



UNIVERSITY OF PADERBORN

■ Competence Center for Sustainable Energy Technologies (KET)





E. Y. Kenig



Kompetenzzentrum für nachhaltige Energietechnik

Why Energy Technologies?




Critical topics for today and the future

-  Energy generation
-  Sustainable energy supply and its rational use
-  Ecological aspects
-  Urgent need in scientifically proven engineering know-how



 High time to act!

KET main targets

-  Acquiring a strong national position in the area of energy technology
-  Evolving to the central contact point for the OWL industry with respect to energy-related problems
-  Extending the curriculum via implementation of the relevant research results



Partners

Interdisciplinary research



**Chair of Fluid
Process Engineering (FVT)**
Prof. Kenig
Faculty of Mechanical Engineering

**Chair of Thermodynamics
and Energy Technology (ThEt)** **ThEt**
Prof. Vrabec
Faculty of Mechanical Engineering






**Department of
Power Electronics and
Electrical Drives (LEA)**
Prof. Böcker
Faculty of Electrical Engineering,
Computer Science and Mathematics

**Department of Electrical
Energy Technology (EET)**
Prof. Krauter
Faculty of Electrical Engineering,
Computer Science and Mathematics



Further collaboration in the future

-  Other groups within the University
-  Heinz Nixdorf Institute
-  Center for Optoelectronics and Photonics of Paderborn (CeOPP)

Main expertise areas: EET (Prof. Krauter)

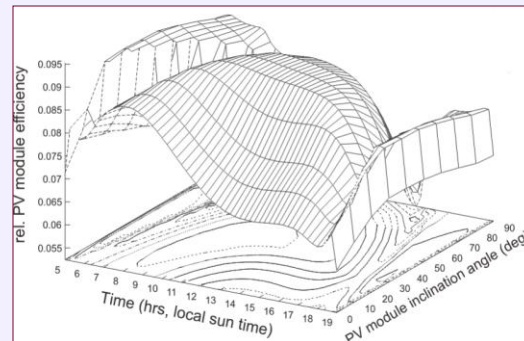
Renewable energies (wind power, PV, geothermal) and their integration in existing electrical grids

Offshore wind measurements und evaluation

Design assessment for Type Certification for PV power plants and components

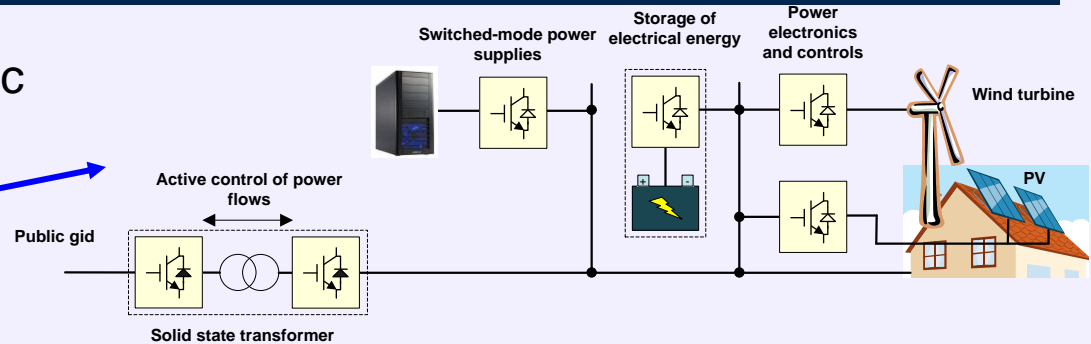


Met-ocean stations for evaluation for offshore wind energy purposes

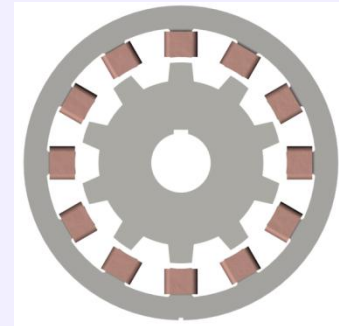
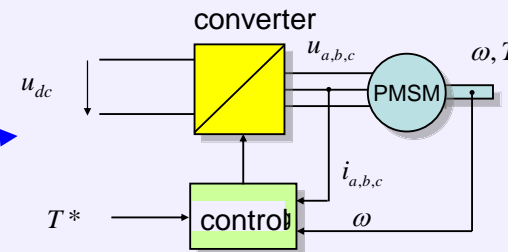


Main expertise areas: LEA (Prof. Böcker)

