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actuate

Eco-training for Van Hool's AG300*ExQuiCity*

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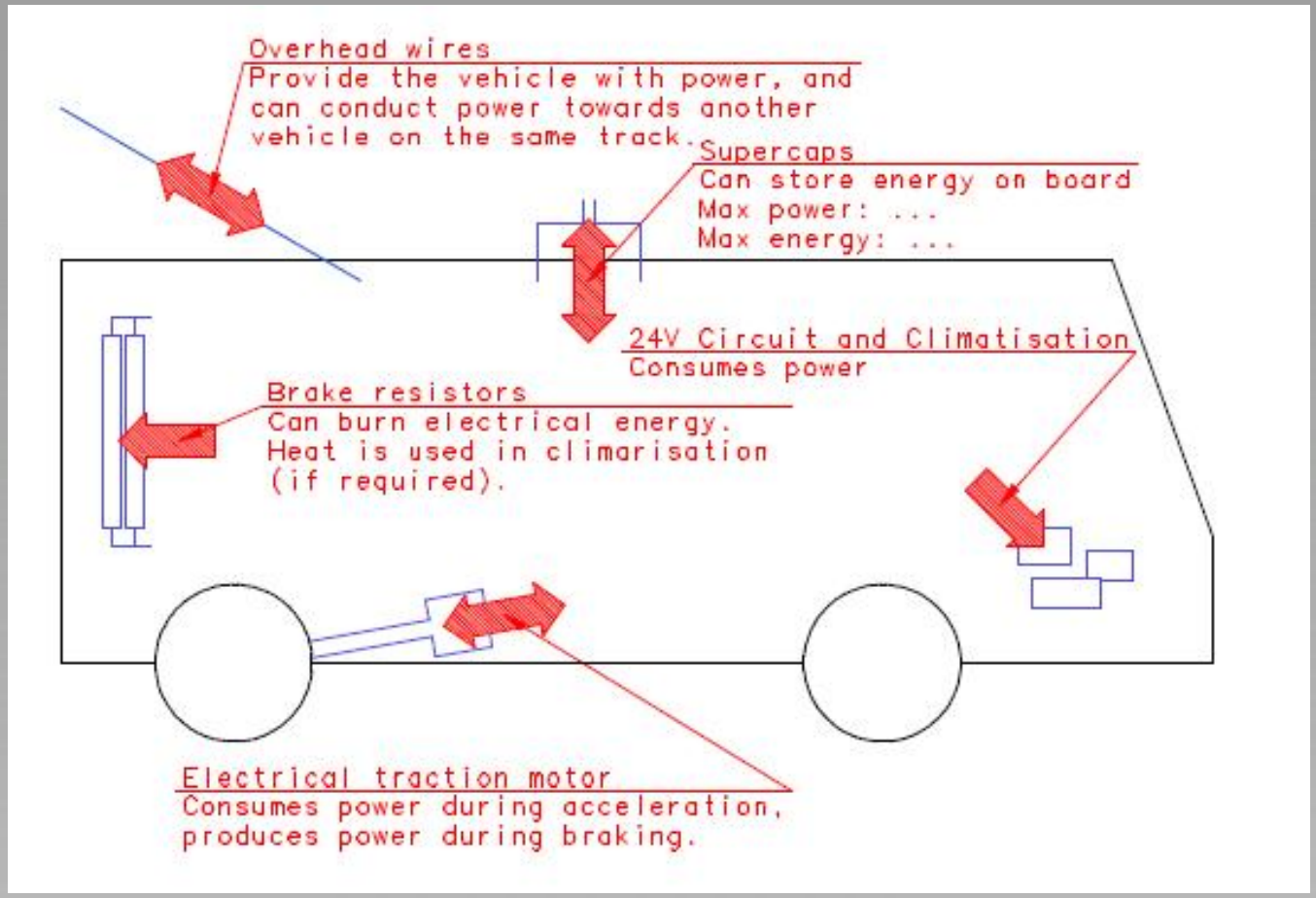
VANHOOL

Van Hool's AG300G ExQuiCity

AG300 Trl Ex.Qui City	
Vehicle length	18.610m
Passengers seats	34
Bus Type	1x Articulated
Axles	3
Drive line	Trolley (750V)
Electrical energy storage	Supercaps
Auxiliary power	Diesel generator

Electrical energy flow in ‘trolley mode’



Drivers training for ‘Eco-driving’

Aim of eco-driving:
Reuse brake energy as much as possible to power the next acceleration or on board auxiliaries.

