

Industrie Service

**Choose certainty.
Add value.**

Hydrogen and fuel cells in aviation

A Product Information Sheet by Hydrogen Task Group

Roughly 120 years after the invention of the fuel cell, it was space travel that paved the way for the utilisation of this form of technology. Functionality and reliability were considerably more important than the relatively high costs for fuel cells. By increase of experience and decrease of costs fuel cells became more and more interesting for other applications.



The current trend towards energy efficient planes is driving the further development of on-board components and systems. Especially known for their energy efficiency fuel cells and hydrogen technology will be one of the main key technologies to achieve this goal.

TÜV SÜD engineers have long-standing experience in process engineering and offer their special skills and know-how in fuel cell technology, hydrogen technology, explosion protection, electronics, risk management, safety and reliability.

TÜV SÜD experts advise manufacturers and authorities on the approval of aircrafts, their systems and components. They provide customised support to:

- **Aircraft manufacturers**
- **Suppliers**
- **Airlines**
- **Airport operating companies**
- **Research facilities and authorities**



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Consulting and Engineering

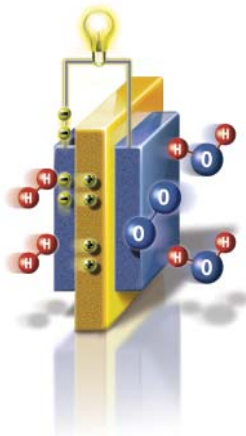
- Determining approval, quality and design requirements for components and systems
- Consulting on safety-related component and overall-system design
- Preparing risk and reliability analyses (e.g. FMEA, HAZOP, PAAG)
- Employing measuring technology to assess component behavior
- Component and system calculations and analyses, e.g., with respect to
 - strength
 - fracture mechanics
 - Finite Element Method (FEM)
 - Computational Fluid Dynamics (CFD)
 - pipe stress analyses
- Analysing and/or validating available data
- Project management
 - process scheduling
 - supplier evaluation
- Assisting in approval procedures
- Consulting to establish hydrogen infrastructure

Testing and Certification

- Testing the safety design of systems and components
- Determining component qualification (pressure equipment, instrumentation and control equipment) in line with national and international standards
- Reviewing safety analyses
- Testing on in-house test rigs for
 - hydrogen engines
 - fuel cells
 - pressure vessels and components
- Testing in our in-house accredited laboratories
 - materials tests
 - pressure and leak tests
 - lifecycle and durability tests
- Individual component tests
- Component type approval
- Certifying sub- and total systems
- Preparing accepted expert opinions on behalf of the German Federal Aviation Office (Luftfahrtbundesamt)

Training

- Holding customised employee training on design and development, operation and servicing of fuel-cell and hydrogen applications



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