

Charging Performance of S-shaped permanent magnet double stator generator for hydro turbine application

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Introduction: During the past few years, the hydro turbine with double stator generators system performance analytical area has gathered considerable attention and becomes an important research segment within the renewable energy. Various works have been done on various types of dual stator generators for different renewable energy systems. For instance, there have been researches on the design and performance evaluation of dual stator axial flux permanent magnet generators used in marine current turbines [10]. The existence of two stators is beneficial but is also accompanied by issues like variation in torque ratios which impact the rotor maglev forces [12]. Nonetheless, the double stator generator system demonstrated superior efficiency and performance compared to single stator systems.

Approach: This study investigates the performance of a double stator generator utilized in hydro turbines, where the efficiency and charging power of the system, along with the inner and outer stators, were evaluated both in laboratory conditions and through field testing, which is conducted at Inki River Park in Kalumpang, Selangor, Malaysia. Additionally, the integration of a Battery Management System (BMS) enabled real-time monitoring and control of the battery, further enhancing the system's functionality, which the BMS will connect to the maximum power point tracking (MPPT).

Results and Discussion: In overall system, the MPPT operate for 24 V system, which is started to charge the battery at the charging condition from 21V. For the inner stator, the system is started to charge at 350 RPM with the charging power of 43.5W, while the outer stator is at 150 RPM with the charging power of 41.5 W. By combining the inner and outer stator in series coil connection, the system is started to charge at 150 RPM, but with the charging power of 86.4 W, which is double of charging power of inner and outer stator. When the charging voltage is at 25 V, the inner stator generator achieved a maximum charging power of 280W at 650 RPM, the outer stator reached 190.76W at 230 RPM, and for double stator generator, 258W charging power generated at 250 RPM.

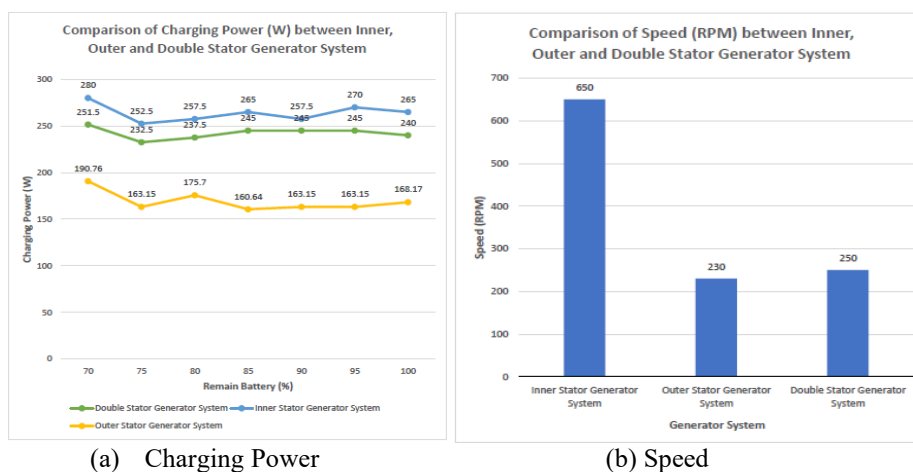


Fig. 1 Comparison between Inner, Outer and Double Stator

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