

Performance Analysis of Distributed Inverter Architectures

Short Description

Global rise in mobility brings traditional modes of transport to their limits. Vacuum Transportation enables an efficient and safe way of transport. Vehicles, so-called pods, travel at high speeds on a rail through a low-pressure tube in order to minimize drag.

ETH Zurich's Hyperloop Team Swissloop participated with other university teams in Elon Musk's Hyperloop Pod Competition for three consecutive years. While so far the focus has been maximum acceleration for the competitions, Swissloop aims to shift research focus on more viable prototypes. This approach includes the development of components that achieve the required performance, but also work reliably and safe.

A novel approach for supplying high power induction drives aims to split the inverter into smaller submodules. The distributed architecture allows for more flexibility in the design of induction motors, as many parameters can be tweaked with different inverter settings, instead of manufacturing another motor. The goal of this thesis is to analyse performance metrics of a distributed inverter architecture and compare it to a conventional inverter. Simulations should consolidate the results and propose improvements for future inverter development.

The results of this thesis aim to justify the development of a distributed inverter used to drive high power induction motors. These motors could either be incorporated into pods or into the test track built by the EuroTube Foundation. This thesis is conducted at the Institute ??? in collaboration with EuroTube and Swissloop.

Type	Semester thesis / Master thesis
Partner	ETHZ, EuroTube Foundation, Swissloop
Start date	tbd
End date (planned)	tbd
Student(s)	tbd
Internal supervisors	Fabio Dubois, fabio.dubois@eurotube.org Yvan Bosshard, yvan.bosshard@swissloop.ch
External supervisors	???

Work packages

- Literature review of power inverters and performance metrics
- Proposal of a distributed architecture
- Isolation of critical parameters
- Simulation of systems and comparison of results
- Documentation and writing of report

Requirements

- High motivation and interest in the topic
- Able to work independently and be creative
- Understanding of power systems and power electronics
- Basic understanding of control theory
- Basic skills in Simulation (MATLAB/Simulink, Simplorer, etc.)

Application

Please email your CV and transcript to tbd



Planned AlphaTube Infrastructure, Collombey-Muraz, Switzerland



Swissloop Pod Claude Nicollier (2019)