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IN-FIELD USE OF LASER DOPPLER VIBROMETER ON A WIND TURBINE BLADE*

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Abstract

One of our primary goals was to determine how well a laser Doppler vibrometer (LDV) could measure the structural dynamic response of a wind turbine that was parked in the field. We performed a series of preliminary tests in the lab to determine the basic limitations of the LDP' for this application. We then instrumented an installed parked horizontal axis wind turbine with accelerometers to determine the natural frequencies, damping, and mode shapes of the wind turbine and rotor as a baseline for the LDV and our other tests. We also wanted to determine if LDV modal information could be obtained from a naturally (wind) excited wind turbine. We compared concurrently obtained accelerometer and LDV data in an attempt to assess the quality of the LDV data. Our test results indicate the LDV can be successfully used in the field environment of an installed wind turbine, but with a few restrictions. We were successful in obtaining modal information from a naturally (wind) excited wind turbine in the field, but the data analysis requires a large number of averaged data sets to obtain reasonable results. An ultimate goal of this continuing project is to develop a technique that will monitor the health of a structure, detect damage, and hopefully predict an impending component failure.

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