Institut für
Antriebssysteme und
Leistungselektronik

Fachgebiet für elektrische Maschinen
und Antriebssysteme
Prof. Dr.-Ing. Bernd Ponick

Bachelor- / Masterarbeit

Betreuer: Maximilian Bieber / Siddique Akbar

Telefon: +49 (0) 511 / 762-14339

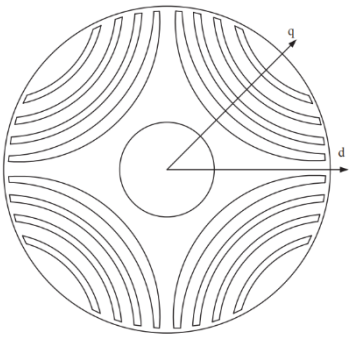
E-Mail: Maximilian.Bieber@ial.uni-hannover.de

Potential of multi-material printing in the additive manufacturing of rotors of synchronous reluctance machines

This thesis can be written in German or English.

Additive manufacturing (AM), often also known as 3D printing, is a rapidly emerging technology. The integration of AM into the production process of electrical machines offers various advantages, such as greater design freedom, better cooling possibilities and less material waste. This is due to the possibility of producing complex geometries that are difficult or impossible to realise with conventional manufacturing techniques.

A synchronous reluctance machine (RSM) generates torque through magnetic reluctance by inducing non-permanent flux barriers into the ferromagnetic rotor, which doesn't have any windings or magnets. It is a promising candidate for additive manufacturing, as it is possible to manufacture the rotor with practically no additional post-production (insertion of magnets or winding with the field winding) and this motor type offers a resource-saving alternative to PMSM or ESM. Multi-material printing of rotors of RSM could for example avoid flux leakage and thus increase the torque density.



Typical rotor geometrie of an RSM; Quelle: [1]

This research work starts with an in-depth literature review on (multi-material) additive manufacturing of RSM rotors, followed by FEM studies to demonstrate the potential of multi-material printing and efforts to realise the full potential of multi-material printing in the production of RSM rotors. Finally, an evaluation of the possibilities of multi-material printing is to be made.

Forschungsschwerpunkt:

Elektromobilität / Aviation ☐ Großmaschinen ☐ Industrieantriebe / Mechatronik ☒

Inhalt:

	viel ◣ wenig						viel ◣ wenig				
Methodenentwicklung	☐	☐	☐	☐	☒	Programmierung	☐	☒	☐	☐	☐
Maschinenentwurf	☒	☐	☐	☐	☐	HF-Effekte	☐	☐	☐	☐	☒
FE-/Systemsimulation	☐	☒	☐	☐	☐	Geräusche / Schwingungen	☐	☐	☒	☐	☐

[1]: Duck, Peter, Jonathan Jurgens, and Bernd Ponick. "Calculation of synchronous reluctance machines used as traction drives." 2015 IEEE Vehicle Power and Propulsion Conference (VPPC). IEEE, 2015.