ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

swissloop

euroTUBE

Design of an Ultra light-weight Gate Structure for Vacuum Transport Airlock Doors

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.

The test track AlphaTube, built by the EuroTube Foundation, figures a novel airlock valve design for enclosing and unloading vehicles into and from the main tube. In a linear test track atmospheric doors (one directional pressure gradient) figure as end caps bearing the full differential pressure (dp = 1 bar, equivalent to ~40 tons on a 2.2 m diameter!) when the tube is evacuated to the nominal pressure of 1 mbar.

This thesis shall investigate a variety of geometries for a stiffness and light-weight optimized door gate and will implement a first proof-of-concept working prototype for the gate mechanism. The developed mechanism will provide a compact and fail-safe solution for vacuum transportation applications.

Type	Master thesis
Partner	ETHZ, EuroTube Foundation, Inspire
Start date	14.09.2020
End date (planned)	08.01.2021
Student(s)	tbd
Internal supervisor	Fabio Dubois, fabio.dubois@eurotube.org
External supervisor	Markus Zogg, zogg@inspire.ethz.ch

Work packages

- Literature review of related work
- Compilation of requirements list
- Concept study for airlock door structures and the related closing mechanisms
- Design and analysis of a selected airlock door structure and the related closing mechanism
- Design and manufacturing of a (reduced scale) airlock door demonstrator component
- Testing and performance evaluation on demo test setup

Requirements

- High motivation and interest in the topic
- Able to work independently and be creative
- Methodological and goal-oriented working behavior
- Good theoretical understanding of structural mechanism and topology optimization
- First experience with FEM simulation of composite structures is beneficial
- Knowledge about vacuum transport technologies is beneficial

Application

Please email your CV and transcript to zogg@inspire.ethz.ch

Planned AlphaTube Infrastructure, by EuroTube Foundation

Swissloop Pod *Claude Nicollier* (2019)