

Name	Short Name	Country
HyCentA Research GmbH	HyCentA	Austria
		
Description		
<p>The HyCentA Research GmbH is the only extra-university research institution in Austria exclusively concerned with hydrogen technologies. Since its foundation in the year 2005, HyCentA is performing research and development projects in an international network with industry and academia regarding production, distribution, storage and application of hydrogen. HyCentA's fields of expertise include engineering, simulation, testing and education of hydrogen technologies like electrolysis, hydrogen storage, fuel cells, refuelling, measuring and safety systems. Moreover, HyCentA is supporting educational issues in cooperation with Graz University of Technology by supervision of academic theses (Bachelor, Master and PhD) and by offering hydrogen-related lectures. The list of scientific publications and the received awards underline HyCentA's expertise.</p>		
<p>The HyCentA team consists of approximately 35 experts comprising mechanical, chemistry, physical, electrical and industrial engineers. More than 15 years of experience and the technological expertise guarantee the necessary know-how to cope with inter- and multidisciplinary challenges of hydrogen technologies. This includes approval, certification and safety issues of electrochemical and hydrogen systems. Moreover, HyCentA has designed several innovative hydrogen facilities (wind2hydrogen, ELOG BioFleet I+II, HIFAI-RSA), which form a profound knowledge basis.</p>		
<p>HyCentA is operating a modern research infrastructure with highly qualified staff at the facilities of Graz University of Technology. The research infrastructure consists of a high-pressure test stand up to 1000 bar, a hydrogen refuelling infrastructure for cars, trucks and busses, two flexible test cells with modern measurement techniques, and the fuel cell system test bench HIFAI-RSA. The HIFAI-RSA enables comprehensive investigations of fuel cell systems up to 160 kW in a virtual environment simulating dynamic operation and real ambient conditions.</p>		
Activities		
<p>Research & Development</p> <ul style="list-style-type: none"> • Electrolysis, Hydrogen Production and Infrastructures • Hydrogen Storage and Distribution Systems • Fuel Cells – Mobility and Stationary Power Systems • Measurement Techniques and Test Systems 		



Simulation

- Hydrogen facility simulation model – HYDROLYSE
- CAD Design and FEM Simulation
- Multi-Phase Flow Simulation
- Real Time Fuel Cell System Simulation and Control Design
- Vehicle Simulation and HiL
- DOE and Automated Calibration

Testing

- Highly Dynamic Fuel Cell System Test Bench up to 160 kW
- High Pressure Test Stand up to 1000 bar
- H₂-Refuelling for 350 and 700 bar with cold fill
- Test cells for component and subsystem testing
- Hydrogen Quality Laboratory

Teaching

- Lectures at Graz University of Technology
- Mentoring of Bachelor, Master and PhD Theses
- Book 4th Edition 2018
- Conferences, Networking and Consulting

Relevant publications, products to the project

- ✓ Sartory, M.; Justl, M.; Salman, P. et al., Modular Concept of a Cost-Effective and Efficient On-Site Hydrogen Production Solution. SAE Technical Paper 2017-01-1287, 2017, doi:10.4271/2017-01-1287
- ✓ Sartory, M.; Wallnöfer-Ogris, E.; Salman, P.; Fellingner, T.; Justl, M.; Trattner, A.; Kell, M.: Theoretical and experimental analysis of an asymmetric high pressure PEM water electrolyser up to 155 bar. International Journal of Hydrogen Energy (2017) Volume 42, S. 30493-30508. Doi: 10.1016/j.ijhydene.2017.10.112
- ✓ Klell, M.; Eichlseder, H.; Trattner, A.: Wasserstoff in der Fahrzeugtechnik. Erzeugung, Speicherung, Anwendung. ATZ/MTZ-Fachbuch. Wiesbaden: Springer Vieweg 2018
- ✓ Brandstätter, S.; Striednig, M.; Aldrian, D.; Trattner, A.; Klell M.; Dehne T.; Kügele C.; Paulweber M.: Highly Integrated Fuel Cell Analysis Infrastructure for Advanced Research Topics. SAE International, Technical Paper, DOI: 10.4271/2017-01-1180 Event: WCX™ 17: SAE World Congress Experience
- ✓ Trattner A.: Highly Integrated Fuel Cell Analysis Infrastructure for Advanced Research Topics. WCX™ 17: SAE World Congress Experience, April 4 - 6, 2017, Detroit, MI, USA

