CZECH TECHNICAL UNIVERSITY IN PRAGUE

Faculty of Electrical Engineering

Department of Electric Drives and Traction

Title

Subtitle

Petr Zakopal

Prague 2023

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 Introduction

P_{n} ASM

2 Design

The Permanent Magnet assisted synchronous reluctance motor (PMSynRelM) is widely used for it's significant advantages of small size, low loss, high efficiency, better performance than plain synchronous reluctance motors SynRelM and wide constant power to speed range. [1], [2]

2.1 Stator

There are many solutions on how to connect the stator winding. Research has been carried out for standard Delta or Start winding, but to increase the torque for same stator current the combined Start-Delta winding was proposed. The first research has been caried out for standard SynRelM in [3] and then extended to PMSynRelM prototypes in [4]. The main idea of the hybrid Delta-Star connection is to split the standard phase wiring into two parts. The one part is for the Delta connection, the other for Star connection. Then the coils of wiring are connnected to series.

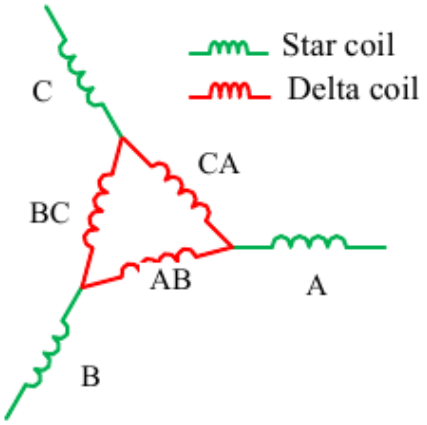

Figure 2 - 1 Hybrid Star-Delta wiring of PMSynRelM. CHANGE THIS IMAGE FOR YOUR OWN, IT IS FROM [4]

Conclusion

References

1. LI, Xinmin; SUN, Zihan; SUN, Wenbo; GUO, Liyan; WANG, Huimin. Design of Permanent Magnet-Assisted Synchronous Reluctance Motor with Low Torque Ripple. *World Electric Vehicle Journal*. 2023, roč. 14, č. 4. ISSN 2032-6653. Available from DOI: 10.3390/wevj14040082.
2. HUYNH, Thanh Anh; HSIEH, Min-Fu; SHIH, Kai-Jung; KUO, Hsiu-Fu. Design and analysis of permanent-magnet assisted synchronous reluctance motor. In: *2017 20th International Conference on Electrical Machines and Systems (ICEMS)*. 2017, pp. 1–6. Available from DOI: 10.1109/ICEMS.2017.8056462.
3. IBRAHIM, Mohamed Nabil Fathy; ABDEL-KHALIK, Ayman S.; RASHAD, Essam M.; SERGEANT, Peter. An Improved Torque Density Synchronous Reluctance Machine With a Combined Star--Delta Winding Layout. *IEEE Transactions on Energy Conversion*. 2018, roč. 33, č. 3, pp. 1015–1024. Available from DOI: 10.1109/TEC.2017.2782777.
4. IBRAHIM, Mohamed N.; SILWAL, Bishal; SERGEANT, Peter. Permanent Magnet-Assisted Synchronous Reluctance Motor Employing a Hybrid Star-Delta Winding for High Speed Applications. In: *2018 XIII International Conference on Electrical Machines (ICEM)*. 2018, pp. 379–385. Available from DOI: 10.1109/ICELMACH.2018.8506694.
5. M., Popescu. Induction Motor Modelling for Vector Control Purposes. In: *Helsinki University of Technology, Laboratory of Electromechanics* [online]. 2000 [visited on 2023-10-14]. Available from: https://avys.omu.edu.tr/storage/app/public/mustafa.aktas/110896/induction_motor_modelling.pdf.
6. LIPČÁK, Ondřej; BAUER, Jan. Doprovodný materiál k přednáškám. In: *Materiál k přednáškám a cvičení v předmětu B1M14EPT* [online]. [B.r.] [visited on 2023-02-28]. Available from: https://moodle.cvut.cz.
7. BOAZZO, Barbara; VAGATI, Alfredo; PELLEGRINO, Gianmario; ARMANDO, Eric; GUGLIELMI, Paolo. Multipolar Ferrite-Assisted Synchronous Reluctance Machines: A General Design Approach. *IEEE Transactions on Industrial Electronics*. 2015, roč. 62, č. 2, pp. 832–845. Available from DOI: 10.1109/TIE.2014.2349880.

Appendix A: List of symbols and abbreviations

A.1 List of abbreviations

ASM	Asynchronní Motor
PMSynRelM	Permanent Magnet Assisted Synchronous Reluctance Motor
SynRelM	Synchronous Reluctance Motor

A.2 List of symbols

P_n (W) jmenovitý výkon