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### Comparative Study of Permanent Magnet Configurations of Short-Stroke Linear Motor for Reciprocating Compressor in Household Refrigerator Applications

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#### Abstract

In this paper, two novel designs of linear permanent magnet motors (LPMM) with moving magnets armature and slotted stator are proposed. The aim of the designs is to drive a linear reciprocating compressor in a household refrigerator. The designs are analyzed and compared with conventional rectangular permanent magnets (PM) array, by evaluating their configurations and static characteristics based on finite element analysis (FEA). In contrast to a conventional reciprocating compressor, a direct-drive linear compressor in which the piston is driven directly by a linear motor (LM) and resonant springs is considered a positive displacement. The analysis on performance of LPMM using the proposed designs is carried out on the open-circuit magnetic field distribution, thrust force, flux-linkage, winding inductance, back-EMF and cogging force. The extensive simulation results indicate the effectiveness of the proposed designs and their superiority of the conventional design with rectangular PMs array.

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