In these buses, regenerated power is used for:

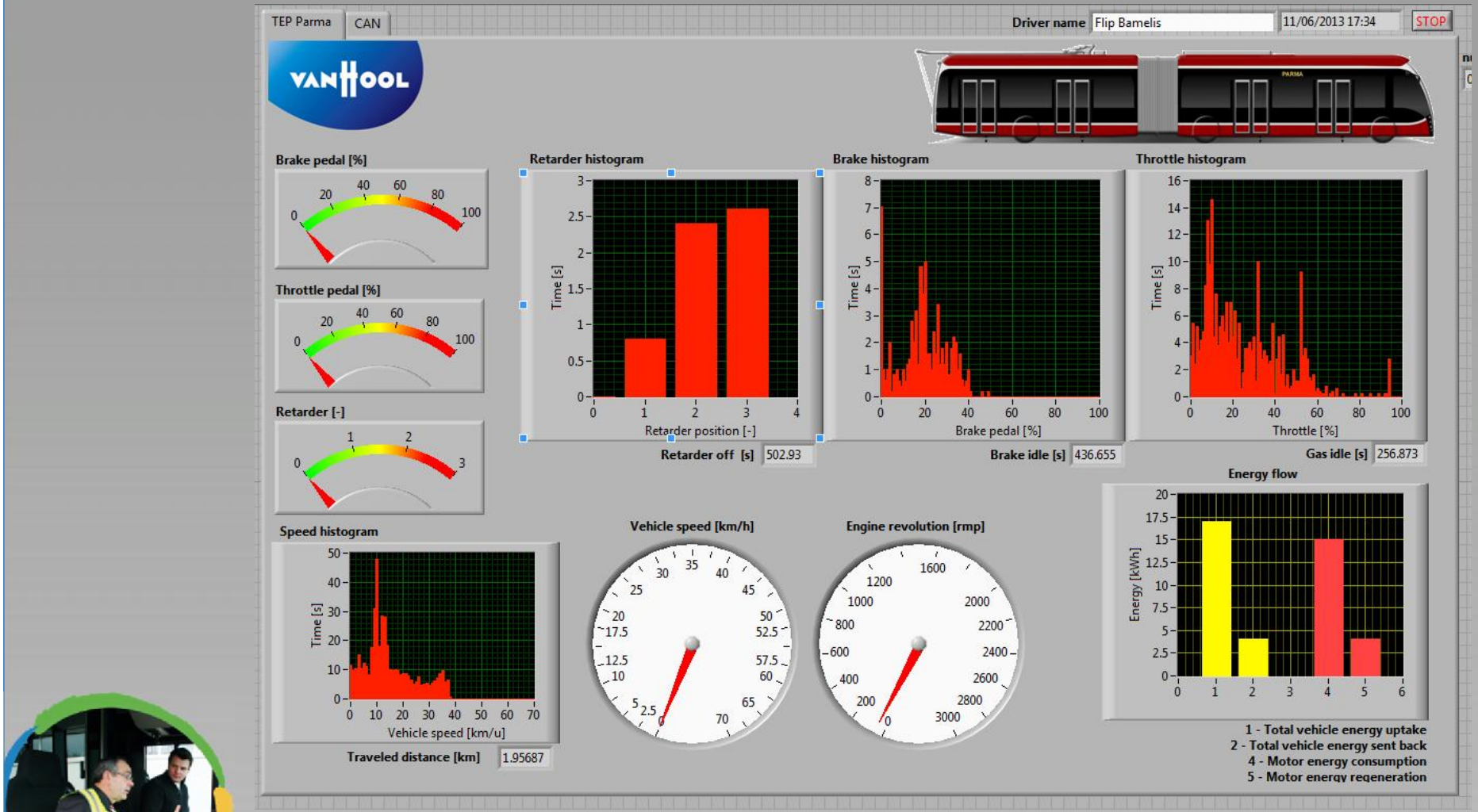
- -to power auxiliaries (pneumatics, servo steering, 24V network, heating)
- -stored temporarily in supercaps on board
- -sent to power another accelerating trolleybus on the same segment (if present)
- -burnt in brake resistors on board (heat is recuperated in heating system)

Main aim
How to teach a driver that he/she maximally regenerates power into electrical power?
Technically this means:

