



EMCEL GmbH

Company Presentation

» Current challenges and their solution: Fuel Cells

- › Growing energy costs cut your margin
- › Customers and consumers expect increasingly "green" suppliers
- › Stability of energy supply will decrease with wind/solar power expansion
- › Volatility of electricity prices will strongly increase
- › More stringent emission regulations will come

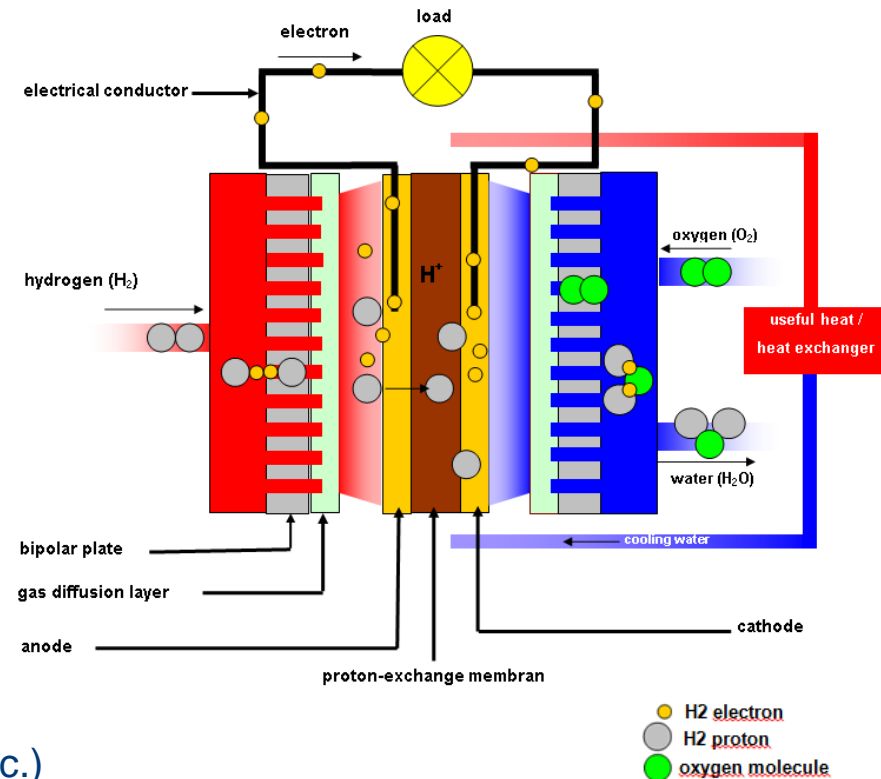
Conclusion

**A controllable, efficient, low-emission
and distributed way of power
generation is required**



» Fuel Cells Technology

- › **Electricity generation**
zero emission, low-noise and low-maintenance
- › **Reaction of hydrogen and air**
 $H_2 + O_2 \rightarrow H_2O + \text{Electricity} + \text{Heat}$
- › **Fuel cell system**
Converts many fuels to electricity, heat, and water
- › **Fuel**
typically hydrogen or natural gas, but also other flammable gases (process gas, sewage gas, blast furnace gas etc.)



» Fuel Cells

Fields of application and advantages delivered



electricity generation



heat and cooling supply



energy recovery from byproducts and waste products



cost reduction (→ funding options)



production of inert gases



Wide power range: 1W ... 1MW

»» EMCEL GmbH

The Company

- › Engineering service provider
- › Based in Cologne
- › Established in 2009
- › Main areas of business are corporate engineering services in the fields of fuel cells, hydrogen technology and electric mobility.

The EMCEL team consists of experienced engineers from process engineering, mechanical engineering, electrical engineering and business administration.

Team members at EMCEL have felt at home



in the world of fuel cells for many years and were already working passionately on the change to renewable energy before the company was established.

» EMCEL GmbH

Our Guiding Principle

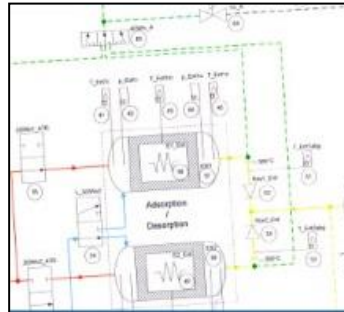
"We believe fuel cell technology to be applicable in many sectors, finding implementation wherever electric energy and new ideas are in demand."

This is why we deliver a broad range of services in:

Consulting



Engineering



Project Management



Service/Maintenance



» Services

Consulting

In addition to systems and application consulting – ranging from benchmarking to product development – we also provide consulting on regulations, codes and standards (RCS) as well as safety.

Our customers value our extensive know-how in hydrogen and high-voltage safety, as well as the support for legislation-compliant development and safety analysis (FMEA, CE certification).

