Fatigue Analysis of an Optimized HAWT Composite Blade

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Abstract

The objective of this work is to study the fatigue behavior of an optimized composite wind turbine blade of a previous research. This work employs methodologies using classical theory, as well as probabilistic and numerical techniques for the study of the wind turbine blade. Rainflow cycle counting technique and Palmgren-Miner's sum are used to estimate the fatigue service lifetime of the blade. Fatigue analysis for the blade results showed that the service lifetime of the blade until failure is about 17 years for the turbine operating speed of 36 rpm, and about 15.8 years for the operating speed of 47 rpm, which are less than the expected service life of 20 years by 14.7% and 20.9% respectively.