Sustainable rolling stock for sustainable railways

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Leading railway evolution through technological innovation

Very well known R&D projects ...

Test at very high speed:
- Aerodynamics
- Soundproofing
- Dynamic stability
- Material performance under extreme conditions
- How high speed affects the environment

... whilst others not that notorious

... but that contribute decisively to make true all of the users’ needs
Sustainability in its broadest sense

SUSTAINABILITY

SAFETY

COMFORT

ENVIRONMENTAL ASPECTS
Safety:
- Rigidity of the trainset. No "accordion" effect in case of derailment

Comfort on board:
- Rolling noise and vibrations are reduced and restricted to the area between cars

Sustainability:
- **Energy consumption**: reducing the number of bogies reduces weight and improves aerodynamic resistance
- **Cost**: fewer bogies means lower maintenance costs (a bogie accounts for 35 to 40% of the cost of maintaining)
Sustainability
Reducing impact on the environment

- 98% of easily recyclable materials
  - Aluminium, steel, copper and glass
- Able to produce its own electricity
  - Up to 8 MW of power feedback into the grid
- Aero-acoustics to reduce noise
  - Same noise at 360 kph than competitors at 300 kph
- 70 tonnes less than competitor models
  - 15% reduction in energy consumption
Less energy consumption than competitors thanks to:

Intensive works on aerodynamic shapes:

- Nose
- Bogie fairings
- Gangways
Sustainability
Energy consumption

15% less energy consumption than competitors

Due to:

- Reduced weight
- Optimized use of regenerative braking
- Reduced number of bogies
- High efficiency of traction drive
- Improved aerodynamics
Sustainability
Traction: permanent magnet motors

• Power/weight ratio: more than 1 kW/kg
• Efficiency ratio: 98%

Increased efficiency
• No need to create magnetic fields

Less losses due to harmonics
• Pulse Width Modulation (PWM)

Less losses
• Stator (increased nb of poles)
• Rotor (low resistivity of magnets)

Less maintenance
• Air self ventilated
• Totally enclosed
Sustainability
Reducing operational costs

Modularity of trainsets

Fine-tuning for trains’ circulation, train fleets and railway hubs

2 * AGV7 = 400 m = 3 * AGV11
**Sustainability**

**Global comfort**

**AGV Automotrice Grande Vitesse**

**The Most Spacious Train**

With a body width of 3 metres, the AGV is the most spacious train on the market. The space is cleverly used to the benefit of passenger comfort and movement.

**Unrivalled Accessibility**

The height of the AGV’s floor, 10mm lower than on other trains, provides outstanding accessibility. Passengers can board the train using just two steps.

**Plenty of Light**

The windows, 15% larger than those on other trains, bring great amounts of light into the compartment, ideal for enjoying views of the landscape passing by.
Sustainability
Spanish commuter trains: CIVIA Platform

ALSTOM’s contribution to RENFE’s success story in Commuter trains.

Articulated train, use of aluminium, efficient traction chain,...

- CIVIA I: The first family of the new commuter platform
- CIVIA II: Including fire detection.
- CIVIA III: Meeting passive safety requirements.
- CIVIA IV: Full STI compliance with regards to accessibility.
Sustainability
HESOP reversible substation

Defined by RAILENERGY as « technical leap »

- Allows full recovery of braking energy
- Returns energy upstream: real “green energy”
- Brake resistors and short circuit breakers can be avoided in given configurations
- Application to commuters, metros, tramways
Sustainability
APS: Aesthetic power supply

Catenaryless tramway

Allows running into city centers where for different reasons superstructure cannot be considered:

- Bridges
- Sharp turns
- Aesthetically protected environments

Total autonomy independent of:

- Interstation length
- Slope
- Power of auxiliaries
Great brands don’t just happen, they’re made.