References



Consulting in the field of Heating-Ventilation-Air-Conditioning for electric vehicles

Customer: Automotive group



Safety consulting for the use of hydrogen in an urban transportation application

Customer: Public owned undertaking



Consulting and tracking of codes, standards and regulations for fuel cell vehicles

Customer: OEM

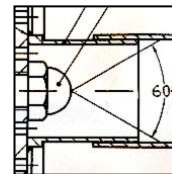
» Services

Engineering

This is where the cornerstone is laid for marketable products. During product development, we will utilize and apply our industry knowledge to providing support in the design and optimization of components and systems, and to carry out market research.

We deliver tailored software and hardware solutions for data and fault analysis for electric mobility applications.

References



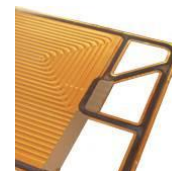
Design of humidifier modules to be applied in test benches for fuel cell system testing

Customer: Automation engineering



Design and development of hard- and software for embedded systems in a mobile application

Customer: Engineering company



Market analysis and selection of hydrogen sensor technology for fuel cell test bench development

Customer: Systems integrator

» Services

Project Management

With a focus on fuel cells, hydrogen and electric mobility, we plan, manage and monitor your projects. We function as a point of contact for your customers and partners, either under your name or as an external partner. We support you in your projects and handle all or part of the workload for you, so that you can focus on your core business.

References



Project management of re-design of the laminating process of a production line for solar modules

Customer: PV module manufacturer



Management and coordination of system interfaces for stand-alone fuel cell energy systems

Customer: Systems integrator

» Services

Service und Maintenance

Experience our service concept tailored specifically to the requirements of fuel cells and electric mobility – whether it is high-voltage, hydrogen, customer insights or special technical possibilities.

You select the service that is ideal for your needs. You determine the exact scope of service by selecting the required service levels and modules.

References



Servicing and maintenance of the electrical drive train of fuel cell buses in the day-to-day use

Customer: Bus manufacturer



Training of users and technical personnel of fuel cell vehicles taking into account their foreknowledge

Customer: Bus manufacturer



Servicing, maintenance, data and fault analysis of fuel cell buses in several European cities

Customer: Fuel cell manufacturer

» Services – Regulations, Codes and Standards

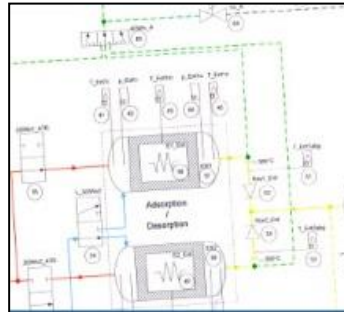
Services offered

In addition to systems and application consulting – ranging from benchmarking to product development – we also provide consulting on regulations, codes and standards (RCS) as well as safety. Our customers value our extensive know-how in hydrogen and high-voltage safety, as well as the support for legislation-compliant development and safety analysis (FMEA, CE certification).

Consulting



Engineering



Project Management



Service/Maintenance



» Consulting – Regulations, Codes and Standards

Description of services offered

In addition to systems and application consulting – ranging from benchmarking to product development – we also provide consulting on regulations, codes and standards (RCS) as well as safety

We do have extensive knowledge about common regulations, codes and standards (RCS) on both national (Europe, USA, Japan etc.) and international (ISO, IEC, UNECE usw.) levels, including but not limited to fuel cell, hydrogen storage and electromobility related RCS.

We would be happy to assist you in development and approval of your products taking into consideration applicable compliance requirements. Another service we offer our customers is the elaboration of feasibility studies, conceptual design and safety analysis in our wide field of competency.

» Consulting – Regulations, Codes and Standards

Our approach

- › Identification and determination of target market segments
- › Identification of the regulations and standards relevant to your product
- › Categorization and prioritization of the applicable regulations
- › Guidance development to your needs
- › Preparation of easy-to-use check-lists and summaries
- › Check and track of compliance with the resulting guidance

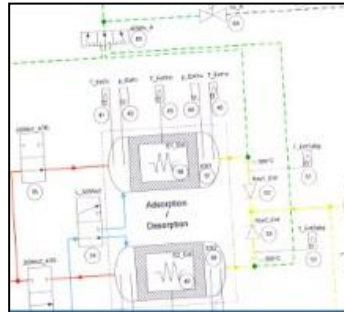
» Engineering Services offered

This is where the cornerstone is laid for marketable products. During product development, we will utilize and apply our industry knowledge to provide support in the design and optimization of our customers' components and systems.

Consulting



Engineering



Project Management



Service/Maintenance



» Engineering

Description of services offered

The development of products in the field of fuel cell technology requires multi-faceted experience. Electrical requirements, chemical / process technology requirements and demands arising from the application (e.g.. environmental impacts, vibrations, operator's failure or misuse) must be considered and incorporated into the development.

