vibrations are detected and designed out of the system.





Detailed modal analysis is carried out to determine the natural frequencies of the various components of the wind turbine. Frequency response and transient response analyses are also carried out to determine critical deflections under forced oscillations caused by changing wind direction. Interference between various components of the wind turbine is analyzed and the structure is designed as per

the IEC or other regulations. The turbine is designed in such a way that the natural frequencies of the blades are different from the operating RPM. Detailed fastener analysis is carried out and all fasteners are sized appropriately. The entire structural design is conducted to simplify transportation and assembly. Detailed CAD for Finite Element Analysis (FEA) is generated in Siemens NX and can be translated into other CAD formats.



The DARcorporation Advantage

Experience in the design, detailed analysis and building of prototypes gives DARcorporation a unique advantage over other companies, since we can go from initial design all the way through full size manufacturing. The unique tools developed for design and analysis make DARcorporation the best choice for any new wind turbine development. DARcorporation engineers can advise on what the best materials are for your design and what the best configuration is. We will work with you to design and optimize your wind turbine for performance, manufacturability and cost.

