Current Status GLC F-CELL and H2Mobility

Prof. Dr. Christian Mohrdieck
SIX COMPANIES AND FIVE ASSOCIATED PARTNERS FROM THE AUTOMOBILE, GAS AND OIL SECTORS JOINED FORCES TO FOUND H₂ MOBILITY. THEIR COMMON GOAL? TO PUT IN PLACE THE INFRASTRUCTURE TO GUARANTEE NATIONWIDE HYDROGEN-POWERED MOBILITY IN GERMANY.
H2-Mobility

Build up a H2-infrastructure network until 2023 in Germany

By 2018/19 as many as 100 Hydrogen stations across Germany should provide the world’s densest network

* By 04/2017 there are 33 HRS are completed, 22 HRS are under construction
H2-Mobility

Applied HRS Technologies

HRS Performance Specification

At its refueling stations H2 MOBILITY uses the most modern and efficient technologies currently available on the market. For successful hydrogen mobility a high degree of standardisation and reliability are essential, as is keeping capital expenditure and operating costs as low as possible.

In 2015 the first HRS were ordered from the manufacturers Air Liquide, Linde and HoLogic.

700 bar hydrogen refueling station standardisation
In order to ensure uniform standards and to facilitate procurement, H2 MOBILITY has drawn up a functional description of standardised HRS. It gives an overview of the required performance in terms of quantity and quality and lays out the regulations to adopt. It distinguishes between four different sizes of hydrogen refueling stations: very small, small, medium and large. The general performance specifications of the different refueling station sizes are given in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>VERY SMALL HRS</th>
<th>SMALL HRS</th>
<th>MEDIUM HRS</th>
<th>LARGE HRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of refueling positions</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Number of vehicles that can be refueled per hour per position</td>
<td>2.5</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Number of vehicles that can be refueled back to back per refueling position</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Max. waiting time to refuel consecutive cars (in min.)</td>
<td>20</td>
<td>10</td>
<td>6</td>
<td>n/a</td>
</tr>
<tr>
<td>Number of consecutive hours to meet the performance specifications</td>
<td>--</td>
<td>3</td>
<td>3</td>
<td>24/7</td>
</tr>
<tr>
<td>Average number of vehicles refueled per day</td>
<td>10</td>
<td>30</td>
<td>60</td>
<td>125</td>
</tr>
<tr>
<td>Maximum number of vehicles refueled per day</td>
<td>20</td>
<td>30</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Maximum hydrogen hourly throughput (in kg)</td>
<td>18</td>
<td>33.6</td>
<td>67.2</td>
<td>224</td>
</tr>
<tr>
<td>Average hydrogen throughput per day (in kg)</td>
<td>54</td>
<td>168</td>
<td>376</td>
<td>790</td>
</tr>
<tr>
<td>Maximum hydrogen throughput per day (in kg)</td>
<td>99</td>
<td>232</td>
<td>429</td>
<td>1000</td>
</tr>
<tr>
<td>Number of vehicles served per station (approx.)</td>
<td>100</td>
<td>400</td>
<td>800</td>
<td>1600</td>
</tr>
</tbody>
</table>

Example of a small hydrogen refueling station layout

Filling process
Filling process: The filling process to adopt is laid out in the international standard SAE J16601-2014. Vehicle tanks with a capacity of 1-7 kg of hydrogen at a pressure of 700 bar have been taken as the design baseline.

Modular design
The hydrogen refueling stations are described in terms of functional modules:

- **Module 1**: On-site hydrogen storage system
- **Module 2**: Hydrogen compression system
- **Module 3**: High pressure buffer storage
- **Module 4**: Hydrogen pre-cooling unit
- **Module 5**: Dispensing system
Starting 2017: Mercedes-Benz GLC F-CELL

With plug-in technology
DAIMLER: Next Generation Fuel-Cell System

Huge technological progress

2010: Underfloor package

2017: Compartment package

- 30% reduction fuel cell engine size
- 90% reduction of Platinum
- 30% higher electric range in future vehicles
- 40% higher system performance
DAIMLER: Next Generation Fuel-Cell System

GLC F-CELL Facts

- Approx. 500 km combined electric range NEDC
- < 50 km ranges in battery-electric mode alone
- 700 bar hydrogen refueling in approx. 3 min
- Battery with an energy content of approx. 9 kWh
- 2 carbon fibres coated tanks with ~4 kg capacity
Thank You for Your Attention!