Which Savonius Vertical-Axis Wind Turbine Is More Efficient: One With a Wind Deflector or One Without?

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Wind energy currently comprises 6% of world energy production and continues to grow in response to the need for climate change action. Savonius vertical-axis wind turbine systems could make up an increasing part of smaller scale production. Experiments were carried out to test whether a Savonius vertical-axis wind turbine setup with a rotating deflector or a setup with no deflector was more efficient at multiple wind speeds in indoor fixed wind conditions and in outdoor real world wind conditions. The prediction was that the deflector setup would produce more electricity than the no deflector setup because it could minimize the drag on the backside of the returning blade by both shielding the returning blades and funneling wind into the cup part of the blades, increasing rotational speed. The independent variable in this experiment was the type of setup (deflector vs no deflector) and the dependent variable was the amount of electricity produced (volts). When tested in an indoor fixed wind source using a leaf blower, the deflector setup produced from a 27% to 37% increase in electrical output in wind speeds 7 mph or greater and produced from a 12% to 26% decrease in wind speeds less than 7 mph. When tested in an outdoor real world wind source, for every average wind speed (2.5-9mph),the deflector setup produced from an 11% to 85% increase in electrical output. These findings show that use of a deflector improves turbine efficiency and use is feasible in outdoor real world wind conditions.