

論文 / 著書情報  
Article / Book Information

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Title(English)	
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Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary



(博士課程)  
Doctoral Program

## 論文要旨

THESIS SUMMARY

専攻 : Department of	電気電子工学	専攻	申請学位 (専攻分野) : Academic Degree Requested	博士 (工学)	Doctor of
学生氏名 : Student's Name	清田恭平		指導教員 (主) : Academic Advisor(main)	千葉明	
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要旨 (英文 300 語程度)

Thesis Summary (approx.300 English Words)

Permanent magnets with rare earth materials are widely used in an interior permanent magnet motor (IPMSM) in Hybrid Electric Vehicles (HEVs). The recent price variation of Rare-earth materials has become a serious concern. A Switched Reluctance motor (SRM) is one of the candidates for HEV Rare-earth free motors. In this thesis, an SRM is developed with dimensions, maximum torque operating area, and maximum efficiency that all compete with the IPMSM installed in 3rd generation HEV.

First, it is shown that the above requirements can be satisfied with a designed SRM within the maximum RMS current of the IPMSM. At the high speed, simulation results show that the output of the designed SRM is found to be greatly enhanced with respect to that of the IPMSM.

Second, a comparison of energy consumption between the SRM and the IPMSM using four standard driving schedules is carried out. In American highway driving schedule and the European driving schedule, the SRM is found to have better efficiency because its efficiency is high at the high-rotational-speed region.

Third, the same size test machine has been constructed and test results are presented over the entire speed range. It is found that a shaft output of 100 kW, which is 1.7 times of that of the IPMSM is possible at high rotational speed under the voltage and current ratings. The possible operation area in a torque and speed plane is found to be enhanced. It is also found that the design stage prediction is close to the test results except in the low rotational speed and the high torque region, and high speed and high power region.

Finally, a cylindrical outer shape rotor with offset structure is proposed and a comparison to the conventional SRM rotor is carried out to reduce the windage loss and the acoustic noise caused by the salient poles. It is found that the efficiency is improved due to the windage loss reduction. It is also found that the acoustic noise is significantly reduced in the proposed rotor design.

備考 : 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

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