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Performance study of ducted nozzle Savonius water turbine, comparison with conventional Savonius turbine

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1 **Performance study of ducted nozzle Savonius water turbine, comparison with conventional**
2 **Savonius turbine**

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8 **Abstract**

9 Savonius turbine presents an attractive, environmentally friendly and cost effective
10 electric generation in low velocity regions. However, this turbine has not been fully explored, as
11 researchers are still searching for solution for the main problem of low efficiency of Savonius
12 turbine configuration. This research paper proposes a novel system of ducted nozzle
13 configuration around Savonius rotor to increase the efficiency of the turbine. In this study, six
14 different duct nozzle designs had been investigated. A numerical investigation was carried out in
15 this research work using finite volume Reynolds-Averaged Navier-Stokes Equations (RANSE)
16 code ANSYS Fluent with Reynolds numbers of 1.32×10^5 . Consequently, validation was
17 carried out following previous experiments. Flow characteristics through augmented
18 configuration, and performance of the Savonius turbine had been studied, and it was found that
19 the water flow speed had been enhanced by the developed ducted nozzle system. The maximum
20 power coefficient of the ducted nozzle turbine was increased by 78% compared to the
21 conventional modified rotor. The maximum power coefficient was 0.25 at tip speed ratio (TSR)
22 of 0.73. The use of this system is expected to contribute towards a more efficient utilization of
23 flows in rivers and channels for electrical generation in rural areas.

24 **Keywords:** Savonius turbine, ducted nozzle, diameter ratio, performance, flow characteristics,
25 power coefficient.

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