

TECHIRON WORKS™



UK Testing

June –August 2012

Emissions Analytics



Independent testing organisation

Specialist in real on-road performance measurement

Using high quality portable emissions measurement system (PEMS)

Captures detailed data on MPG and gaseous emissions

Analyses results to understand performance differences

And transient vehicle performance

Over 400 vehicle tests conducted



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PEMS equipment



Laboratory-grade SEMTECH-DS

Portable Emissions Measurement System connects to tailpipe

- Captures emissions for CO₂, CO, NO, NO₂, total hydrocarbons
- At 1 Hertz
- Air temperature, pressure, humidity
- GPS for speed and altitude
- Engine data via CANBUS
- Weights approximately 95kg including auxiliary batteries
- Repeatability of +/- 2%



SEMTECH credentials



Development initiated in the 1990s

Established Joint Development Agreement with Ford Motor Company

Procured EPA Patent enabling mass emission calculation using exhaust flow meters

SEMTECH systems commercially available February, 2002

Awarded multiple contracts from USEPA, DG Joint Research Centre and Hong Kong EPA

Fully compliant with CFR 1065, Subpart J for Portable Emissions Measurement Systems (PEMS)



PEMS in action



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Testing Regime

Testing Variables & Limitations

As we looked to recreate a consumer's experience when using Techron there are a number of variables within the test regime to be considered.

Fuel: The performance quality of any fuel remaining in the tank on receipt of the vehicle (this may be higher performance fuel e.g. 97 Ron) .

The same fuel was utilised throughout the testing

- European Norm EN 228 / Unleaded Gasoline 95 10ppm Sulphur
- European Norm EN 590 / Diesel 10ppm Sulphur

Service & Driving History: Servicing & driving history were unknown. Vehicles were treated “as is” on delivery.

Vehicle Inspection: Pre and Post testing vehicle inspection primarily involved to engine boroscoping and external injector unit photography to give a visual reference of engine condition.

Vehicle Faults : Any vehicle which suffered a major mechanical or electrical fault during testing was replaced.



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Testing Regime

Testing Variables & Limitations

Petrol Engine testing was carried out on PFI engines only.

All tests were completed while vehicles were at full operating temperature

Testing was carried out in similar weather conditions utilising the same driver

Vehicles tests were run without utilising extraneous vehicle systems.

Testing equipment was supplied with power independent of vehicle systems

Emissions testing and mileage routes were standardised and driving pattern followed a defined regime following a computerised trace.

Vehicle speeds were recorded using GPS.

Power measuring equipment and emissions measuring equipment was calibrated prior to each test and compensated for weather, humidity and ambient pressure.

Vehicle Testing Results : The testing is limited by the equipment, test regime and circumstances under which the test was conducted. The results obtained are a comparison of before and after in respect of the specific vehicle tested. The results obtained are not comparable with any other testing.



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Testing Regime



Vehicle Selection

Vehicles were chosen to be relevant to the UK and European markets, reflecting popular models and engines.

This included best-selling models as well as engines that appear in more than one make and model of car, due to shared platforms (e.g. the Volkswagen Group).

The vehicles were sourced as carefully as possible in order for them to be considered as matched pairs.

As the test was designed to repeat the consumer's experience, vehicles were then selected to match as closely as possible most common ages and mileage in use. The target profile was three to five years old with 30,000-50,000 miles on the odometer, to give average miles per year in the range 8,000 - 12,000.

Petrol Vehicles			
Make	Model	Year	Mileage
VAUXHALL	ASTRA	2009	32,329
VAUXHALL	ASTRA	2007	36,166
HONDA	CIVIC	2008	37,164
HONDA	CIVIC	2009	49,937
FORD	FOCUS	2006	51,580
FORD	FOCUS	2009	40,917
NISSAN	QASHQAI	2009	30,487
NISSAN	QASHQAI	2008	33,409

Diesel Vehicles			
Make	Car	Year	Mileage
BMW	320D	2008	54,787
BMW	320D	2008	54,746
HONDA	CIVIC	2007	44,156
HONDA	CIVIC	2008	57,251
VAUXHALL	CORSA	2009	36,622
VAUXHALL	CORSA	2008	42,269
FORD	FOCUS	2008	41,555
FORD	FOCUS	2008	47,274
VW	PASSAT	2009	42,592
VW	PASSAT	2009	45,400
NISSAN	QASHQAI	2009	32,408
NISSAN	QASHQAI	2009	44,981



