



DARcorporation Newsletter



2009 AirVenture, Oshkosh, WI July 27 – August 2, 2009 HANGAR C – BOOTH 3098

As always DARcorporation will be at Oshkosh for the EAA AirVenture and hope you will stop by to say hi. Willem Anemaat, Balaji Kaushik (pictured) & Ken Po will be demonstrating the newest version of Advanced Aircraft Analysis (AAA) and talking airplanes! This year DARcorporation added a new Prototype & Fabrication Shop (DARworks) and has been very busy with Wind Energy Projects, in addition to several exciting aircraft projects so there will be a lot to talk about!

DARcorporation and Wind Mills

DARcorporation does not only design airplanes. We are also in the business of designing, wind tunnel testing, manufacturing prototypes and testing full scale wind mills (or wind turbines).

Wind mills can either be Horizontal Axis Wind Turbines (HAWT) or Vertical Axis Wind Turbines (VAWT). Examples of HAWT is the Hi-Q (#61 design) wind turbine designed and built by DARcorporation. Examples of VAWT are the Wind Energy Corp wind turbine and the SkyDrill 10 KW wind turbine.

Over the years DARcorporation has developed a unique expertise in aerodynamic design of wind turbines. Special software has been based on Blade Element Methods (BEM). This BEM is used in the initial aerodynamic design of the wind mill blades. Airfoil design and analysis software is used to analyze and design the airfoils used on the blades. An optimal airfoil distribution, twist distribution and chord length distribution is developed using the BEM software. Once a final wind-mill blade is designed in BEM, CFD tools (such as Blue Ridge Numerics CFDesign) a full Navier-Stokes tool, is used to simulate rotation and quantify the full power curve of the wind mill. Pressure distribution over the blades can be calculated and torque (and thus energy) curves are constructed. If any flow problems show up the blade design will be refined. Once aerodynamic design is finalized, a wind tunnel model will be designed and constructed, by either DARcorporation or subcontractors.



Hi-Q Wind Turbine designed & built by DARcorporation auto furled out of the wind.



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DARcorporation and Wind Mills (cont.)

The wind tunnel at The University of Kansas (for very small models) and the Wichita State University are used to test the wind turbine models. Either a small generator is attached to the model with a torque sensor to measure the power or an electronic brake with a torque sensor. In case of the generator a resistor box is attached to simulate the load on the generator and to control the rpm.

With the different rpm's and the torque a power curve can be constructed. DARcorporation developed a unique wall correction method to correct the data from the wind tunnel for wall effects. Corrections to the model or new models are constructed to come to a final design.

Once the final aerodynamic design is known, the structural design starts. DARcorporation uses NEi Nastran to analyze the structure. The structure can be made out of steel, aluminum, glass fiber and/or carbon fiber or a combination.

A unique method has been developed by DARcorporation engineers to analyze the harmonic behavior of wind mills where vibrations and the effect of these are analyzed.

Detailed CAD methods using Siemens Unigraphics are then applied to do the detailed drawings for production of the prototype wind mills. DARcorporation either constructs the prototype in its own workshop or outsources certain parts or the whole windmill to other shops. Once the turbine is built, DARcorporation will supervise installation at a test site and will collect test data. Normally a wind turbine will operate for several months to establish the power curves.

Experience in the design and building 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 makes

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 your design and make it as optimal form a power generating point of view as possible. Please contact Dr. Willem Anemaat (anemaat@darcorp.com) for additional information.



Wind Energy Corporation, Windy II Vertical Axis Wind Turbine, Designed & Tested by DARcorporation



DARcorporation designed & tested Vertical Axis Wind Turbine (VAWT) Prototype for SkyDrill Power Systems.