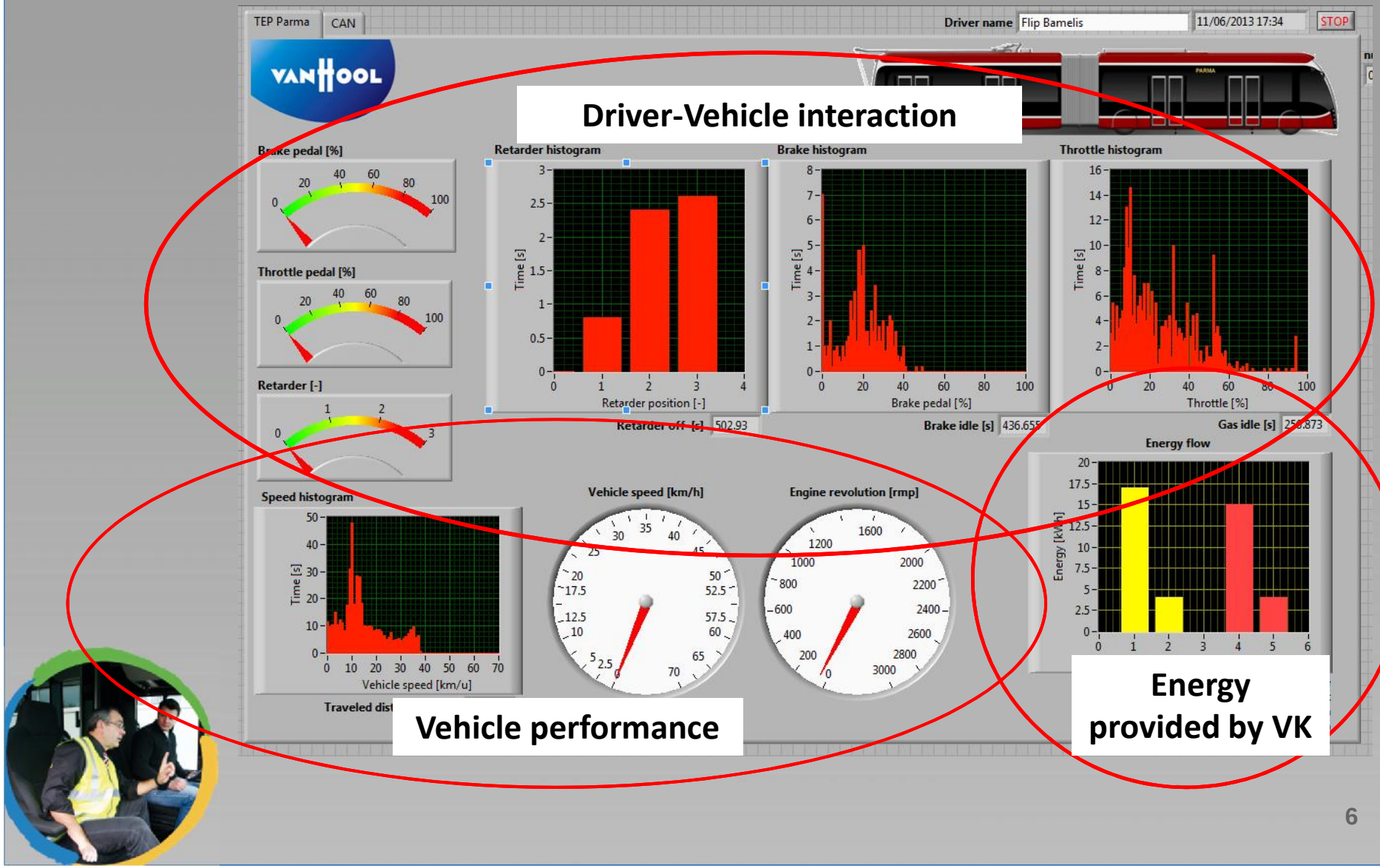
- -avoid high accelleration level
- -use the retarder for decelleration
- -only use the brake pedal ‘smoothly’

Where are the ‘regeneration limits’ and what should be stressed in training?

Tool for driver's evaluation

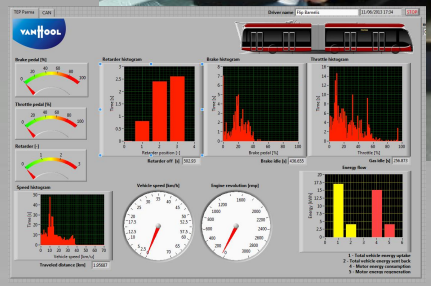


Tool for driver's evaluation

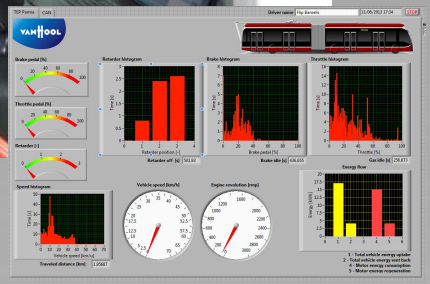


Eco-drivers training

One hour theoretical training by our trainer using the ‘Salzburg manual’



