

VANHOOL | Fuel Cell

**Fuel cell Electric Bus :
It works and it's ready !**



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INTRODUCTION VAN HOOL

- 70 Years Bus Experience (design, production, service)
- Family owned and managed
- 90% Exports Worldwide
- 4.900 Employees in two production facilities
- 1.200 Output Buses and Coaches yearly
- 4.000 Industrial vehicles yearly
- Flexibility in Design and Market requirements
- Innovator in technologies



ZERO EMISSION SOLUTIONS

With regard to zero-emission solutions Van Hool is technology neutral, thus **all solutions are being developed.**

Trolley solutions (IMC battery)



Battery electric solutions



Fuel cell electric solutions





FUEL CELL BUS REFERENCE PROJECTS

131
FC buses
sold
















PHYSICS DRIVING THE SOLUTION

Hydrogen has most potential to become the disruptive technology driving large scale zero emission deployment.

It is physics driving the solution

		Battery electric Bus	Fuel cell electric Bus	
Usable energy on the bus	Energy density H2 = 33 kWh/kg	250 kWh	600 kWh Assumed 5 stacks H2: (36 kg usable H2 or 1.200 kWh) x 50% efficiency	X 2,4 MORE
Time to charge	H2 = Gaz/liquid	1 hour Assumed 250 kW charging power	7 minutes Standard filling process	X 8,5 FASTER

FUEL CELL BUS DEVELOPMENT ROADMAP

Time >	2005-06	2007	2008-09	2011	2012-15	2016+
Series				CHIC	High VLOCity HyTransit Cologne	3EMotion JIVE
1						
2						
3						
4						
5						
6						
Number Buses	5	16	1	5	22	82

- 13 years of building experience
- Running over several development phases
- Small scale projects
- Highly supported by FCH JU

Standardised technical definition for Low Floor City Bus

- **Flat Urban Service Line**
24 kWh traction battery and 85 kW hydrogen fuel stack
- **Regional and hilly City Service Line**
36 kWh traction battery and 85kW hydrogen fuel stack

Standardised service concept

- Spare parts management
- Dedicated service technicians
- SLA contracts with main suppliers

Standardised documentation

- Manuals, service documents
- Training packages



FUEL CELL BUS SERIES PRODUCTION



INAUGURATION AT UITP STOCKHOLM

Inauguration of the first fuel cell bus for
RVK Cologne

First fuel cell bus of a lot of 35 buses

First bus produced in a standardised
series production @ Van Hool

Current capacity of fuel cell bus
production line : 2,5 buses/week.



FOLLOW-ON ORDER IN THE NETHERLANDS

Follow-on order of Qbuzz (operator in the Netherlands) after first successful experience with 2 hydrogen buses of Van Hool (photo)



PERSBERICHT

datum 25 juli 2019

Waterstoftankstation en 20 waterstof bussen voor busconcessie Groningen Drenthe

Nieuwe fase in gebruik waterstof als voertuigbrandstof

First BRT system in Europe running on hydrogen

Launch end of 2019 in Pau, France

8 Vehicles type Van Hool Exqui.City 18 FC

- Full day autonomy
- No catenary wiring, no rails
- Smooth and silent
- Zero emission without compromises

Tender won in consortium with Engie and ITM

- Bus and infrastructure in one package





Thank you for your attention

(during this presentation 2 fuel cell buses have been refuelled !)