

Research-Based Learning

Prof. Dr. Walter Neu

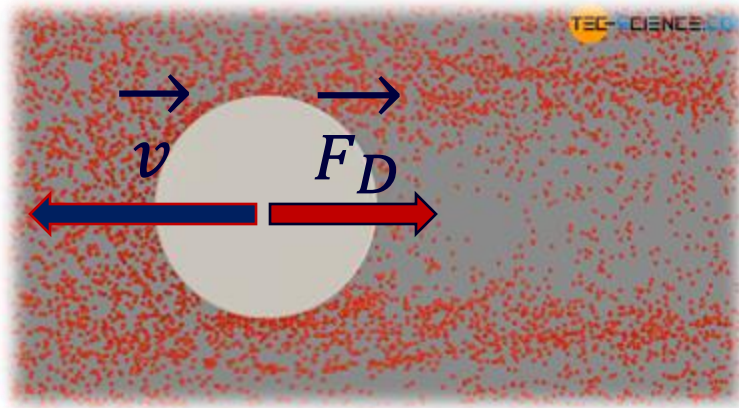
Prof. Dr.-Ing. Thomas Schüning

- How to implement research in teaching
- Students in R&D projects
- Didactic concept
- Project-oriented courses in teaching <-> LSRI

HS Emden/Leer, Institute of Hyperloop Technology, Emden

U Oldenburg, School of Mathematics and Science, Oldenburg

How to implement research in teaching



<https://www.tec-science.com/mechanics/gases-and-liquids/flow-separation-boundary-layer-separation/>

$$F_D = \frac{1}{2} \rho C_D A \cdot v^2$$

$$P_D = F_D \cdot v$$

$$= \frac{1}{2} \rho C_D A \cdot v^3$$

$v > 400 \text{ km/h} \Rightarrow E_{\text{loss}} > 83\% \text{ due to air friction}$

Hyperloop evolution



603 km/h



> 1080 km/h



Hyperloop - the answer?



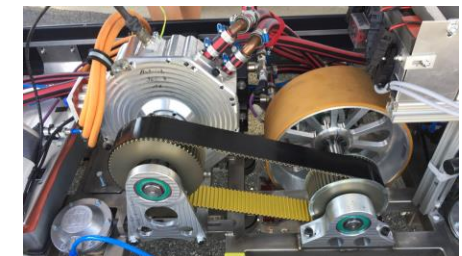
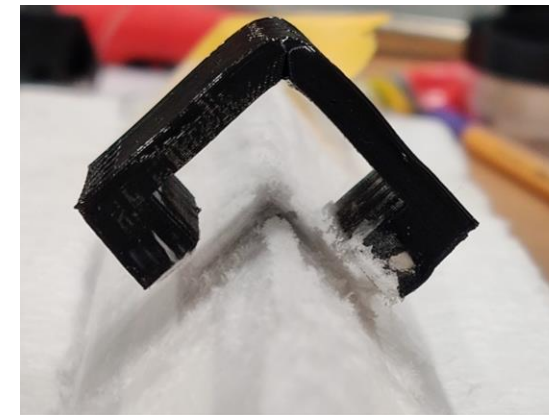
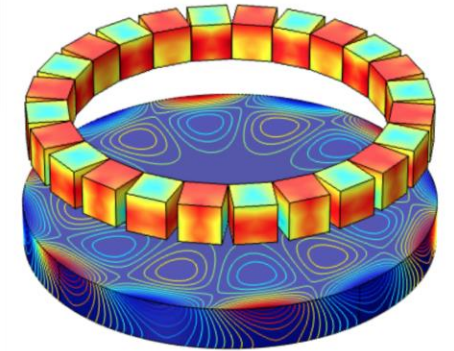
- Mobility
- Climate change
- Energy
- Socio-economics
- ...



