naamsa

Cleaner fuels to support vehicle emission reduction in Southern Africa

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Presentation sections

- European CO_2 emission reductions and plans
- Vehicle CO_2 emission testing
- Vehicle technology trends to reduce emissions
- South Africa : Vehicle emission and fuel standards:
- SA Department of Energy fuel economy labelling
- SA National Treasury CO_2 vehicle taxation
- Summary

European new passenger car fleet standards and CO_2 legislation

- 130 gr/km average by 2015 – progressive intro from 2012.
- 95 gr/km average by 2020 – subject to review.
- Waver for sub 10,000 units pa and special arrangements for sub 300,000 units manufacturers.
- Not initially applied to light commercial vehicles – now set at 175 gr/km from 2017.
- Results in an effective 19% decrease in CO_2 emissions for all vehicles compared to current fleet.

Implications for Sub Saharan markets ?

European Fuel specifications: sulphur legislation

EU Member States must make petrol and diesel having a maximum sulphur content of 10mg/kg widely available from 2005 .

100% availability of such fuel mandated in 2009.

Light Vehicle Emissions Test Cell

Small vehicles only (Fully Laden < 3.5 t).

Multi million dollar investments

On-going calibration / correlation / maintenance requirements to maintain accuracy, precision and reliability

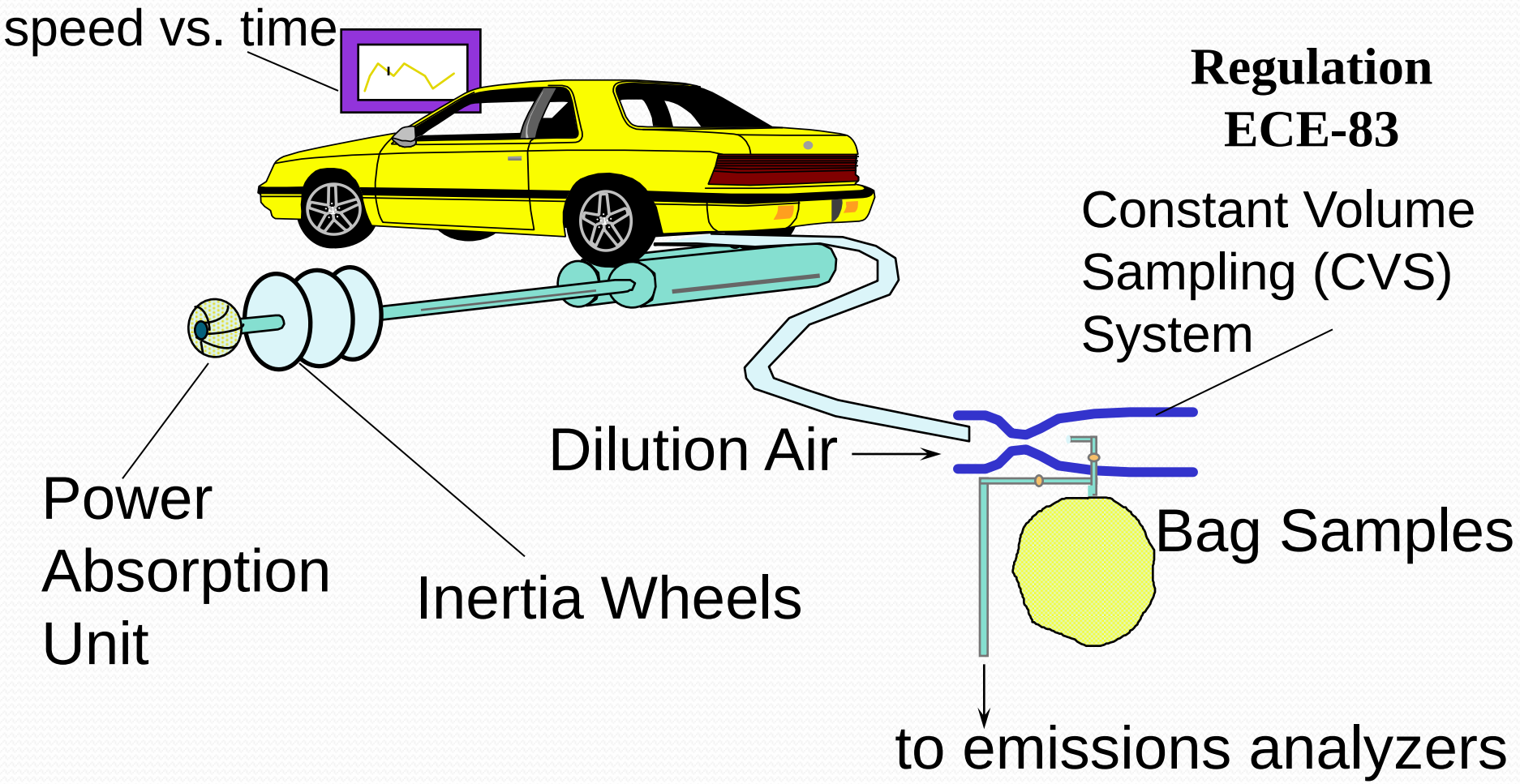
Highly skilled operators required

Ford Motor Company

Emission/CO2 Testing Facilities

Slide: Ford Motor Company

Typical Light Duty Vehicle Test Facility

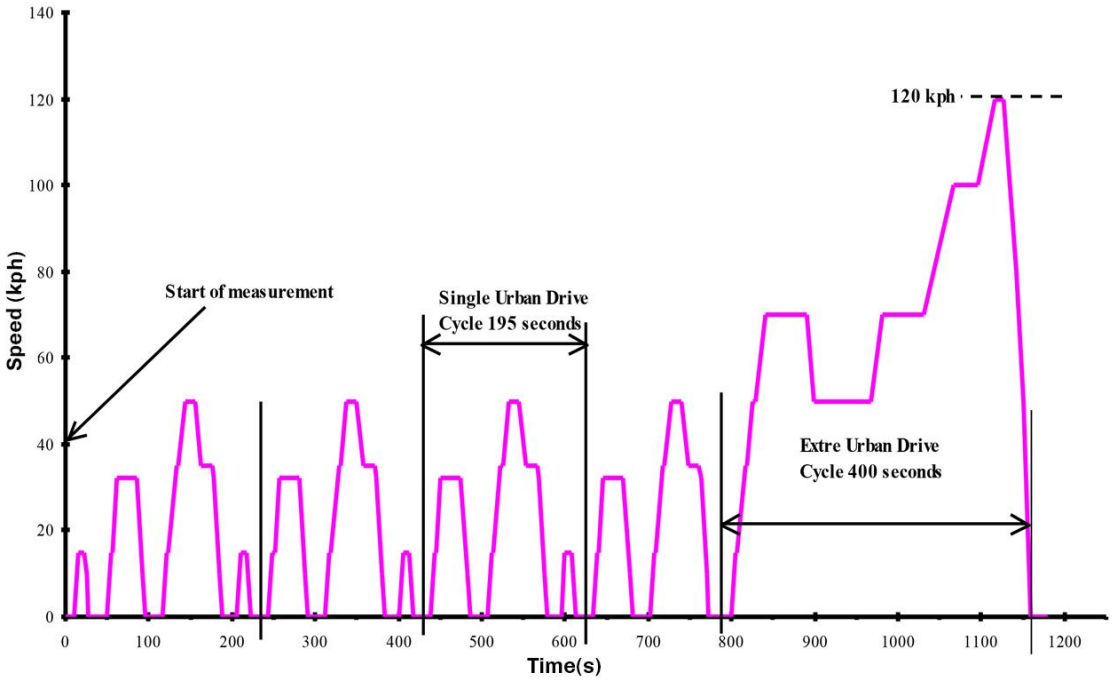


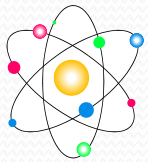
- Measurements in g/km

New European Driving cycle (NEDC)

- New European Emissions / CO2 Cycle applied from year 2000.
- Excellent for repeatability and assessment against legislative standards.
- Recognised by both Industry and Legislators for some time as not representative of real driving.
- NEDC not only used in Europe but Mauritius / India / China / Russia / S Africa and many parts of South America.

