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## **Blockage corrections in wind tunnel tests of small vertical axis wind turbines**

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The effect of blockage ratio on wind tunnel testing of small vertical-axis wind turbines has been quantitatively investigated in this study. Darrieus-type three blades vertical axis wind turbine was used in the wind tunnel tests. Height and rotor diameter of the turbine were 0.4 m and 0.35 m, respectively. We measured the wind speeds and power coefficients at three different wind tunnels where blockage ratios were 3.5%, 13.4% and 24.7%, respectively. The test results show that the measured powers have been strongly influenced by the blockage ratio and the rotor tip speed ratio. The power coefficients generally increase as the blockage ratio and tip speed ratio increase. The power coefficient at blockage ratio of 24.7% reveals two times greater than that at 3.5%. After examining various blockage correction methods, the most of the correction methods are found to be unsuitable for Darrieus wind turbines. The correction methods which use wind velocity drop ratio underestimate the blockage effect, yet the conventional Maskell's correction method overestimates the blockage effect. Maskell method is basically applicable to the rectangular solid body but the Darrieus rotor is not a solid body but a porous one. Therefore, the present study proposed the modified correction coefficients for the Darrieus wind turbine based on the measurements. The results show that the correction error for power coefficients can be less than 5% when the present correction coefficients apply.

### **Biography**

Soon-Duck Kwon has 20 years experiences on wind-tunnel tests and bridge aerodynamics after completing his PhD from Seoul National University in Korea. He is currently Director of the KOCED Wind Tunnel Center in Chonbuk National University, Korea.

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