Numerical Design and Analysis Process for Blade Design of Rotor Craft and Wind Turbine

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Abstract

During last decade, wind energy has been in the spotlight as one of leading sources among various renewable energies such as solar, tide, biomass, hydropower, and geothermal. The first wind apparatus used for electric production was built in 1887 at Glasgow in Scotland. During the first half of 2017, wind energy shared 25% of average capacity and also generated about 11% of EU electricity demand. Since 2017, wind energy became the second largest form of power generation capacity in Europe after gas, and IEA expects wind to become No. 1 source of power in Europe soon after 2030, which could nearly 30% of Europe's power demand by 2030. In addition to continuous renewable energy policy and increasing social attention on green energy against fossile energy, dramatical reduction of cost of energy (COE) and increased performance of wind turbines have been key players for growth of wind energy as well, which are mainly by virtue of implementations of advanced technologies. With help of high perforance computing devices including parrallel computers, more realistic and accurate analysis has been possible in line with improved algorithms, besides fast calculation. The applications include load calculation with multibody dynamics (MBD), finite element analysis (FEA) for structural integrity, and computational aerodynamic dynamics (CFD) for better energy capture, and so on. Also, continouus monitoring from turbines installed at on-sites and its agile reaction has been possible with support of high performance computing resources. On this paper, several examples of numerical analysis on wind turbine and its components will be reviewed broadly and discussed. Especially numerial analysis trend related to wind turbine blade design will be further described. Due to high performance computing devices and parallel computer application, increasing reliability and high energy performance could be highly achieavable and total cost of operation and managements (O&M) of wind turbines will be further reduced as a result.

Keywords: *Blade, Wind Turbine, Helicopter, Rotorcraft*

Biography

Kwangtae Ha earned a PhD at Georgia Institute of Technology at 2005. After PhD, he worked at diverse fields including Caterpillar R&D Center, Groen Brothers Aviation at USA, and Samsung Heavy Industries for Wind Turbine Development, and Korea Aerospace Industries for LCH/LAH Development. He is currently working at Fraunhofer IWES as Research Associate. His current interests are conceptual testing simulation and tension-torsion coupled composite wind blade.