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Testing Regime

Testing comprised of the following segments

Initial power test
Initial emissions test
Techron added
Initial mileage accumulation
Overnight Soak
Final mileage accumulation
Final emissions test
Final power test



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Testing Regime



Peak power test on two-wheel, single axle 1,200bhp dynamometer

Conducted before first emissions test and after last

Tyres pressurised to 50psi

Vehicle up to full operating temperature

Driven in fourth gear

Power and torque measured

Across range of engine speeds from 1,500rpm to redline

Cycle repeated until peak result achieved



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Emissions Measurement Cycle

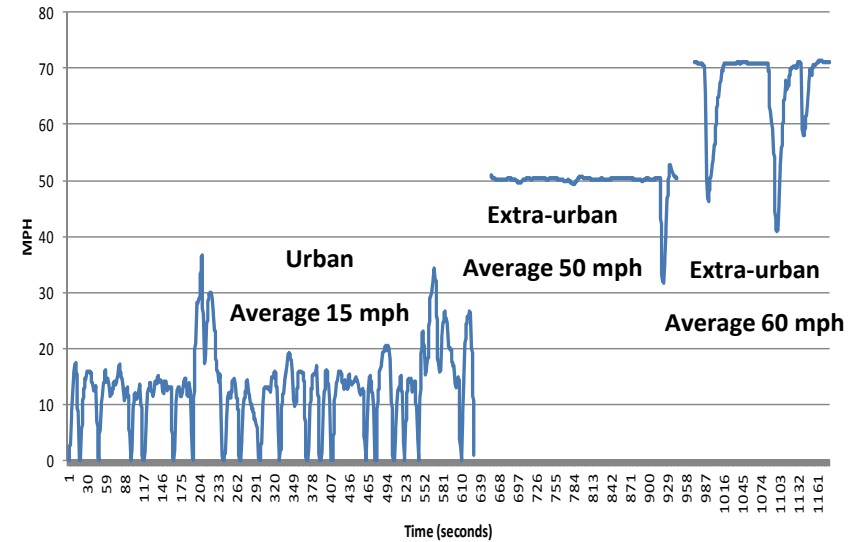


3 components to cycle

- Urban
- Extra-urban
- Extra-urban

Total cycle 65-75 minutes

- 3 repeats of 11-minute urban cycle
- 4 repeats of 5-minute extra-urban50
- 4 repeats of 4-minute extra-urban60



Overall average speed of 35mph



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Mileage Accumulation



Low fuel level by end of initial emissions test

Techron Concentrate Plus or Techron D Concentrate added

Fuelled with 50 litres

250 miles accumulated on urban route

Vehicle switched off and allowed to soak overnight

250 further miles accumulated on extra-urban route until fuel back to original level

Repeat emissions test

Repeat power test

Finish test



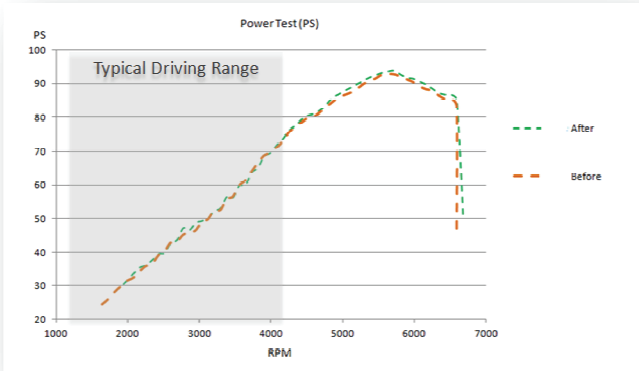
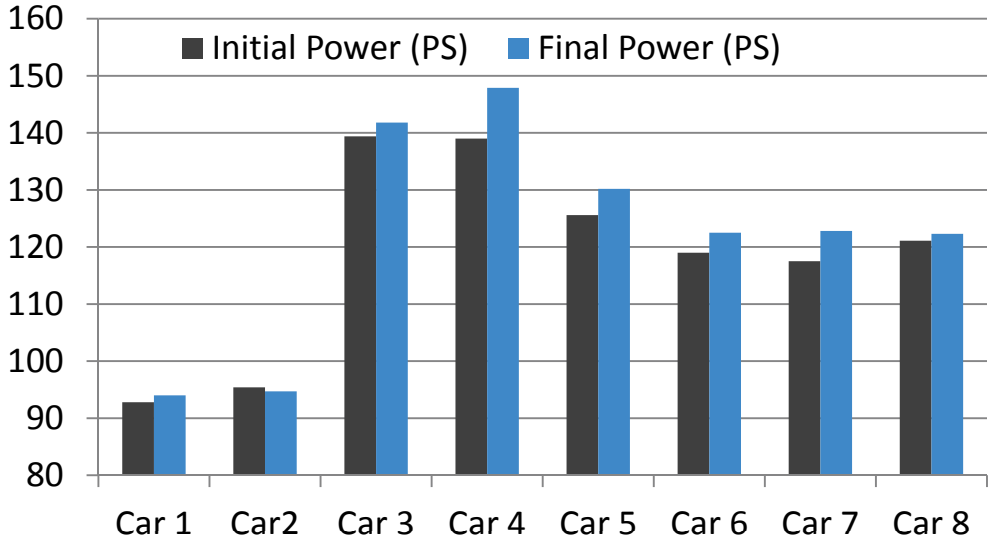
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Testing Results – TECHRON® Concentrate Plus (Petrol) Peak Power



