

## ABSTRACT

In this paper a hybrid-PM synchronous generator (hybrid PMSG) to be used in small-scale wind turbine systems is described. PMSGs are known for their high efficiency and high torque density. However they produce a constant flux which inhibits their direct grid connection. For grid compliance, power electronic converters are usually used. In this paper another possibility for the direct grid-connected PMSG system is proposed and studied that achieves grid compliance without using a power electronic converter. The design approach follows the conventional PMSG design procedure at the initial design stage. Rotor field windings are then added into the electromagnetic circuit in series connection to obtain variable flux capability. Analytical calculation using magnetic equivalent circuits is carried out and verified by FEM simulations. The proposed design results in improved grid compliant performance of the PMSG per copper utilization in the rotor without the need of a power converter.