Benefits for student projects in R&D



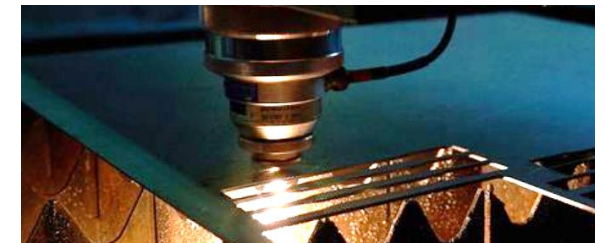
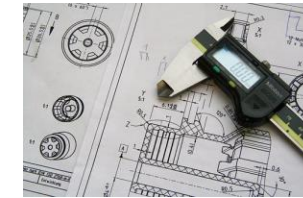
- Research support
 - Resource expansion
- Motivation for students
 - e.g. Hyperloop technology => impact on a global scale
- The competition idea fosters
 - Interdisciplinarity
 - Innovation
 - Personal maturness
 - Career prospects
 - Opportunities on the job market
 - Startup - team members found companies



Didactic concept



- Sound knowledge in
 - Engineering, Natural Sciences, Management, etc.
- Use course competitions as motivation:
 - Seminar task: "Who finds the best parameter field for max. cutting speed under given quality level"
 - Design competitions
- (Inter)national competitions
 - Solar boat race
 - Battery-powered screwdriver race
 - Hyperloop Pod Competition

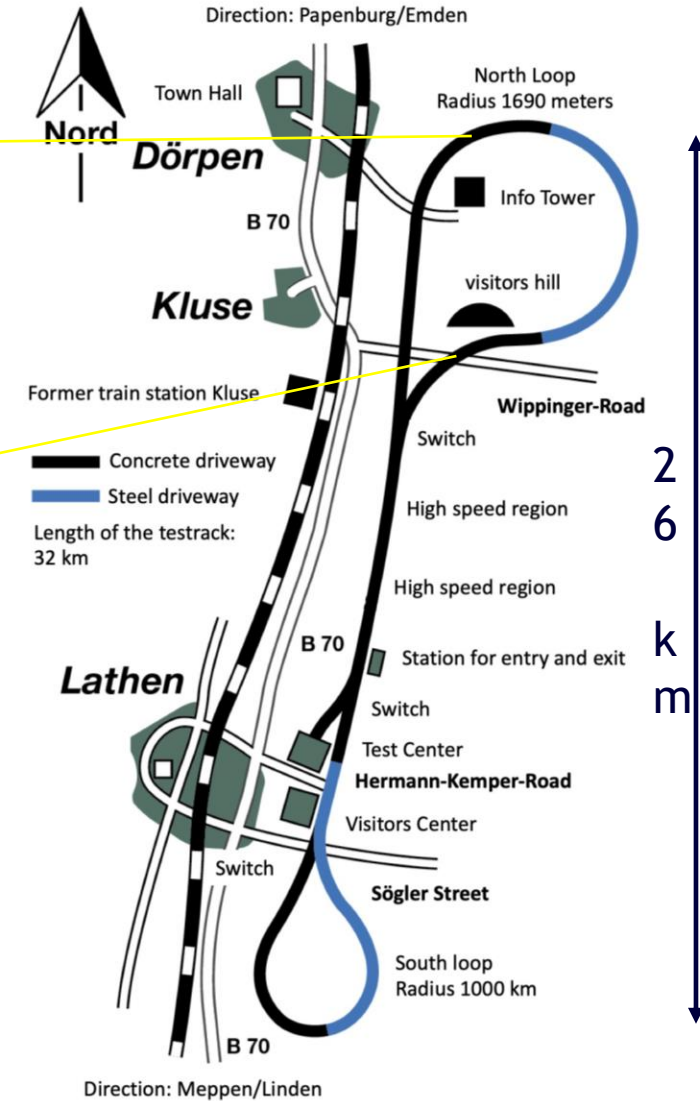


Upscaling the concept



- Suprastructure and civil engineering
- Low pressure environment
- Fluid dynamics
- Propulsion and braking
- Levitation and suspension
- Guidance and switching
- Pod motion physics
- Power generation and supply
- Air locks and transfer
- Environmental control and life support systems (ECLSS)
- Network communication and control systems
- Safety and emergency management
- ...

