Experimental Investigation for Small Horizontal Portable Wind Turbine of Different Blades Profiles under Laboratory Conditions

Abstract

Experimental investigation for small horizontal portable wind turbine (SHPWT) of NACA-44, BP-44, and NACA-63, BP-63 profiles under laboratory conditions at different wind velocity range of (3.7-5.8 m/s) achieved in present work. Experimental data tabulated for 2, 3, 4, and 6-bladed rotor of both profiles within range of blade pitch angles (β=10°, 20°, 30°, 40° and 50° ). A mathematical model formulated and computer Code for MATLAB software developed. The least-squares regression is used to fit experimental data. As the majority of previous works have been presented for large scale wind turbines, the aims were to present the performance of (SHPWT) and also to make a comparisons between both profiles to conclude which is the best performance. The overall efficiency (η) and electrical output power (Po) affected by changing blades number and (β). The best (η) for both profiles of 2 and 3-bladed rotor occurred at (β=30°) and NACA-44, BP-44 profile was better than NACA-63, BP-63 profile. The best η for both profiles of 4-bladed rotor occurred at (β=20°), and NACA-63, BP-63 profile was better than NACA-44, BP-44 profile. The best (η) of 6-bladed rotor occurred at (β=20°) for NACA-44, BP-44
profile and at (β=10°) for NACA-63, BP-63 profile, clearly NACA-44, BP-44 profile was better than NACA-63, BP-63 profile. Finally, the maximum value of mean overall efficiency was (η=31.1813 %) concluded for NACA-44, BP-44 profile of 6-bladed rotor at (β=20°).

References


Index Terms

Computer Science
Artificial Intelligence

Keywords