

Abstract Submitted
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Reduction of aerodynamic load fluctuation on wind turbine blades through active flow control JOHN-MICHAEL VELARDE, THOMAS COLEMAN, ANDREW MAGSTADT, Syracuse University, SOMIL AGGARWAL, None, MARK GLAUSER, Syracuse University — The current set of experiments deals with implementing active flow control on a Bergey Excel 1, 1kW turbine. The previous work in our group demonstrated successfully that implementation of a simple closed-loop controller could reduce unsteady aerodynamic load fluctuation by 18% on a vertically mounted wing. Here we describe a similar flow control method adapted to work in the rotating frame of a 2.5m diameter wind turbine. Strain gages at the base of each blade measure the unsteady fluctuation in the blades and pressure taps distributed along the span of the blades feed information to the closed-loop control scheme. A realistic, unsteady flow field has been generated by placing a cylinder upstream of the turbine to induce shedding vortices at frequencies in the bandwidth of the first structural bending mode of the turbine blades. The goal of these experiments is to demonstrate closed-loop flow control as a means to reduce the unsteady fluctuation in the blades and increase the overall lifespan of the wind turbine.

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