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Wind Turbine Composite Blade Manufacturing: The Need for Understanding Defect Origins, Prevalence, Implications and Reliability

Douglas S. Cairns
Principal Investigator and Lysle A. Wood Distinguished Professor

Jared Nelson and Trey Riddle
Ph.D. Candidates

Department of Mechanical and Industrial Engineering
Montana State University
Bozeman, MT

ABSTRACT

Renewable energy is an important element in the US strategy for mitigating our dependence on non-domestic oil. Wind energy has emerged as a viable and commercially successful renewable energy source. This is the impetus for the 20% wind energy by 2030 initiative in the US. Furthermore, wind energy is important on to enable a global economy. This is the impetus for such rapid, recent growth. Wind turbine blades are a major structural element of a wind turbine blade. Wind turbine blades have near aerospace quality demands at commodity prices; often two orders of magnitude less cost than a comparable aerospace structure. Blade failures are currently as the second most critical concern for wind turbine reliability. Early blade failures typically occur at manufacturing defects. There is a need to understand how to quantify, disposition, and mitigate manufacturing defects to protect the current wind turbine fleet, and for the future. This report is an overview of the needs, approaches, and strategies for addressing the effect of defects in wind turbine blades. The overall goal is to provide the wind turbine industry with a hierarchical procedure for addressing blade manufacturing defects relative to wind turbine reliability.

Keywords: Wind Turbine Blade, Composites, Manufacturing, Defects, Damage Tolerance, Reliability