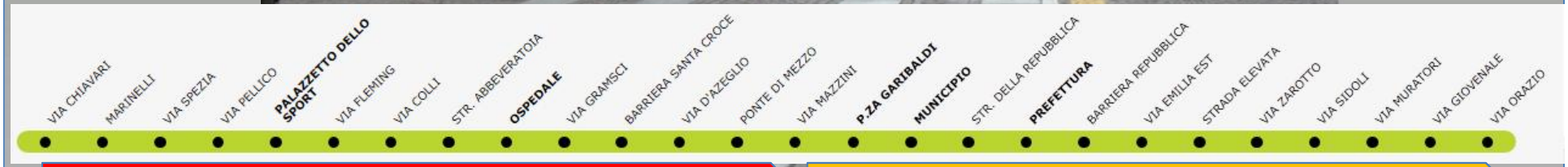
Blank



Coached

Training session organisation			
9:00-12:00	Drivers 'Blank drive'	8	2x 'Linea 5'
12:00-13:00	Theoretic training	8	TEP room
13:00-14:00	*Lunch*		
14:00-17:00	Drivers 'Coached drive'	8	2x 'Linea 5'
In total 20 drivers were trained.			

Tep's Linea 5



DRIVER 1

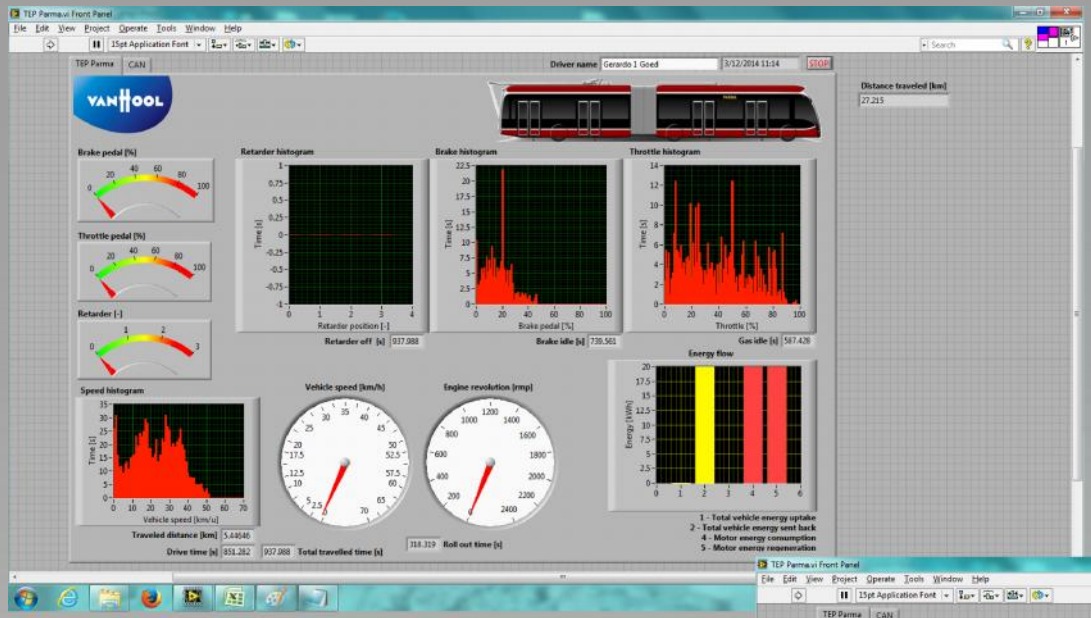
DRIVER 2

DRIVER 4

DRIVER 3

TEP Linea 5	
Topography	Flat
Length	3.8 + 5.3km
Average travel time	32'
Line type	Urban & suburban