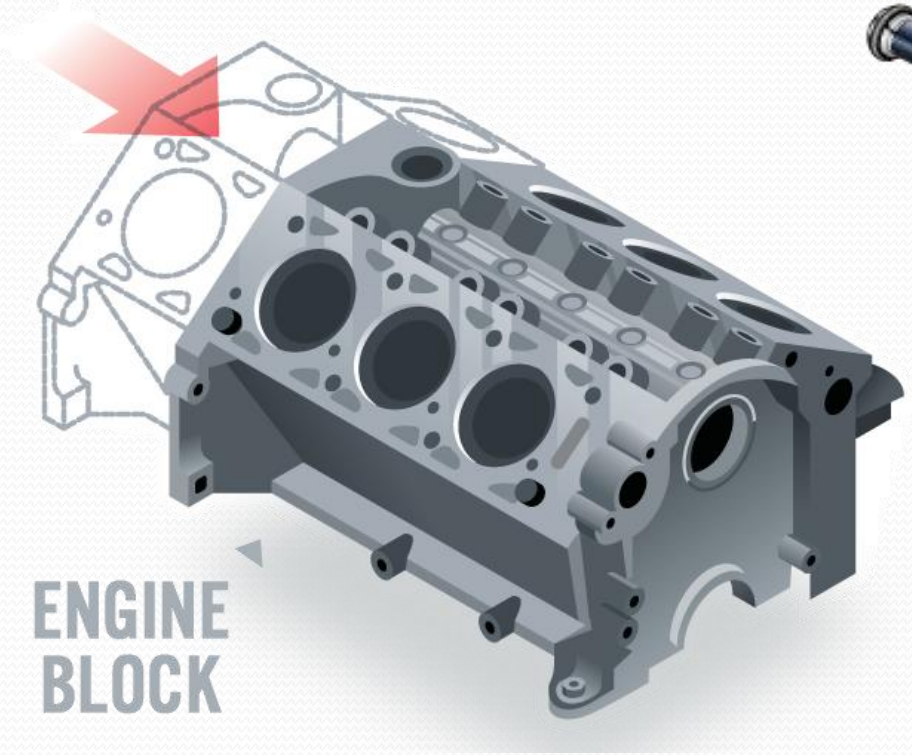
New European Driving Cycle (NEDC)





Vehicle technology trends: Petrol Engines

- **Gasoline Direct Injection**
- **Turbo charging**
- **“Downsizing & Boosting”**



Source: Ford Motor Company

New Vehicle Technology Migration

2012 2020 20

Recent/Near Term
Begin migration to advanced technology

Mid Term
Full implementation of known technology

Long Term
Volume roll-out of hybrid electric technologies and alternative energy sources

Near Term

- Significant number of vehicles with Stratified Injection technology
- Dual clutch and 6-speed transmissions replace 4- and 5-speeds
- Increased hybrid applications
- Increased unibody applications
- Introduction of smaller cars and CUVs
- Electric power steering
- Battery management systems
- Aero improvement