Previous & Current Projects

- ✓ E-LOG-Bio-Fleet: Eco Logistics Bio Hydrogen Powered Fleet of Fuel Cell Range Extender Industrial Trucks (FFG Project Nr.: 825854)
The development and integration of fuel cells with compressed hydrogen tanks as a range extender presented a technology leap in the improvement of electric industrial trucks. For the supply with hydrogen from biomethane, an innovative indoor refuelling solution was developed.
- ✓ E-LOG-Bio-Fleet II: Eco Logistics Bio Hydrogen Powered Fleet of Fuel Cell Range Extender Industrial Trucks (FFG Project Nr.: 845091)
The operation of the range extender industrial trucks with onsite hydrogen infrastructure and indoor dispenser as developed and demonstrated in the project E-LOG BioFleet will be continued. During an extended demonstration phase of two years, knowledge about usability, user acceptance, user behaviour as

well as service and maintenance efforts under real-life operating conditions and at advanced system lifetimes will be gained. Based on the findings the innovative technology will be optimized to facilitate commercialization and offer the opportunity for a rapid market entry.

- ✓ **HySnow: Decarbonisation of Winter Tourism by Hydrogen Powered Fuel Cell Snowmobiles (FFG Project Nr.: 859395)**
Development of an entire H₂-infrastructure. A photoelectric plant yields green electricity for a high-tech high-pressure electrolyser producing green hydrogen at 350 bar. The on-site hydrogen production is connected to a hydrogen dispenser unit. Two prototype snowmobiles will be developed including the adaption of a fuel cell system for the low temperature and high-performance targets and the integration of the powertrain into the vehicle.
- ✓ **wind2hydrogen: Conversion of renewable electricity into hydrogen; Storage and transport in the natural gas network (FFG Project Nr.: 843920)**
Development and construction of a power-to-gas plant in Austria (new modular 100 kW high-pressure PEM electrolyser that produces hydrogen from renewable (wind) electricity; storage and transport of hydrogen in bottles or feeding into the natural gas network without additional mechanical compaction). Hydrogen was produced directly by 160 bar without mechanical compression. The pilot plant was operated by HyCentA
- ✓ **FCH REFuel: Experimental development of a modular low-cost H₂ infrastructure with high pressure electrolysis for 350 and 700 bar and fuel cell range extender vehicle (FFG Project Nr.: 850363)**
Experimental development of a modular low-cost H₂-refilling station with electrolyser for 350 and 700 bar and a fuel cell range extended vehicle. A modular scalable and cost-effective hydrogen supply infrastructure for industrial, automotive and mobile applications is developed. Different customer applications are considered. Therefore, standardized modules like high pressure 350 bar electrolyser module, 700 bar single stage compressor module, a storage and dispenser module for both pressure levels are developed, implemented and operated under real life conditions.




Relevant Infrastructure

HyCentA operates a modern research infrastructure with highly qualified staff at the facilities of Graz University of Technology



The research infrastructure consists of the high-pressure test stand up to 1000 bar. Hydrogen components and systems as well as electrolyser systems can be tested.



<p>An additional container for operation and testing electrolysis modules is part of the infrastructure. The prototype of a power-to-gas plant has been successfully constructed and operated.</p>	
<p>The infrastructure includes a station for the refuelling of passenger cars at 700 bar and busses and trucks at 350 bar with cold-fill. The free programmable dispenser also allows refuelling according to specific customer requests.</p>	
<p>The HIFAI-RSA (highly integrated fuel cell analysis infrastructure – Research Studios Austria) allows comprehensive investigations of fuel cell systems up to 160 kW in a virtual environment simulating dynamic operation and real ambient conditions. The test cell can be temperature conditioned between – 40 °C and + 85 °C and operated fully automatic.</p>	
<p>The test stands of HyCentA are equipped with a supply for nitrogen, helium, liquid and gaseous hydrogen (up to 1000 bar), modern measurement techniques and sensor technology (infrared camera for insulation assessment).</p>	