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Flexible Blades for Wind Turbines[1] MADELINE CARLISLE COLLINS, Louisiana Tech University, DAVID MACPHEE, The University of Alabama, CALEB HARRIS, The University of Memphis — Previous research has shown that windmills with flexible blades are more efficient than those with rigid blades. Flexibility offers passive pitch control, preferable to active pitch control which is costly and requires maintenance. Flexible blades morph such that the blade more closely resembles its design point at part load and over load. The lift-to-drag ratios on individual blades was investigated. A mold was designed and machined from an acrylic slab for the casting of blades with a NACA 0012 cross section. A flexible blade was cast from silicone and a rigid blade was cast from polyurethane. Each of these blades was tested in a wind tunnel, cantilever mounted, spanning the whole test section. The angle of attack was varied by rotating the mount. All tests were performed at the same wind speed. A load cell within the mount measured forces on the blade, from which the lift and drag forces were calculated. The stall point for the flexible blade occurred later than for the rigid blade, which agrees with previous research. Lift-to-drag ratios were larger for the flexible blade at all angles of attack tested. Flexible blades seem to be a viable option for passive pitch control. Future research will include different airfoil cross sections, wind speeds, and blade materials.

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