Peak Power (PS) Initial & Final



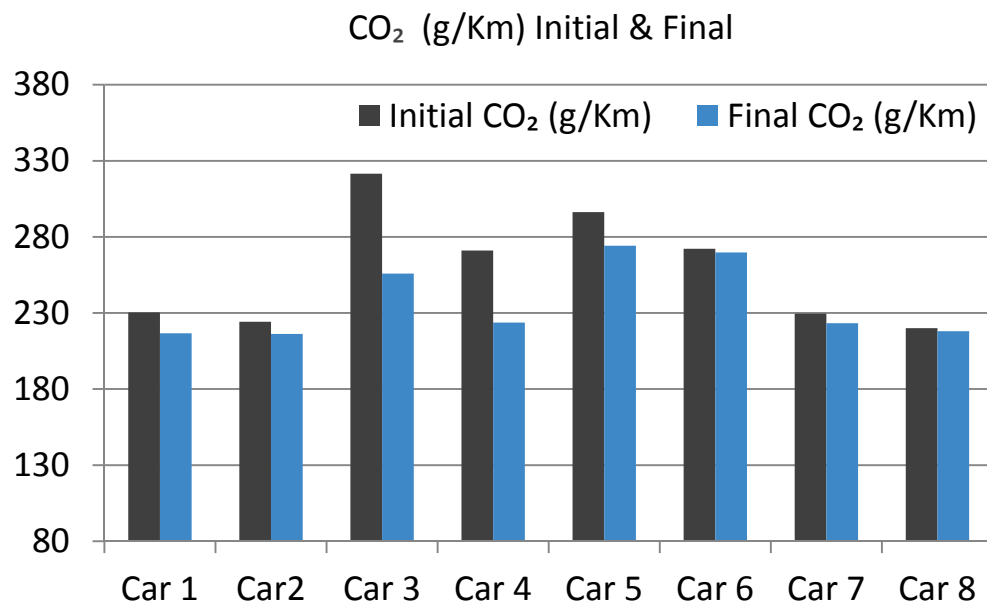
Average change in peak power in this test was 2.6%



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Testing Results – TECHRON® Concentrate Plus (Petrol) CO₂



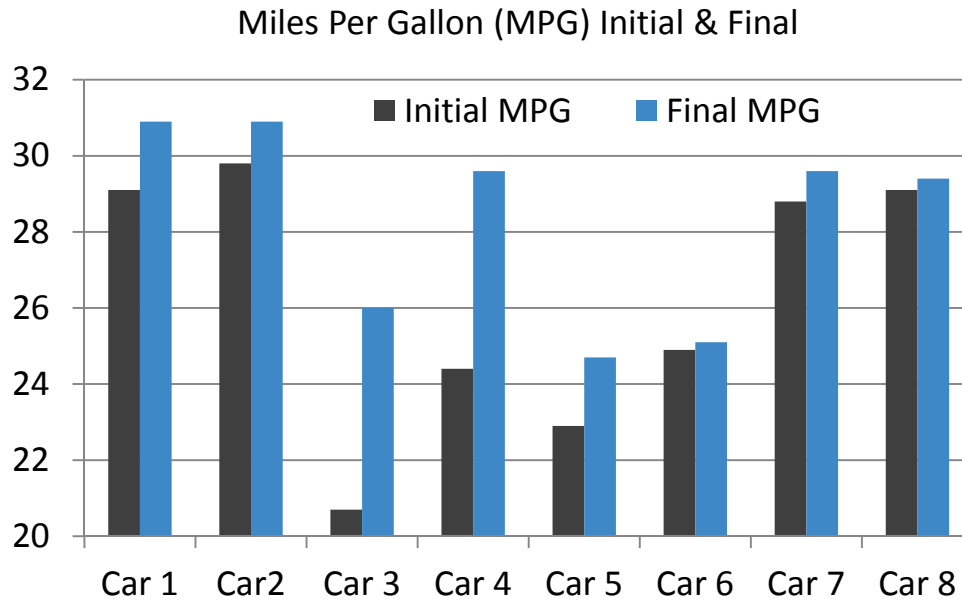
Average change in CO₂ in this test was - 7.4 %



