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Investigation of implementation of stators on vertical axis wind turbines AARON ALEXANDER, ARVIND SANTHANAKRISHNAN, Oklahoma State University — Vertical Axis Wind Turbines (VAWT) have historically suffered from an inability to self-start and, especially on Savonius rotors, low efficiencies due to drag on the returning blade. A few VAWT studies have examined the use of stators to direct the flow onto the power producing side of the rotor thus preventing drag on the returning side, yet all of the designs studied allow the air to exit on the downstream side of the entering flow. This study investigates an alternative stator design for extracting more wind energy by trapping the incoming flow into a rising vortex within the stator enclosure. The flow is then allowed to exit above the stator. The current study compared the performance of a generic Savonius rotor in a 7 m/s free stream flow with the same rotor in two different stator designs. The first stator design allows the flow to escape in the downstream direction. The second stator design utilizes the same stator shape, but forces the air to remain trapped until it can exit above the stators. The initial evaluation of the results was conducted using Computational Fluid Dynamics (CFD) package Star-CCM+ set up with an unsteady k-ε model at a Reynolds number of about 1,400,000. Experimental comparisons with scale models will be presented.

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