

Type Approval of Hydrogen Buses

Challenge & opportunities

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Van Hool, bus & trailer manufacturer

- ▶ 70 years of experience (Development, production, service)
- ▶ Family-owned company
- ▶ 90% export world-wide
- ▶ 4.450 collaborators in 2 production facilities
- ▶ 1200 buses and cars
- ▶ Flexibility in development and production, client-centered

What is type approval ?

- Certification by a Government body or a test lab accredited by the Government ...
- ... of new vehicle type
- With respect to a number of legal requirements, concerning
 - Safety
 - Environment & health
 - Anti theft
 - Information: consumer, taxes, fleet requirements, ..

What is type approval ? (2)

- Use is made of:
 - Visual inspections
 - Destructive test
 - Non-destructive tests
 - Component testing

- Certification of components is used

!!! Not to be confused with in-use periodic inspection !

Type approval in Belgium: EU + UN ECE

- EU framework regulation 2008/858 (formerly directive 2007/46 ...) + GSR (661/2009/)
- Applies to cars, truck, buses, trailers
- Long list of mandatory safety and environmental requirements (+ some other issues)
- For many subjects, specific EU requirements have been replaced by direct reference to the UN ECE regulation. E.g. Braking is based on R-13, electrical safety is based R-100
- A new package of amendments is under discussion in the EU, GSR2
 - E.g. safety of hydrogen systems: ~~79/2009~~ → UN R-134

A closer look to regulations for buses (1)

- R-107 (formerly 2001/85) defines 3 classes:
 - Class I, designed for the transport of many standing passengers + some seated passengers
 - Class II, designed mainly for the transport of seated passengers (standees in gangway and a dedicated platform, maximum the size of two double seats)
 - Class III, designed for the transport of seated passengers only

A closer look to regulations for buses (2)

- What is the use of the classes ?
 - Different requirements per class in R-107, e.g.: Minimum dimensions gangway, minimum seat dimension, minimum number of doors
 - Different requirements in system regulations, e.g. seat belts (R-14, R-16), rollover protection (R-66)

Vehicle classes not to be confused with vehicle concepts !

- Low-floor buses, for city use: Class I
- Low-entry buses, for inter-city use: Basically class I, but can be modified to comply with class II certification
- Coach / high-floor buses: Basically class III, but can be modified to comply with class III

Low-floor buses, for city use: Class I



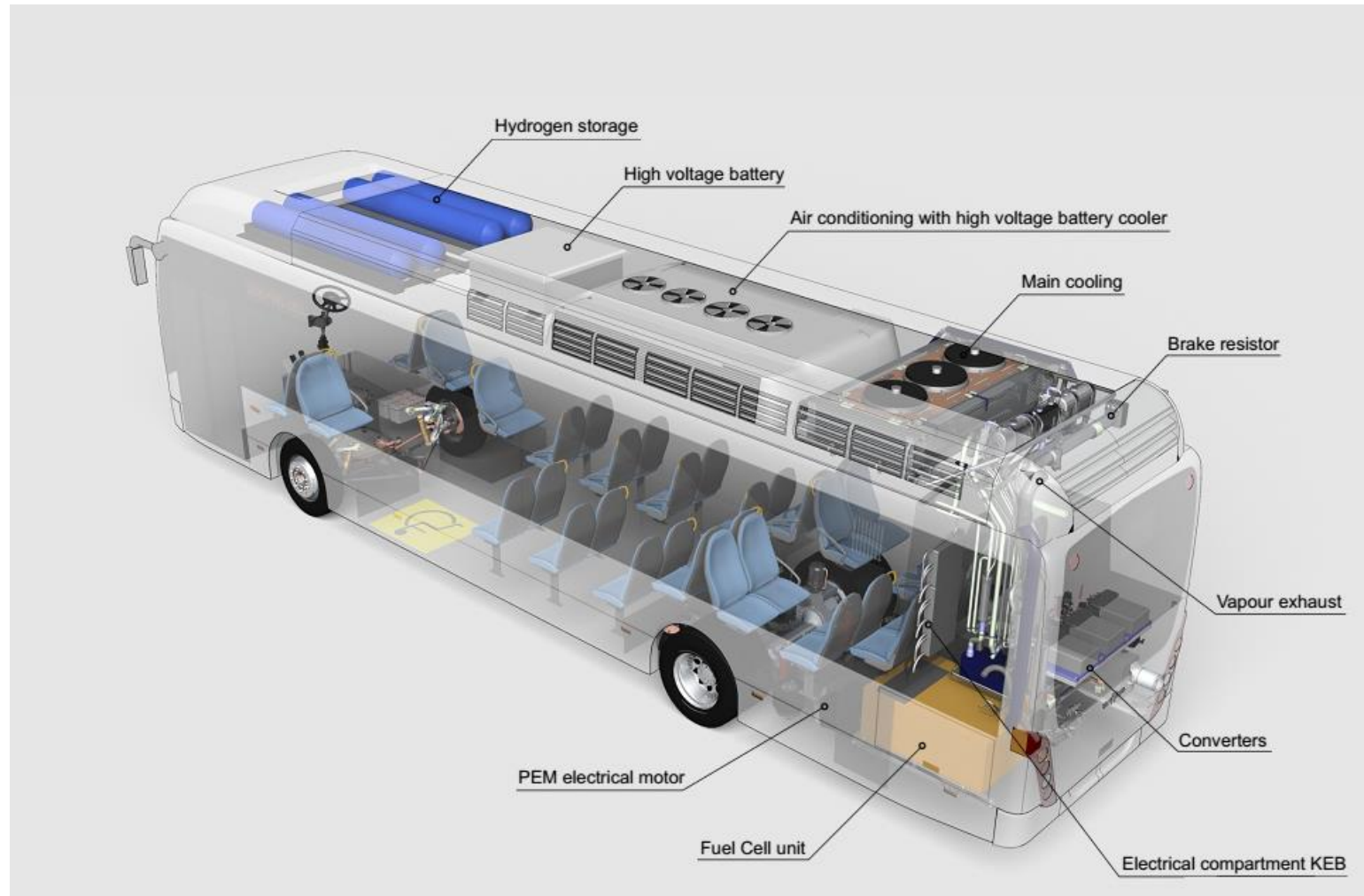
Low-entry bus, class I or class II



Coach high-floor buses: Class III, maybe class II



Hydrogen buses: Van Hool A330



Hydrogen buses

- Van Hool has more than 100 hydrogen buses on the street or under construction: City buses (Class I), autonomy > 300 km
- Next steps: Regional, intercity buses (Class I or Class II)
- EU funded project HyTransit, WP4.7: design of intercity-bus:
 - 60 seats
 - 100 kph
 - Class II
 - Autonomy ? 400 km ?

Hydrogen buses: Where to store the hydrogen ?

- Currently: On the roof ? (about 300 km autonomy)
- In the luggage space of a class III ? Not allowed by R-134: “No hydrogen tanks in passenger compartment or luggage compartment”
- Rear part of the bodywork: E.g. Wrightbus in London
- Empty space in the rear of a low-entry vehicle ?