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Testing Results – TECHRON® Concentrate Plus (Petrol) MPG



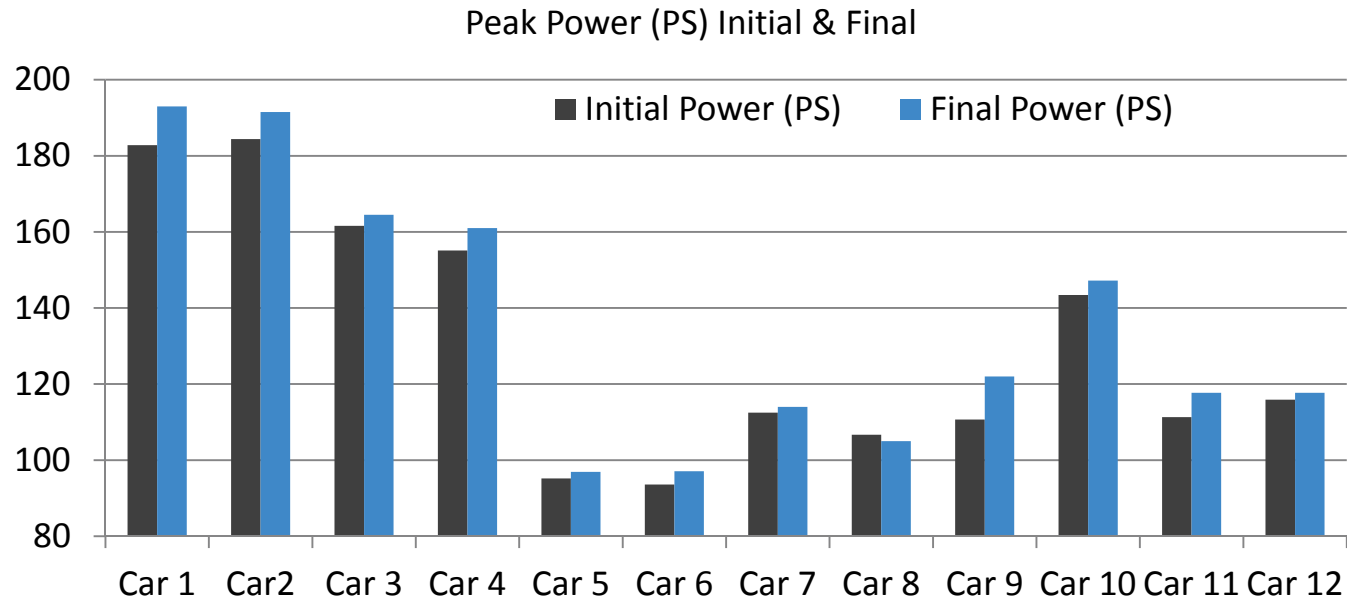
Average change in MPG in this test was 8.7 %



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Testing Results – TECHRON®D Concentrate (Diesel) Peak Power