Driver – vehicle interaction

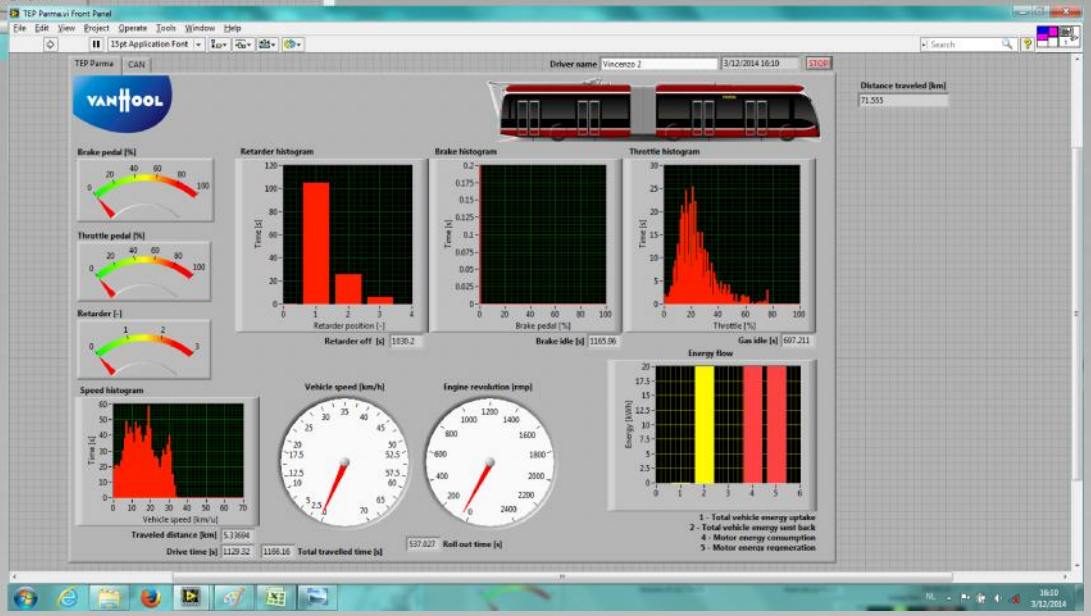


'Blind' –

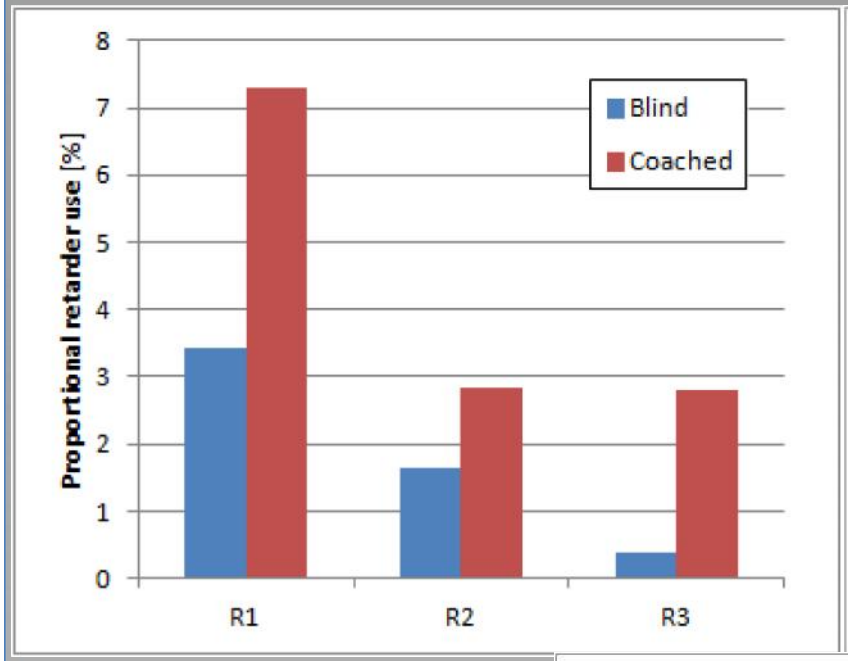
In general, drivers do not use the retarder and often use the full range of the accelerator.

