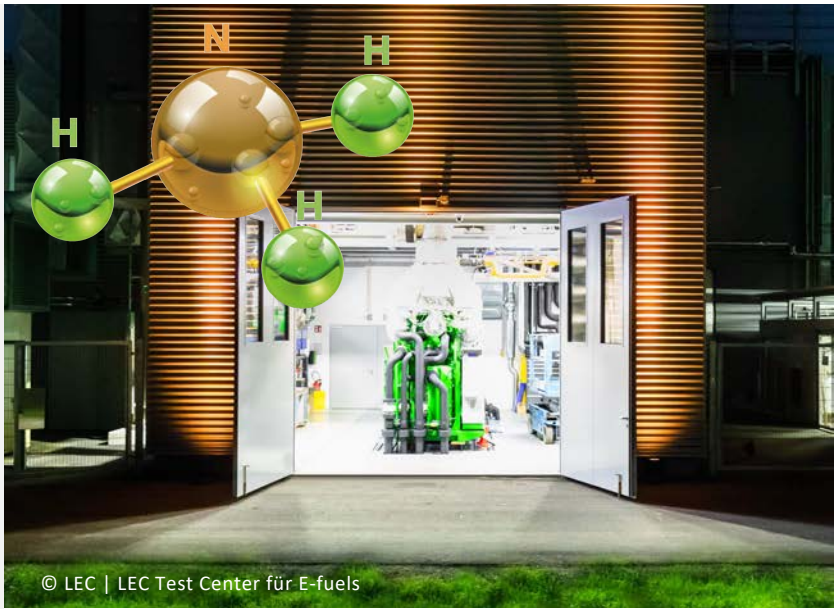
SUCCESS STORY

LEC EvoLET
LEC Evolutionary Large Engines Technology for Sustainable Energy and Transport Systems

Program: COMET – Competence Centers for Excellent Technologies

Program line: COMET-Center (K1)

Project type: strategic
Project duration: 2021-2022



© LEC | LEC Test Center für E-fuels

EUROPE'S FIRST AMMONIA INFRASTRUCTURE FOR ENGINE TEST BENCHES AT THE LEC IN GRAZ.

IN ORDER TO EXPLORE THE USE OF E-FUELS IN SUSTAINABLE ENERGY AND TRANSPORT SYSTEMS, THE LEC HAS ESTABLISHED A NEW INFRASTRUCTURE FOR THE OPERATION OF TEST BENCHES WITH AMMONIA. INITIAL PROJECT RESULTS CONFIRM THE LARGE POTENTIAL OF THIS ENERGY CARRIER.

Green ammonia is seen as a key building block for the decarbonization of the energy sector, shipping and industry, and will become increasingly important in the future as an energy carrier for the transport and seasonal storage of renewable energy. The moderate pressure and temperature conditions for ammonia liquefaction can significantly reduce costs compared to alternatives such as direct hydrogen storage. Since the transport of ammonia is well established, it is reasonable to store hydrogen in the form of ammonia for long transport distances and to split it off again at the point of use. Direct use of green ammonia as a fuel is also convenient, especially in shipping and the energy industry.

The Large Engines Competence Center (LEC) specializes in the development of sustainable large engine solutions and can draw on decades of experience in optimizing combustion concepts for a wide range of gaseous and liquid fuels.

In 2021 and 2022, the test facilities for operation with ammonia were added, another important milestone in the expansion of the LEC's globally unique test

Federal Ministry
Republic of Austria
Climate Action, Environment, Energy, Mobility, Innovation and Technology

Federal Ministry
Republic of Austria
Labour and Economy

Version 01/2020

bench infrastructure. The ammonia supply for the engine test benches is provided by a mobile container in which up to 2000 kg of ammonia can be stored. In order to be able to investigate a wide variety of combustion concepts, both a low-pressure system and a high-pressure system are available for ammonia admission into the engine. The sophisticated design of the exhaust gas aftertreatment systems ensures that local pollutant emissions can be avoided.

The physical and chemical properties of ammonia, in particular the high ignition temperature and the narrow explosion limits, increase the safety of transport and storage, but pose a challenge for the efficient conversion in the engine. A major focus of ammonia combustion research is therefore on ignition concepts, using both diesel pilot injection and spark ignition approaches. For reliable ignition and to accelerate the combustion partial reforming of ammonia and subsequent conversion of a mixture of ammonia and hydrogen in the engine can also be employed.

At the LEC different concepts for use of ammonia in large engines have already been successfully tested in several research projects. One example of this is the CAMPFIRE project, which is part of a lead project funded by the German government. Together with project partners the LEC develops an ammonia combustion system for a 1 MW CHP application. The main focus is on power density, optimization of efficiency and minimization of pollutant emissions. The demonstration of the complete system will take place in the CAMPFIRE Open Innovation Lab in Poppendorf (DE).

Figure 1: Ammonia storage in a mobile container

The goal of the LEC is to contribute with its research to the achievement of the global climate targets. The expansion of the testing capabilities is the foundation for the COMET K1-Program LEC GETS - Green Energy and Transportation Systems (Duration 2023 to 2030), which focuses on the research of the renewable fuels ammonia, hydrogen and methanol.

Project coordination
Ao.Univ.-Prof. Dr. Andreas Wimmer
CEO and Scientific Director
LEC GmbH

T +43 (0) 316 873 30100
andreas.wimmer@lec.tugraz.at

K1 COMET Zentrum LEC EvoLET
LEC GmbH
Inffeldgasse 19
8010 Graz
T +43 (0) 316 873 30101
office@lec.tugraz.at
www.LEC.at

This success story was provided by the centre´s management for the purpose of being published on the FFG website. LEC EvoLET is a COMET Centre within the COMET – Competence Centers for Excellent Technologies Programme and funded by BMK, BMAW, and the provinces of Styria, Tirol and Vienna. The COMET Programme is managed by FFG. Further information on COMET: www.ffg.at/comet