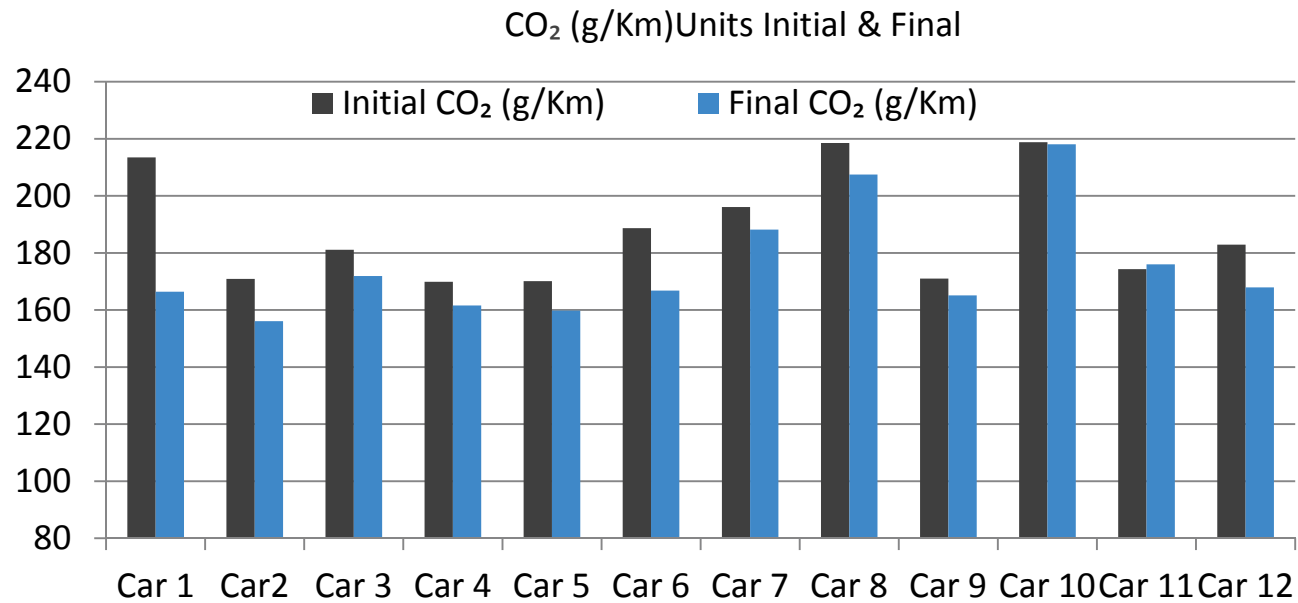
Average change in peak power in this test was 3.4 %



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Testing Results – TECHRON®D Concentrate (Diesel) CO₂



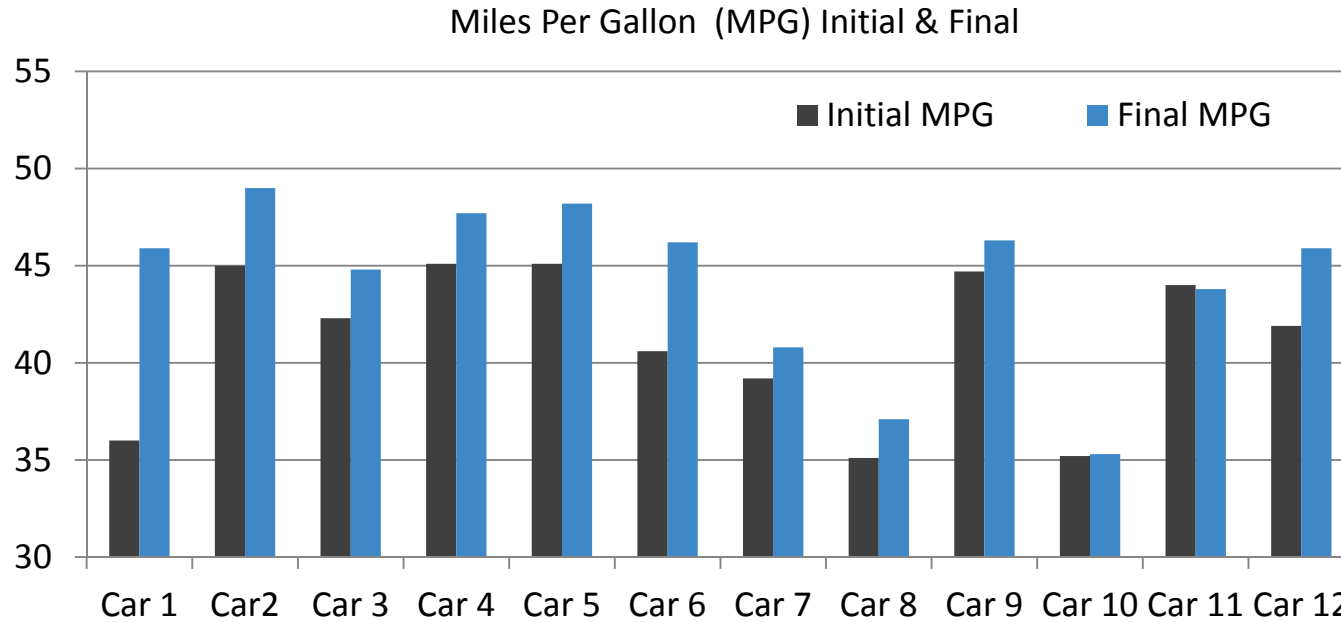
Average change in CO₂ in this test was -6.5 %



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Testing Results – TECHRON®D Concentrate (Diesel) MPG



Average change in MPG in this test was 7.6%



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Close