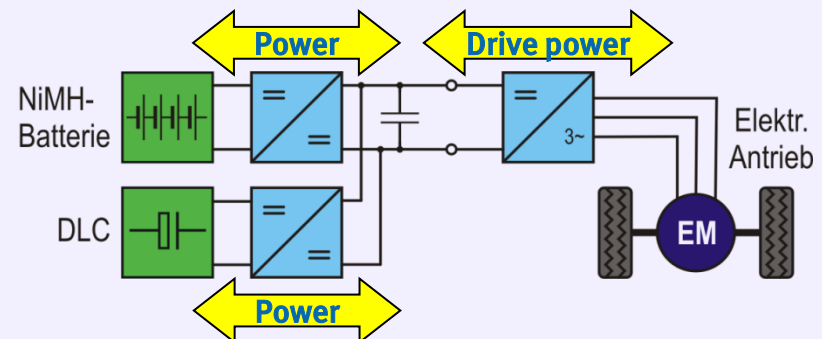
- Efficient conversion of electric energy for renewables, smart grids etc., $\eta > 95\%$



- Energy-optimal control of electrical drives for hybrid and electrical vehicles



- Energy management for hybrid and electric vehicles, electrical energy storages and hybrid storage

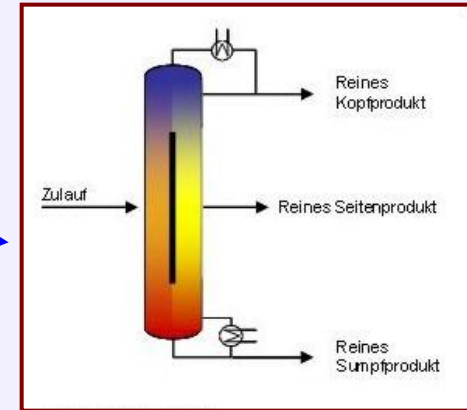


Main expertise areas: FVT (Prof. Kenig)

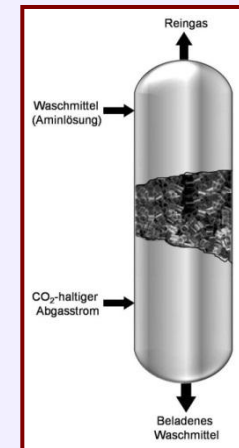
Optimisation of equipment and processes with high energy demand

Efficient solvents for gas purification and CO₂-capturing

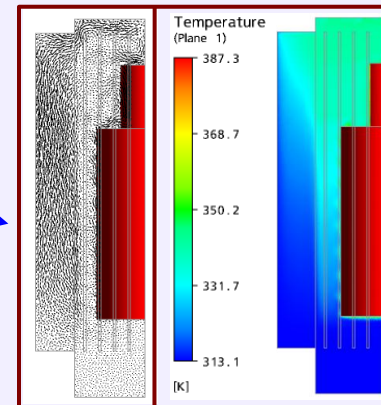
Fluid dynamic modelling and simulation – basic phenomena and practical tasks (separation units, heat exchangers, electronics, etc.)



Dividing wall column

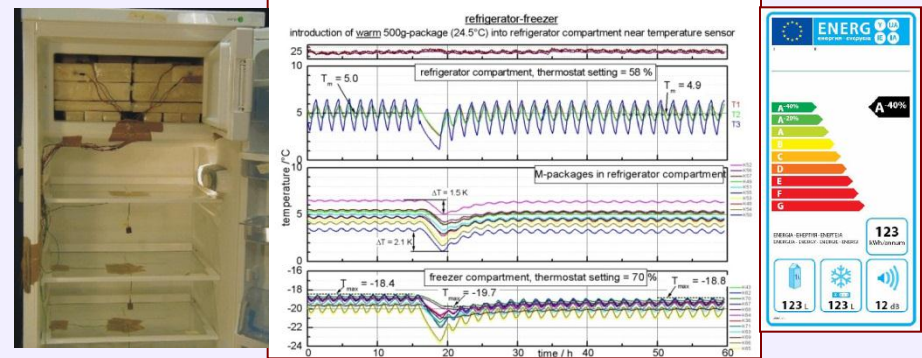


Absorption column

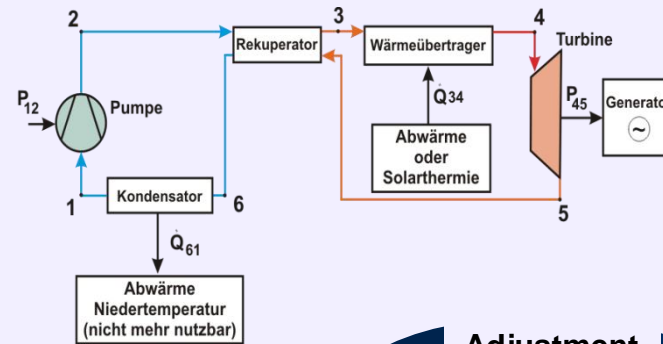


Main expertise areas: ThEt (Prof. Vrabec)

