ESORO INNOVATION ENGINEERING PROTOTYPING

HYCAR – SWITZERLANDS FIRST FUEL CELL VEHICLE

Zero emissions - fuel cell - hydrogen

Terms which are currently hotly discussed in relation to sustainable mobility. During the course of a development project, ESORO dealt in-depth with specific implementation of various ideas. The result was: the HyCar, a fully operable concept vehicle with fuel cell drive train and battery in a hybrid configuration. With its top speed of 120 km/h and range of approx. 360 km, the HyCar is more than a match for traffic - and is almost absolutely silent. The HyCar is fuelled with gaseous hydrogen and the only "waste gas" produced is water vapour.

HyCar is a fully functional concept car - Driven by a fuel cell system and a battery in hybrid configuration. The entire project was realized by ESORO from first concepts to the operating vehicle, evaluation of the components, simulation, virtual mock-up, system integration, design of the control system, stationnary and mobile testing etc. Hycar is used for know-how generation and demonstrates the possibilities of this promising technology.

CHARACTERISTICS

Speed: 120 km/h

Range: approx. 360 km

curb weight: 1160 kg

Fuel cell system: 5 kW at >40% efficiency

Tank: 80 kWh hydrogen

Battery: 23 kWh NaNiCl

Engine: 35 kW asynchronous with 90 Nm

Transmission ratio: 10:1

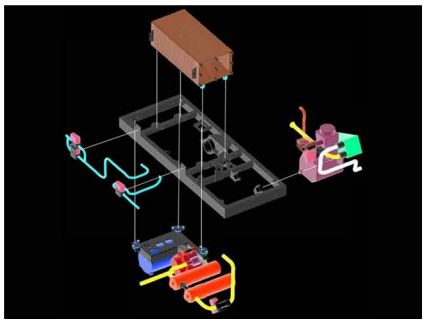
The entire vehicle is constructed fully of fibre composite materials. The ESS lightweight suspension system (ESORO Suspension System), developed and patented by ESORO, with transversal leaf springs serves as the suspension. The HyCar is designed as a technology prototype and will thus never be produced on a series scale. However, it does prove that it is possible to get from one place to another, comfortably and reliably, with a fuel cell vehicle.

SPECIAL

The fuel cell system is accommodated beneath the glass load floor in the HyCar's tail. This allows a view of this novel drive technology.

The front number plate conceals a conventional 230 V socket outlet. This means that the HyCar doubles up as a mobile energy source for DIY enthusiasts or for leisure activities.

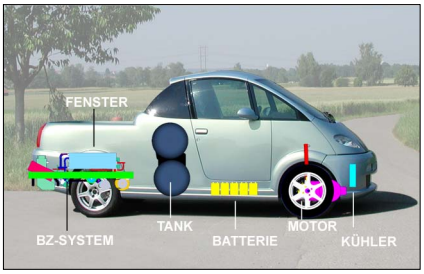
FUEL CELL SYSTEM



The fuel cell system was the actual focus of the project. ESORO developed the entire system around a bought-in fuel cell stack. This included the entire conception, evaluation of the various components and dimensioning them, system integration in the vehicle, development of the monitoring and control system for fully automatic operation and, finally, implementation and testing of the system.

A real-time simulation of the overall system was developed which, thanks to its modularity, is now also available for further projects in order to ensure efficient system development.

DRIVE TRAIN



The illustration shows the arrangement of the various subsystems in the HyCar. The fuel cell system is accommodated in the rear beneath a viewing panel. The two hydrogen accumulators are accommodated in the rear section of the passenger cell, fully encapsulated from the rest of the vehicle. The battery for the hybrid drive train of the HyCar is accommodated beneath the seats. The electric motor drives the front wheels and lies centrally between them. The radiator for the fuel cell system is arranged conventionally in the front section of the vehicle.

HYDROGEN ACCUMULATORS

The HyCar is operated with gaseous hydrogen. This hydrogen is stored in two high-pressure tanks at a pressure of 200 bar. Each tank features a gastight interior tank made of aluminium which is wound with carbon fibres and weighs 32 kg. This means that 76 litres of hydrogen can be stored per tank. The vehicle is refuelled using the HyStation for instance, and the refuelling operation is thus as safe and convenient as on a conventional vehicle.

HYSTATION

Hydrogen which is non-toxic and is the lightest gas promises to make an essential contribution to a sustainable energy economy in future. However, currently, it is not possible to refuel with hydrogen anywhere and neither is there an infrastructure for supplying service stations with hydrogen.

The HyStation is a demonstration service station with which the HyCar fuel cell vehicle can be refuelled easily and safely like a conventional vehicle. The HyStation, admittedly, does not solve the infrastructure problem directly but it shows how convenient refuelling with hydrogen can be and proves that a service station does not necessarily have to look bad...
The HyStation was developed and produced by ESORO on behalf of and in cooperation with our hydrogen supplier SL Gas (Lenzburg, Switzerland).

The HyStation is a hydrogen service station which is very well-suited to demonstrations and exhibitions. Its central component is the cylindrical fuel pump containing the refuelling nozzle, the operating controls and the service station control system. As soon as users identify themselves using a transmitter on the car key, a liquid-crystal display prompts them through the refuelling operation which is just as simple and safe as is refuelling a conventional vehicle. The fuel pump can basically be supplied from a wide variety of hydrogen sources. In the demonstration prototype implemented, a cluster of pressurised tanks supplies the service station with up to 180 Nm^3 of gaseous hydrogen. In future, service stations such as the HyStation could be supplied with locally produced hydrogen.