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## **Wed-Mo-Po3.05-07 [34]: Detent Force and Static Thrust Experimental Analysis of a 3kW Single-Phase Linear Permanent Magnet Generator for Stirling Engines**

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The single-phase linear permanent magnet generator (SPLPMG), which is applied to the free piston Stirling engine (FPSE), has a simple structure and robust topology.

When a linear drive system such as a free piston Stirling engine is applied, a linear generator does not require a mechanical energy conversion device such as a screw or a crankshaft, and thus has a small mechanical loss and a spatial advantage. Also, it does not require lubrication and has a simple maintenance mechanism because of its simple mechanical structure.

Despite these advantages, the linear generator has the disadvantage that it is very difficult to evaluate due to its reciprocating linear motion. Also, unlike rotating machines, it is not easy to evaluate the detent force of a linear generator and to evaluate the output power of a linear generator.

Therefore, in this paper, the detent force, the repulsive force and the static thrust force of the SPLPMG are analyzed by FEM. And the evaluation system of the detent force and the repulsive force

In order to test the detent force and the repulsive force of the SPLPMG, a linear evaluation system was constructed. The evaluation system consisted of a load cell, a mover position controller, an air bearing, and a bed. Based on the developed evaluation system, the detent force of the mover and the repulsive force by the spring magnet will be evaluated and compared with the analysis results.

Also, in the case of linear generators, it is difficult to evaluate the thrust force for the input power when evaluating the load.

Therefore, the load rated current will be applied while the mover is fixed, to evaluate the static thrust force. Based on the results of this analysis, the final paper will give a detailed comparison of the results of the analysis and experimental evaluation of the detent force, the repulsive force of the spring magnet, and the static thrust.

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