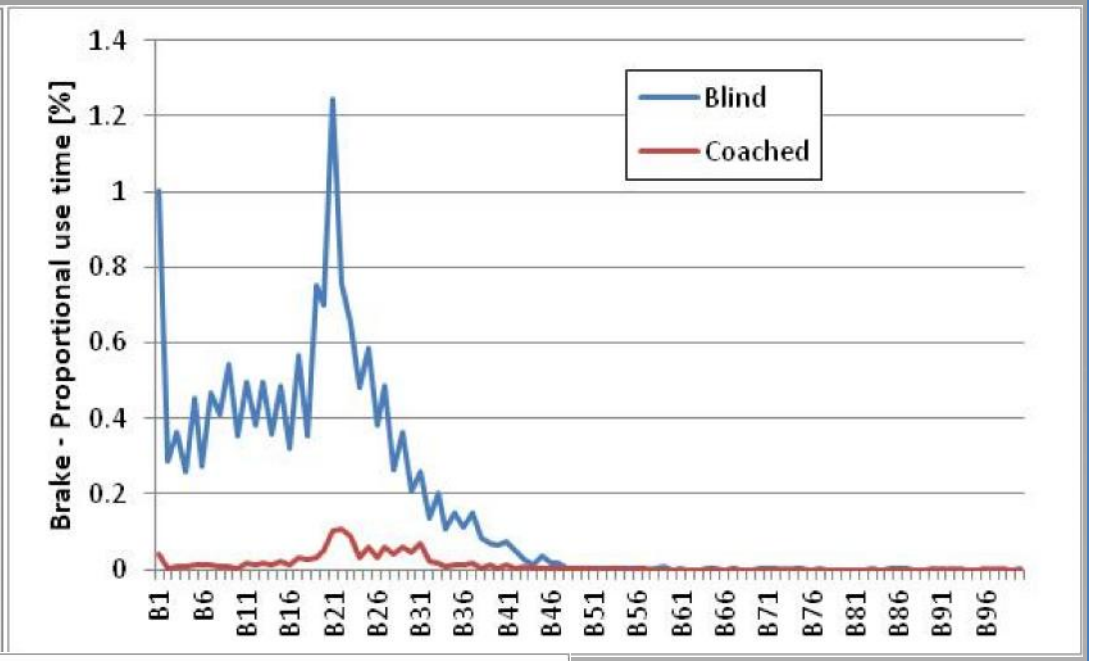
'Coached' -

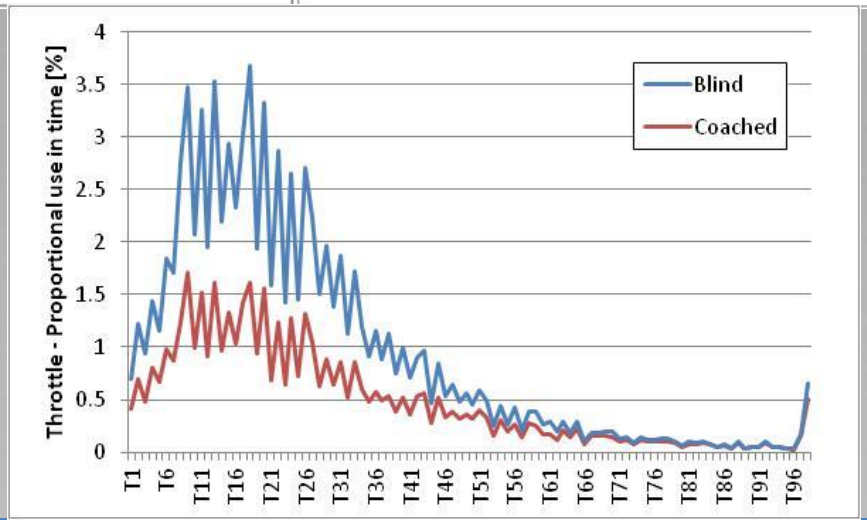
All drivers were coached to use the retarder. Some of them could make the trip without using the brake pedal at all!



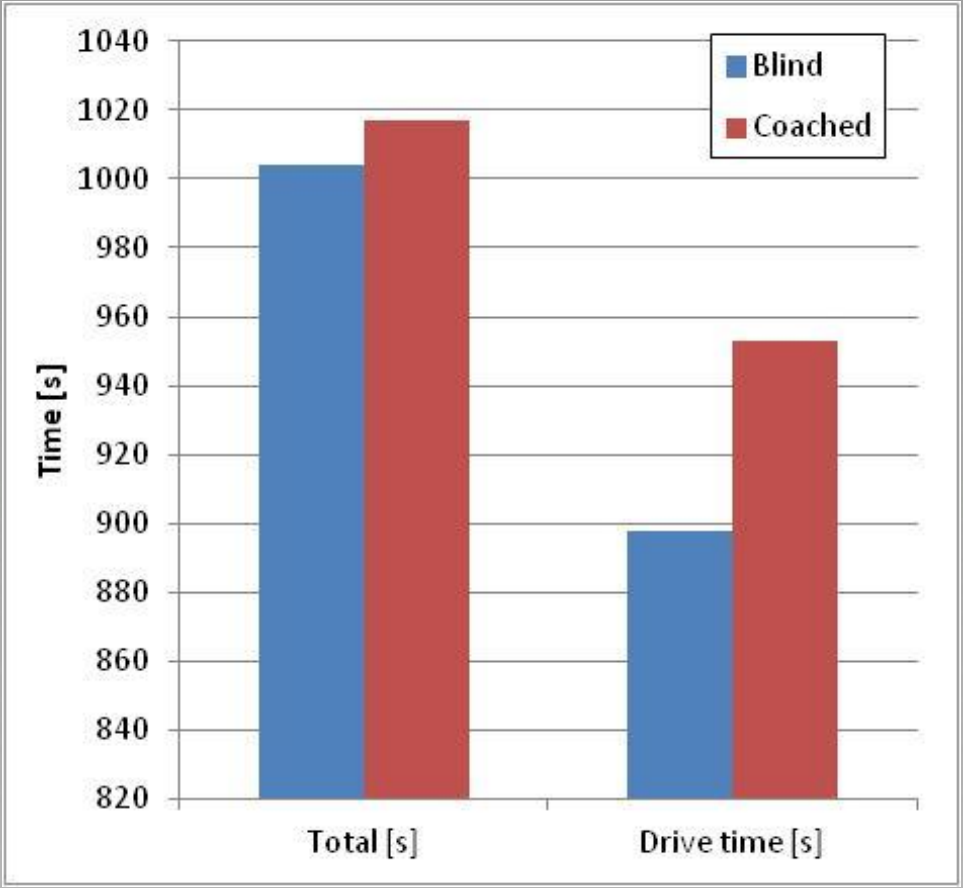
Driver – vehicle interaction: average figures







