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Wed-Mo-Po.06-06: A study on Performance Improvement of Axial Flux Motor Through Halbach Array and Same Direction Skew

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In this paper, methods to reduce iron loss through same direction skew and halbach array by utilizing the shape freedom of 3D printing are proposed. Axial flux motors have a higher power density than radial flux motors and are advantageous in a multi-pole structure. However, in the case of an axial flux motor, it is difficult to manufacture through electrical steel sheet lamination for iron loss reduction. As a method for reducing iron loss in existing axial flux motors, manufacturing through core-loss type, armor force steel plate, and powder material rolling is mainly used. However, in the case of the armor force steel plate, there is a disadvantage in that it is difficult to manufacture, and in the case of manufacturing through rolling, high-cost mold manufacturing is essential. It is possible to overcome the disadvantages of the existing manufacturing method when manufacturing a motor by utilizing the shape freedom, which is an advantage of 3D printing technology. However, cores manufactured using 3D printing currently have high iron loss characteristics, which is a fatal disadvantage to motor output. To reduce iron loss, a combination of pole numbers and slots with a small number of poles can be selected, but a combination with a small number of poles opposes the characteristics of an axial flux motor. Through the same direction skew and Halbach array, the performance of an axial flux motor can be increased even in a combination with a small number of poles. The validity of the proposed model was reviewed through finite element analysis.

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