

Masterarbeit (in English)



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Performance evaluation of a flywheel system



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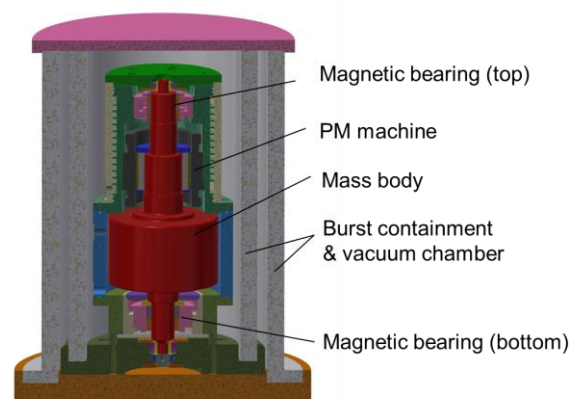
Introduction

Flywheel stores kinetic energy in a rotating mass. In the *Institute EW*, a flywheel prototype (Fig. 1) was built, consisting of a steel rotor with a mass body and a permanent magnet (PM) machine to drive the rotor (shown in Fig. 2). The rotor is suspended by magnetic bearings.

Losses and efficiency are crucial parameters for a storage device. In a flywheel, losses are produced in the machine and magnetic bearings, as well as on the surface due to air friction. They may lead to thermal problems and also reduce the system efficiency. A good loss model is necessary for the primary design and further optimization. The losses in the prototype will be measured experimentally. The aim of this thesis is to validate the loss model based on the measurements and evaluate the performance of the flywheel for given requirements.



a) Prototype



b) System scheme

Fig. 1. Flywheel system, capacity 500 Wh, maximum speed 24 000 min⁻¹

Task

The student should perform the following tasks:

1. Validate and improve the existing loss model based on the measured results.
2. Calculate the overall energy efficiency of the flywheel for given operating cycles.
3. Investigate further optimization possibilities to increase the system efficiency, e.g. optimizing machine design, varying air pressure or structure, etc.

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