A **simulation investigation the performance of a small scale Elliptical Savonius wind turbine with twisting blades and sloping ends plates**

ABSTRACT

The Savonius wind rotor considered the most common categories of the vertical axis wind rotor in order to generate energy from the wind. Elliptical blades one of adopted geometry to design the Savonius turbine rotor. The development of the blade geometry is some of the most essential strategies for improving the Savonius rotor's performance. In this paper, CFD simulations were used to study the effect of geometric parameters of the small scale elliptical Savonius turbine rotor (ESTR) with inner surface wavy blades. The simulation has been implemented in a in a two configurations design models, ESTR models with twisting angle in range of (5˚ to 45˚) and ESTR models with tilt angle of end plates (3˚ to 15˚) with an aspect-ratio of (1) and an overlap-ratio within (0.2). The performance was assessed using torque and the power coefficient varies with the tip speed ratio. The numerical results shows that the increase in the maximum power coefficient with increase of twist angle and tilt angle until optimum values of 30˚ and 12˚ for a twist angle and tilt angle, respectively. Although in all configuration show a good increase in power coefficient but there are a significant increasing in maximum power coefficient for ESTR model with twist angle of 30˚ which was 3.7% while the increasing reach to 14.55% at ESTR model with tilt angle 12˚ at tip speed ratio of 7. As well as, in comparison to the preceding ESTR model, these two models give a leap in power coefficients for a distinct range of tip speed ratios.