

SAMTECH to demonstrate Wind Turbine Structural Dynamics at EOW2009

Liege, Belgium, September 2009. SAMTECH announces its participation in the European Offshore Wind energy Exhibition and Conference (EOW2009), which will be held from the 14th to the 16th of September in Stockholm, Sweden. This event will be an opportunity for SAMTECH to demonstrate advanced Structural Dynamic analysis of Wind Turbines using the new commercial release of its engineering software platform "SAMCEF for Wind Turbines (S4WT)".

The industrial engineering process of large Wind Turbines is a complex organisation involving several teams of engineers, with complementary expertise. During the last 30 years, a lot of advanced engineering software has been developed by wind energy expert researchers, and method engineers of Wind Turbine manufacturers. These software tools are applicable to various disciplines and are usually used sequentially, often requiring iteration loops.

Step 1: The first category of mechanical engineering software is dedicated to the evaluation of dynamic loads in various conditions, working from inputs generated by Aerodynamics (CFD), Aero-elasticity, and Control Design teams. Load computations are usually performed with low fidelity Beam Finite Element models of the Wind Turbine, computing extremely fast in order to cover, in a practical time frame, a wide range of wind conditions, justified by the wind stochastic character.

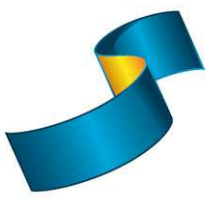
Step 2: The dynamic internal loads extracted from the previous calculations are then translated into envelopes of equivalent static loads for the local Stress Analysis of Wind Turbine structural components. In this context, linear or non-linear structural analyses are performed using general purpose FEA software available on the market.

From the Finite Element Analysis results, a decision can then be taken to update the wind turbine design. During this iteration process, the design modifications of the structural parts are used to update the equivalent beam properties of the previous dynamic load computations. These computations are then repeated (returning to Step 1) until the designers are satisfied.

In the case of Wind Turbines with a mechanical power-train, dynamic loads are given in parallel with specifications to the gearbox manufacturer. The manufacturers will usually perform kinematical design of its mechanical gearing system using simple torsion models, or sometimes 3D rigid Multi-Body Simulation software. This design activity is usually undertaken separately; in particular without strong interaction with the flexible behavior of the blades under the effect of the wind.

What is the benefit of Structural Dynamics in the Wind Energy Industry which already uses all these other engineering software capabilities?

Structural Dynamics, implemented in S4WT, is corresponding to the last phase of the engineering process, where the Wind Turbine design is relatively stabilized, and when accurate analyses have to be performed with detailed High Fidelity FEA Virtual Prototype. This complete Wind Turbine model will allow designers to check its behavior in a selection of severe load-cases required in order to guarantee the Wind Turbine reliability. Structural Dynamic results are structural vibration responses in the time domain, Campbell or Waterfall diagrams describing possible instabilities, eigen-frequencies and mode shapes for different



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configurations... This information is very useful to Wind Turbine Program managers for comparison, and correlation with experimental information coming from Physical Dynamic Tests. *"The ultimate objective of Structural Dynamic models is clearly to allow the structural optimization of some selected Wind Turbine components within the dynamic context of the whole machine, considered as a true Mechatronic System (coherent assembly of Mechanisms, Structures and Control), in order to prevent fatigue failure after several years of operational use in Wind Farms, or to improve machine performance for example in combination with the optimization of wind turbine active damping systems"*, said Eric Carnoy, SAMTECH Chief Executive Officer.

As we are in the context of EOW2009, will S4WT be applicable to Offshore Wind Turbines?

The answer is clearly yes, as S4WT allows the modular and easy replacement of classical onshore Wind Turbine foundation models by any kind of foundation defined by the user in a classical CAD based Finite Element preprocessor. This gives clear future opportunities to designers of foundations (monopole, tripods or even floating platforms with pre-stressed cables) to account naturally for the dynamic effects exerted by Wind Turbines on its support modeled in detail.

For further information about **S4WT** please contact us (marketing@samtech.com) or visit the SAMTECH booth. SAMTECH will be present for the entire duration of EOW2009 (stand B0548) in order to perform live demonstrations of S4WT.

About SAMTECH

SAMTECH is a European leading provider of Computer Aided Engineering software. Founded in 1986, SAMTECH develops and markets the general-purpose Finite Element Analysis code SAMCEF, the Multi-Disciplinary Optimization platform BOSS quattro, and the Open CAE Integration Framework CæSAM, on which S4WT Desktop is based. These core engineering software tools answer to a wide range of industrial needs from the preliminary phases of design to the most advanced verification analyses. The software technology of SAMTECH has an unsurpassed reputation for its quality and reliability. It has been adopted by many major companies across all engineering disciplines as an integral part of their design process. SAMTECH software are compatible with any CAD system (UNIGRAPHICS, CATIA, PROENGINEER, SOLIDWORKS, SOLIDEDGE...) through STEP geometrical format. SAMTECH is certified to ISO9001:2000 quality standards and operates through a network of subsidiaries and representatives in key locations around the world.

Visit <http://www.samtech.com> for details on SAMTECH Products/Services offer.

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