

# 11<sup>th</sup> UIC Sustainability Conference



## Talgo AVRIL: design for sustainability

José María González

[jmgonzalvez@talgo.com](mailto:jmgonzalvez@talgo.com)



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# Talgo AVRIL: design for sustainability

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# Talgo AVRIL: Energy efficiency

Light Weight & Low friction wheelset



Articulated monoaxle wheelset of independent guided (displaceable) wheels (RODAL)

- Mass of Standard Non-motorized bogie: 7.000 Kg
- Mass of Talgo Non-motorized rodal: 4.000 Kg
- Mass of 200 m train over bogies: 370 to 425 Ton
- Mass of 200 m Avril: 295 Ton
  
- Longitudinal slip is avoided
- Reduced wear on wheels and tracks (energy loss)
- Reduced lateral thrust on tracks



AVRIL is light and friendly with infrastructure

# Talgo AVRIL: Energy efficiency

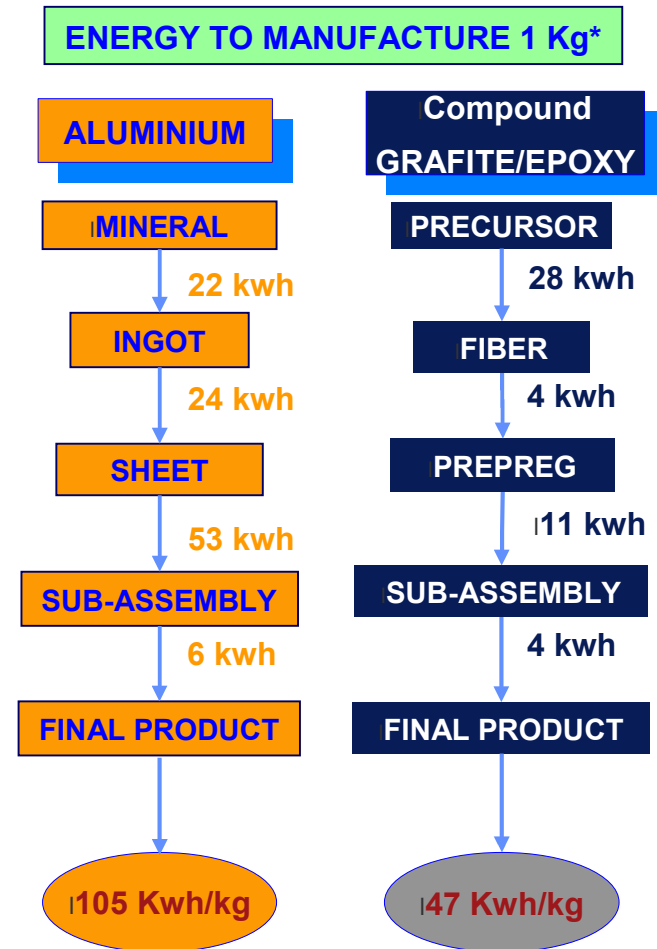
Light Weight: Use of compound structural materials



- Talgo standard:
  - Aluminum body shell with aluminum extrusion profiles
- New developments for AVRIL:
  - Structural compound materials (15% less weight)