- Laboratory for household refrigerators and freezers for optimisation and certifying of energy consumption



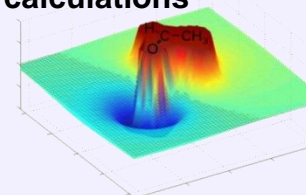
- Organic Rankine Cycle (ORC) co-generation process for waste heat conversion into electrical power



- Thermodynamic properties of fluids for applications in energy technology and chemical engineering

- Experimental
- Molecular Simulation

Quantum-mechanical *ab initio* calculations



$$H\Psi = E\Psi$$

Adjustment

- Geometry
- Electrostatics
- Dispersion

Molecular Model



Examples of recent relevant projects

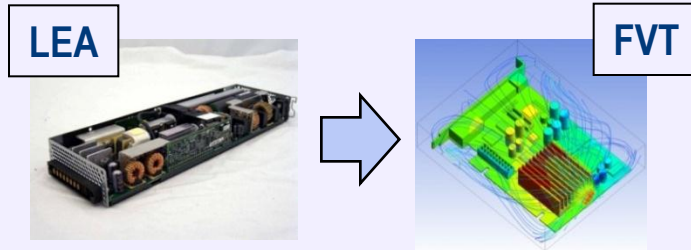
- Bilateral project (EET-ThEt) Enhancement of household refrigerators and freezers - LATENT
- Optimisation of pillow-plate condensers - InnovA²
- Decarbonised total site integration - INTHEAT
- Flexible, fast and future factory - F³-Factory
- Intelligent plastic heat exchangers
- Photovoltaic inverter
- Frequency variable conversion of large electric power - EDAFU
- Drive with integrated magnetic levitation - RAMIA
- High voltage test system - HVTS
- Electric vehicle drives
- High-efficient switched-mode power supplies
- Off-shore wind measurements with evaluation in Nord Sea and Baltic Sea

Sources:

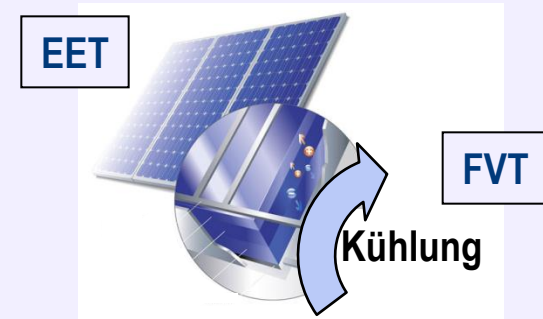
- EU
- Governmental programmes
- Direct industrial funding
- Foundations
- Others

Some promising links

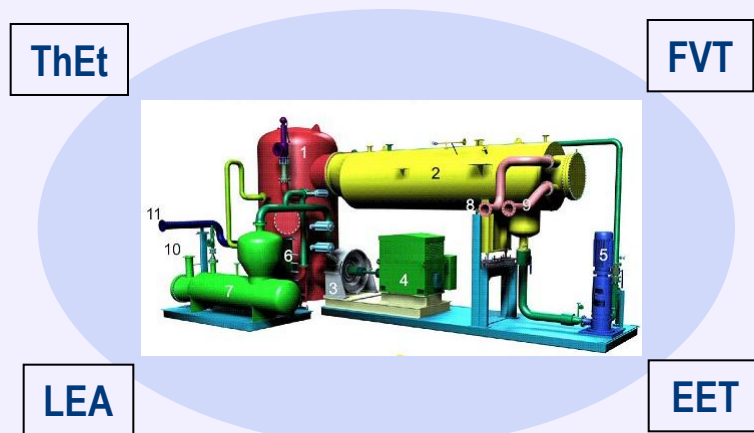
Optimisation of electricity suppliers
and efficient cooling



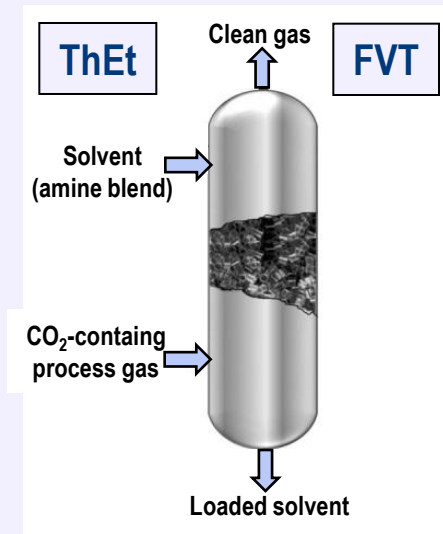
Renewable energy (e.g. PV)



Co-generation (e.g. ORC)



Efficient CO₂-Capturing



Collaboration with the OWL industry

