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Thu-Mo-Po4.06-01 [39]: Analysis of a Double-sides Stator-PM Linear Generator for Wave Energy Conversion

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Linear generators are extensively applied to direct-drive wave energy converters (DD-WECs). Low power voltage and power density can be considered the main drawbacks of DD-WECs given their low direct-drive speed. To increase the output voltage and power, and reduce the number of PMs, a double-sides stator PM linear generator is proposed and researched in this paper, based on stator flux reversal PM machine.
There are three stators in the proposed generator, inner PM stator and outer primary stators. The secondary (mover) is composed of modulated teeth. Muti-teeth design is used to increase the frequency and value of output voltage. To show the performance of the proposed generator, a parallel magnetic circuit double-sides stator PM linear generator (SPMLG2) is compared with the proposed one. The equivalent modulated tooth number, the pole pair of inner and outer primary and be designed have modulated effect. A shift between outer primaries is designed to improve the linkage of armature windings.
2D finite element method (FEM) is implemented to analyze two generators. With three-phase symmetrical resistance load, under the speed of 0.5 m/s and same excited current, the no-load performance and on-load performance of the generators are obtained and presented.
It can be seen from the results, the cogging force of the proposed generator is not more than the cogging force of another linear generator. In addition, the voltage of proposed generator has low harmonic component and higher value. The out power of the proposed generator can research 3.7kw, is higher than ones of another generator. The voltage regulation factor is lower. Therefore, by using the proposed generator, higher output voltage, higher output power and lower voltage regulation factor can be obtained, under on-load condition. All the results show the proposed have field modulated effect and well suited for wave energy conversion.

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