Performance and optimum characteristics by finite element analysis of a coreless ironless electric generator for low wind density power generation

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ABSTRACT
Cogging is an attraction of magnetism between permanent magnets and soft ironcore lamination in a conventional electric ironcore generator. The presence of cog in the generator is seen somehow restricted the application of the generator in an application where low rotational torque is required. Cog torque requires an additional input power to overcome, hence became one of the power loss sources. With the increasing of power output, the cogging is also proportionally increased. This leads to the increasing of the supplied power of the driver motor to overcome the cog. Therefore, this research is embarked to study fundamentally about the possibility of removing ironcore lamination in an electric generator. This research deals with removal of ironcore lamination in electric generator to eliminate cog torque. A confinement technique is proposed to confine and focus magnetic flux by introducing opposing permanent magnets arrangement. There were several parameters analysed using the JMAG Designer. Transient response analysis was used in the JMAG Designer. The parameters analysed were the number of coil turns per phase, gap distance between the magnet pairs as well as the magnet grade used. These few parameters were analysed under the open circuit condition. Results showed with the increasing of gap distance, output voltage produced decreased. The increment of number of turns in the coils and higher magnet grades used, these increased the output voltage of the generator. With the help of these results, a reference point is established to get optimum design parameter for fabrication of working prototype.

KEYWORDS:
Finite element method; Laminating; Permanent magnets; Transient analysis