Lathen - the cradle of EU Hyperloop



Integration of R&D Centres in Teaching



- Curricular Integration of large-scale research centers into teaching
 - MagLev test track (Lathen) is a seminar
- Lectures, practicals, and competition
 - Expansion of laboratory capacities
- International cooperation (satellites)
 - Involvement of European industry
 - Networking
 - Innovation
- Development of young talent ??
 - Academic staff recruitment



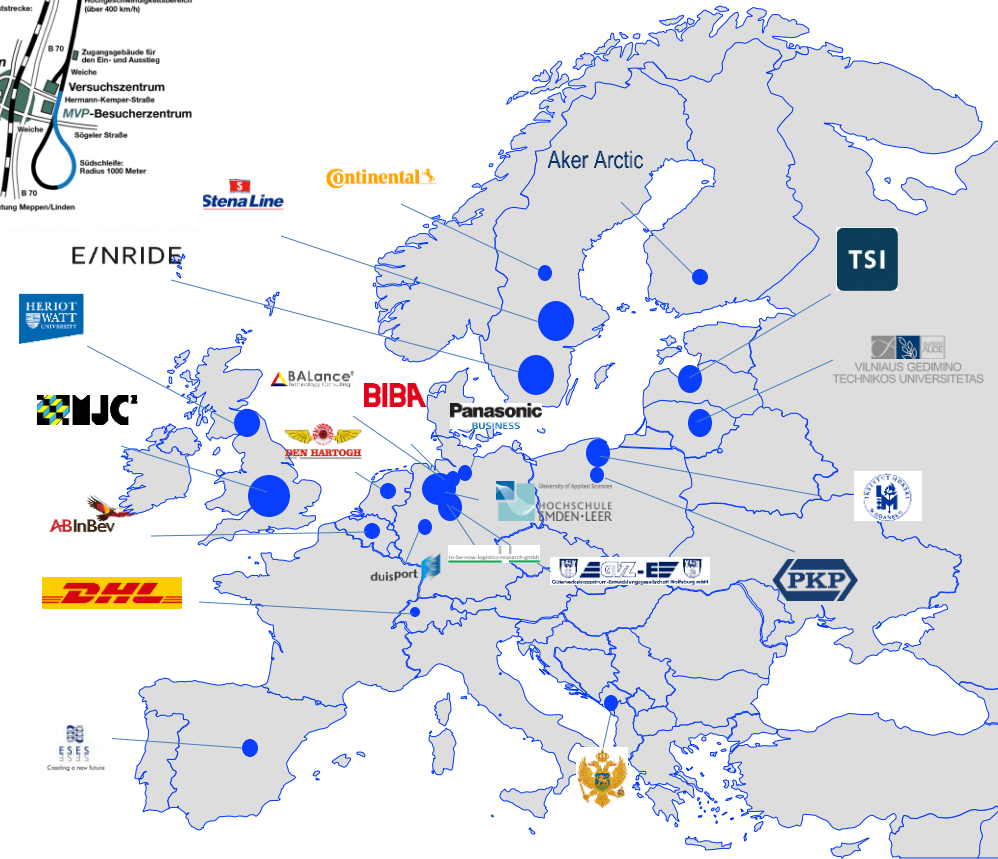
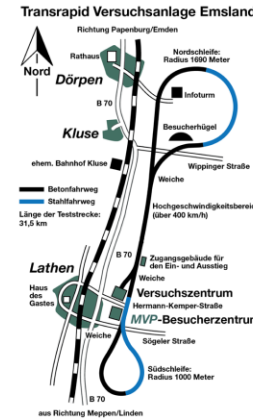
Seminar on Vacuum Transport
swissloop.ch/research

- Join us for discussions and input talks by experts
- Take off with your thesis in the field of Vacuum Transport

Every second Monday, starting on April 12th 18:00 - 19:00 [online](#)
[Zoom-Link to Seminar](#)

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ePcenter - EU research project



“ePcenter explores opportunities provided by AI, digitalisation, automation and innovations in freight transport and handling technologies, creating powerful solutions to enable transparent, efficient and greener supply chains.”

Be part of an innovative model in teaching, research, and development

Welcoming students,
colleagues, and project
participation

Contact

- Prof. Dr. W. Neu
- Prof. Dr.-Ing. T. Schüning

www.iht-emden.de