In order to still bring quality products onto the market at reasonable expenditure, the broadly positioned team of EMCEL GmbH will happily support or undertake the development process.

EMCEL GmbH has extensive experience in the areas of system design, remote or stand-alone energy systems, software and hardware for embedded systems and process technology for fuel cell systems.

» Engineering

Tasks and core competencies

We will happily perform: :

- › **fuel cell system simulation**
 - stand-alone systems (solar-, wind power, fluctuating loads)
 - hybrid systems (batterie storage, EV, grid integration)

- › **component development**
 - process technology in fuel cell systems
 - control units and circuit boards, software development

- › **experiments: validation and optimization**
 - consultation, planning, execution and analysis based on Design of experiments (statistic-based planning and analysis)
 - evaluation, optimization, consultation

- › **market research, benchmarking**

» Service and Maintenance

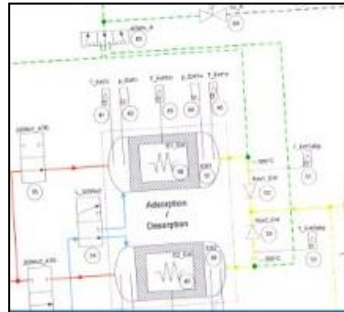
Service Concept 411

Our service range is specifically tailored to the requirements of fuel cells and electric mobility – whether it is high-voltage, hydrogen, customer insights or special technical challenges and possibilities. With our Service Concept 411 you choose the service that is ideal for your demand. You determine the exact service by your choice of service levels and modules.

Consulting



Engineering



Project Management



Service/Maintenance



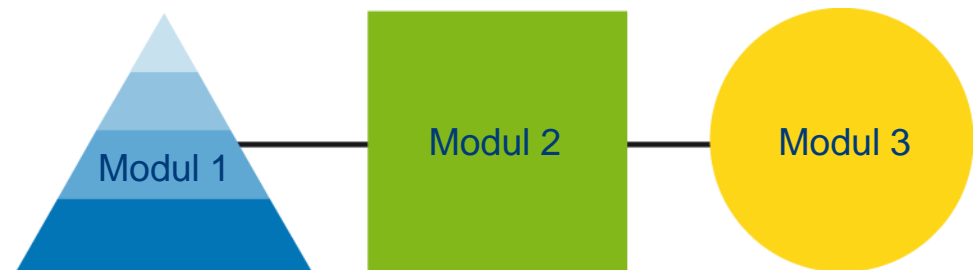
» Service Concept 411

Our Range of Services



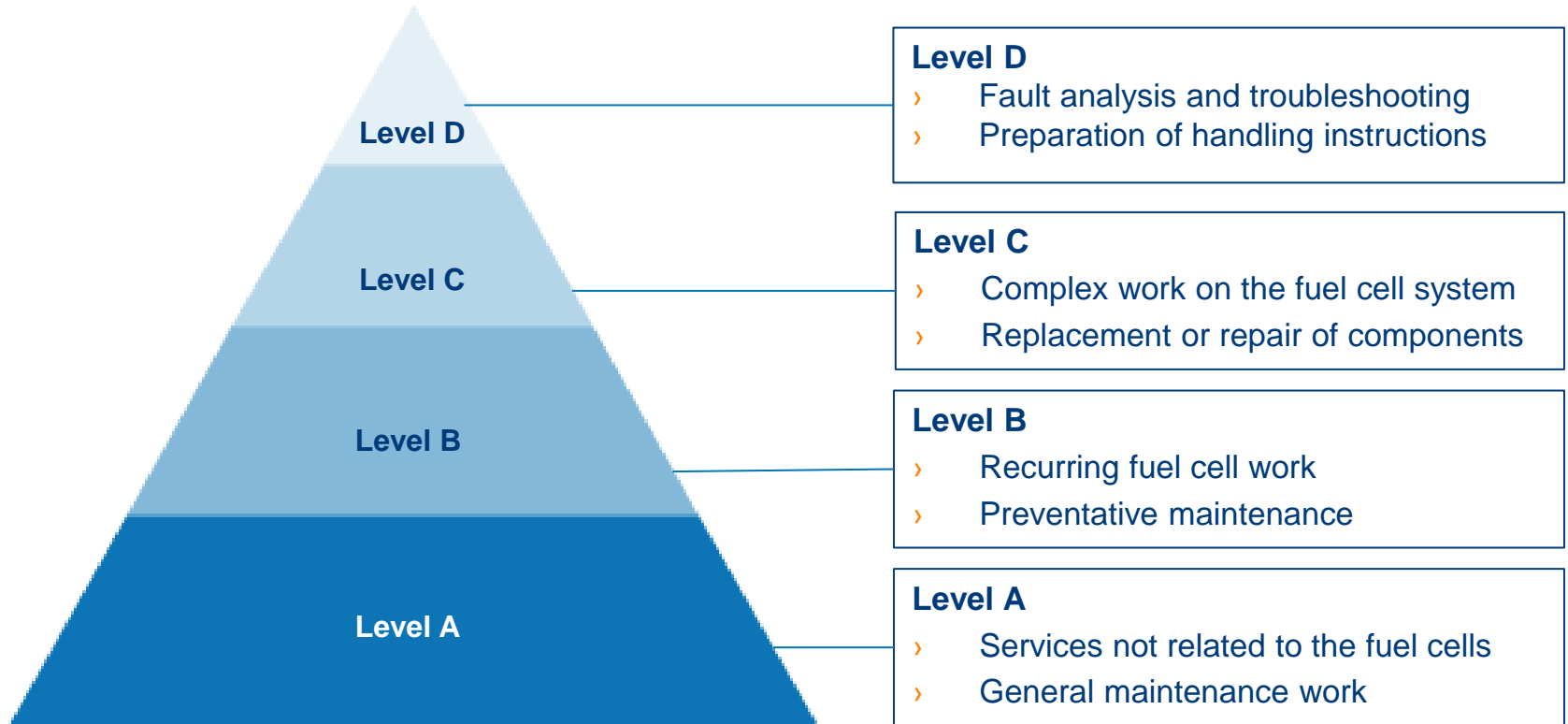
Our Service Concept 411 is based on 3 modules. Each module has a separate focus. All modules can be combined with and complement each other.