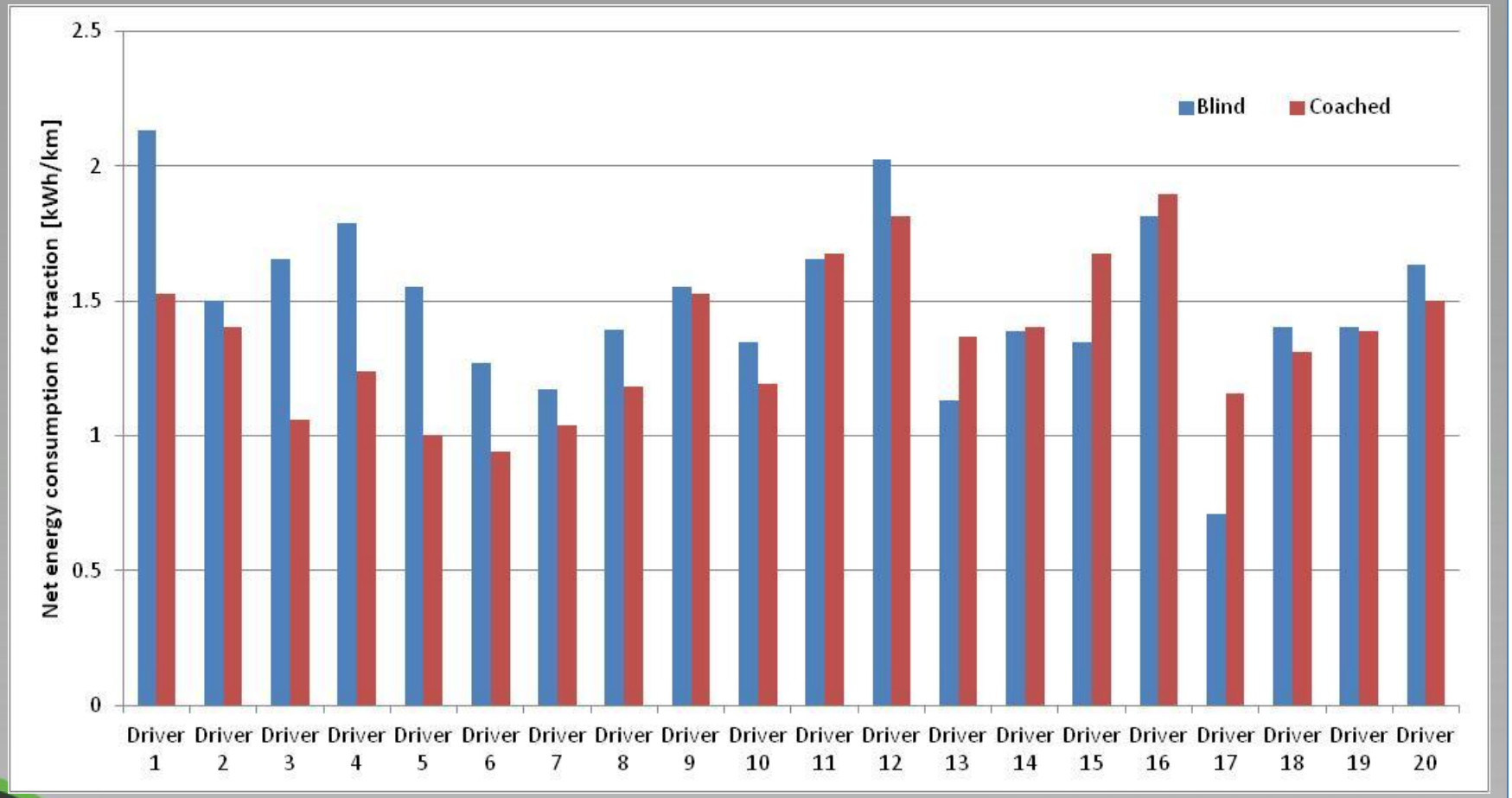
Travel time



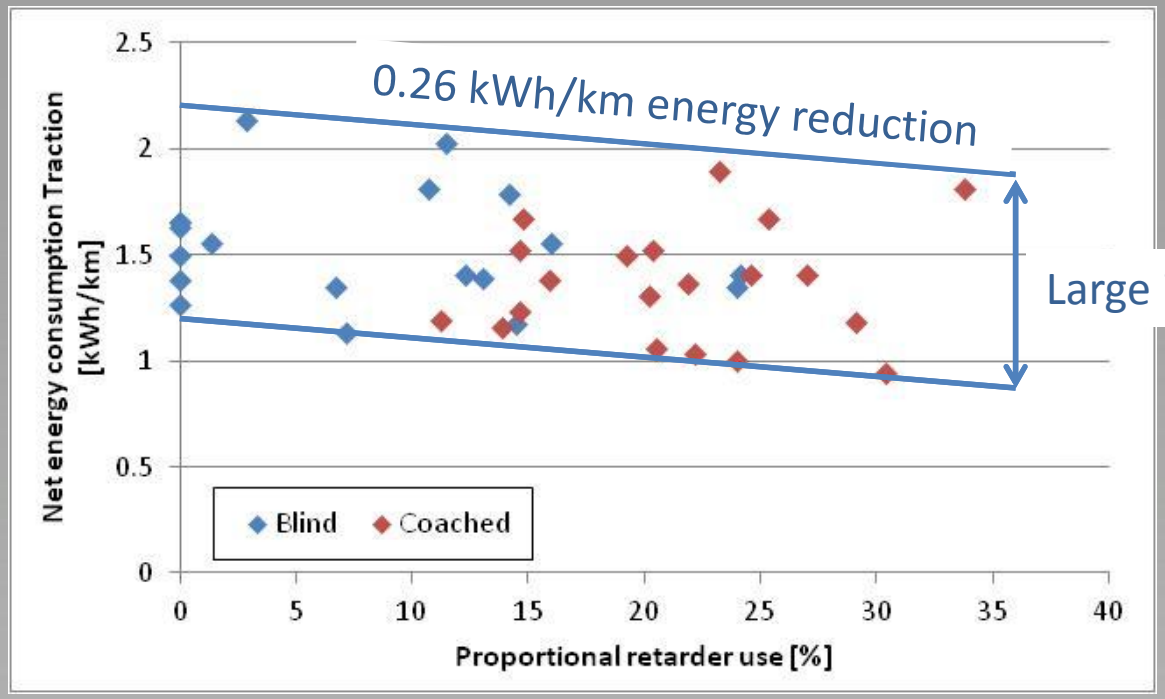
Total travel time increases with less than 20s, although a lower speed could be maintained. This was realised with an more defensive driving style, characterised by an increased ‘drive time’ and more rolling of the vehicle.

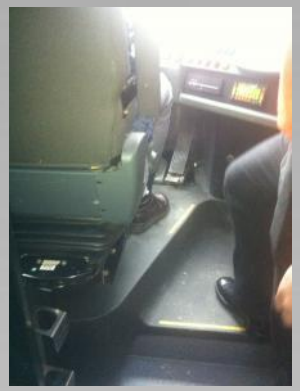
Roll out time [%]	
Blind	14.30
Coached	23.57

Energy consumption by driver



Effect of retarder use on energy consumption





Remarks from drivers and main conclusion

ACTUATE – Remarks from drivers
Eco driving requires much more concentration
Only possible with calm traffic
Use of retarder is not ‘ergonomic’
Drivers of next days were ‘informed’ by former

ACTUATE – Main conclusion
73% of the drivers perform more eco-friendly when coached. These drivers realise an energy reduction of 0.26kWh/km; This is realised by using the retarder more often.