\* source: FIDAMC



AVRIL is light and friendly with environment

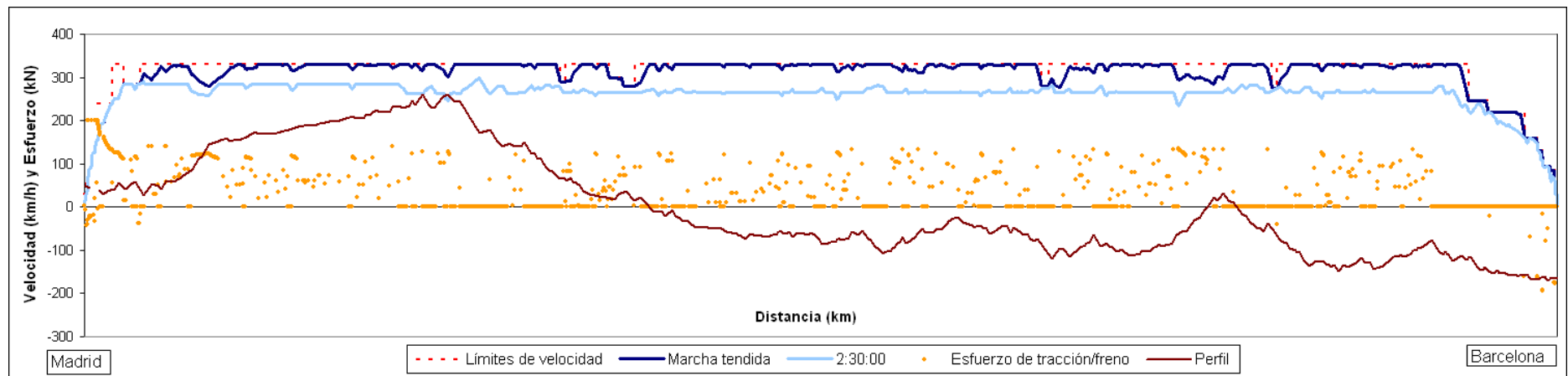


# Talgo AVRIL: Energy efficiency

## Automatic efficient driving



- Talgo & ICAI (Technical School of Engineers) are developing an automatic train driving system based on real time energy efficient criteria
- Automatic driving performance goes beyond manual driving based on pre-set instructions
- Computer simulations on the Madrid-Barcelona line show 30% energy savings with automatic efficient driving vs full speed driving for a 2 hour 30 min journey



5

AVRIL is smart

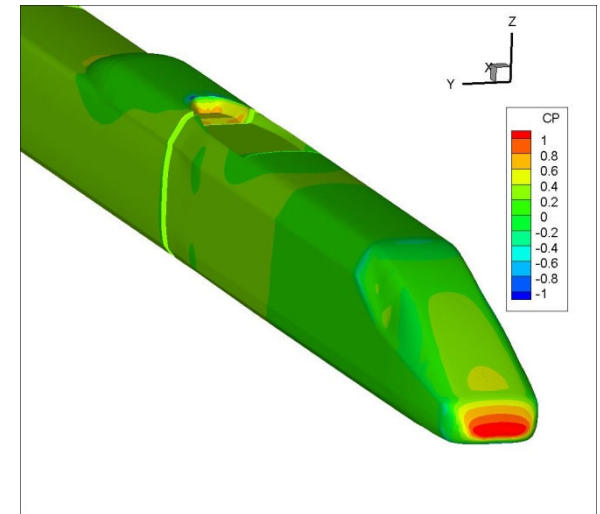
*Talgo*

# Talgo AVRIL: Energy efficiency

## Aerodynamics



- Optimization of exterior design for aerodynamics purposes
- Several lines of investigation under study:
  - optimization of the front nose
  - fairings of wheel organs
  - Fairings of elements under train
  - Optimization of air intakes and exhausts
  - Fairing over pantograph
  - Optimization of transition between cars
- Target is to reduce aerodynamic coefficient by 20% over that of Talgo T350



6 AVRIL is smart

*Talgo*

# Talgo AVRIL: Energy efficiency

## Accessibility



- Talgo concept of Articulated Monoaxle Wheelset allows train floor at platform level. Step-free passenger entry to the train is possible
- Measurements have shown low floor train has an impact in reducing stop time at stations by 20%, meaning further total energy savings on journey.



7 AVRIL is accessible

*Talgo*

# Talgo AVRIL: Energy efficiency

## Simulation results



- A simulation has been made under the Methodology developed by IDEA (Spanish Institute for Diversification and Energy Efficiency) and FFE (Spanish Foundation of Railways)
- Inputs train design data to pre-calculate energy consumption of the train for an standardized route at the design stage.

Characteristic	units	S10Y-4	S 10Z	XYZ	Avril
Train Length	<i>m</i>	200	200	200	200
Weight	<i>t</i>	425	425	422	295
Seats		499	499	509	545
Energy consumption per km	<i>kWh/km</i>	15,4	14,2	15,2	12,4
Energy consumption per seat per 100km	<i>kWh/s/ 100km</i>	3,1	2,8	3,0	2,3
Monetary value of total energy consumed during train life	<i>M€</i>	11,8	11,0	11,7	10,2

# Talgo AVRIL: Recyclability



- Avril is designed with an aim to reduce environmental impact after product end of life
- Talgo has chosen Tecnalía as a partner for Recyclability related activities.
- Criteria taken into account at the Design phase such as:
  - Connection technology optimization
  - Choice of material compatibility optimized
  - Building structure (reduction of pre-dismantling times)
  - Tool choice optimized
- Talgo actively participates in the UNIFE LCA technical group developing a Recycling Guideline which aim is to become an Industry standard for:
  - Procedure for train dismantling and recycling
  - Calculation methodology for Recyclability and Recoverability rates
  - Guide for best practices in terms of Recyclability

9 AVRIL works for the protection of the environment



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**Thank you for your attention**



Madrid, 16-18 June 2010