- › **Modul 1:** 4-step service level concept
- › **Modul 2:** Use of the *mobalyse* data and fault analysis tool developed by EMCEL
- › **Modul 3:** Training



» Service Concept 411 – Module 1

Four Service Levels to Choose From



» Service Concept 411 – Module 2

mobalyse Mobile Analysis Tool



- › *mobalyse* continuously captures the measurement data from your application and provides you with extensive on-board analysis options.
- › Connect your laptop or smartphone to *mobalyse* via (W)LAN or UMTS.
- › Access to current measurement data as well as tables and diagrams of measurement values that you can produce and customize to suit your needs.
- › Access to your measurement data from all over the world. Without additional software and regardless of your operating system.



» Service Concept 411 – Module 2

mobalyse Mobile Analysis Tool



Functions

- › Data and fault analysis
- › Data storage
- › Table output of current data
- › Diagram output of current data
- › Fault log
- › Data downloading
- › SMS message in the event of an alarm

Benefits

- › Web interface – access via your browser
- › Works with all operating systems
- › No additional software required
- › Also suitable for smartphones
- › High level of data security
- › Data at a glance
- › Modular extensions
- › Easy to configure
- › Low power consumption
- › No need to capture data yourself



» Service Concept 411 – Module 3

Developing Internal and External Expertise

We will support you in the development of internal and external expertise

- › Training your customers
- › Preparing training and presentation documentation
- › Providing support and presenting your electric and fuel cell vehicles at exhibitions and events
- › Introducing your guests and visitors to electric mobility and fuel cell technology

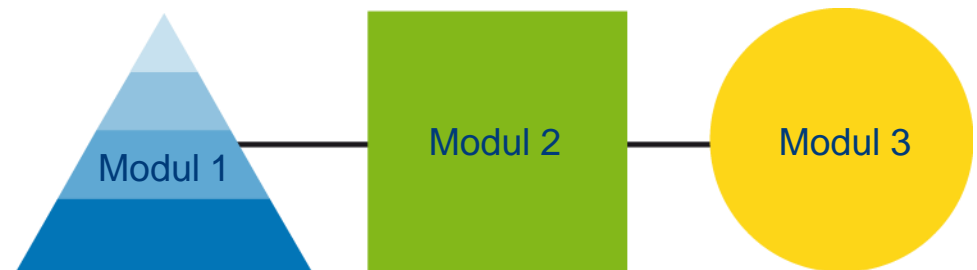
» Service Concept 411 Summary



Choose your ideal service levels and modules from our range of services.

This way you will receive a tailor-made and flexible service at predictable costs and a favorable price.

- › **Modul 1:** Our 4-step service level concept
- › **Modul 2:** Use of the *mobalyse* data and fault analysis tool developed by EMCEL
- › **Modul 3:** Training



»» References

General

- › EMCEL has many years of practical experience in research and development as well as the day-to-day service work in large, medium-sized and small companies.
- › EMCEL works for renowned companies and organisations involved in sustainable energy and electromobility in fuel cells, hydrogen technology, the automotive industry and system building.
- › This is highly valued by our German, European and international customers.



Engineering Company for Fuel Cells
Hydrogen Technology and Electric Mobility

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