Mid Term

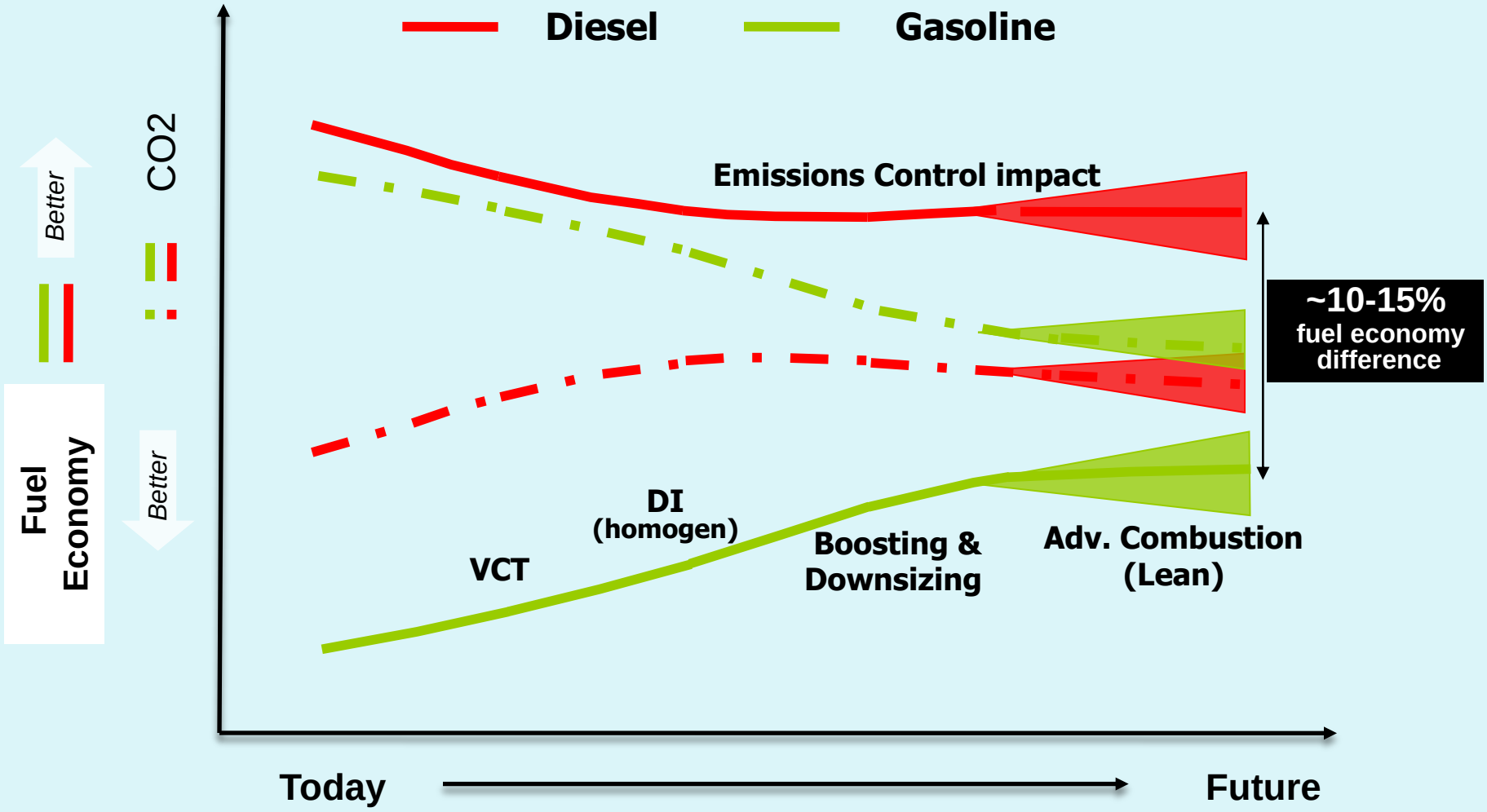
- Weight reduction
- Engine displacement reduction aligned with weight save
- Stratified injection engines available in nearly all vehicles
- Increased use of hybrids as a percentage of gas engines
- Increased diesel use as market demands
- Additional Aero improvements
- EPAS approaching 100% on light-duty vehicles
- Introduction of plug-in hybrids

Long Term

- Percentage of internal combustion dependant on renewable fuels
- Volume introduction of hybrids and plug-in hybrids
- Introduction of Battery Electric and fuel cell vehicles
- Clean electric / hydrogen fuels

Source: Ford Motor Company

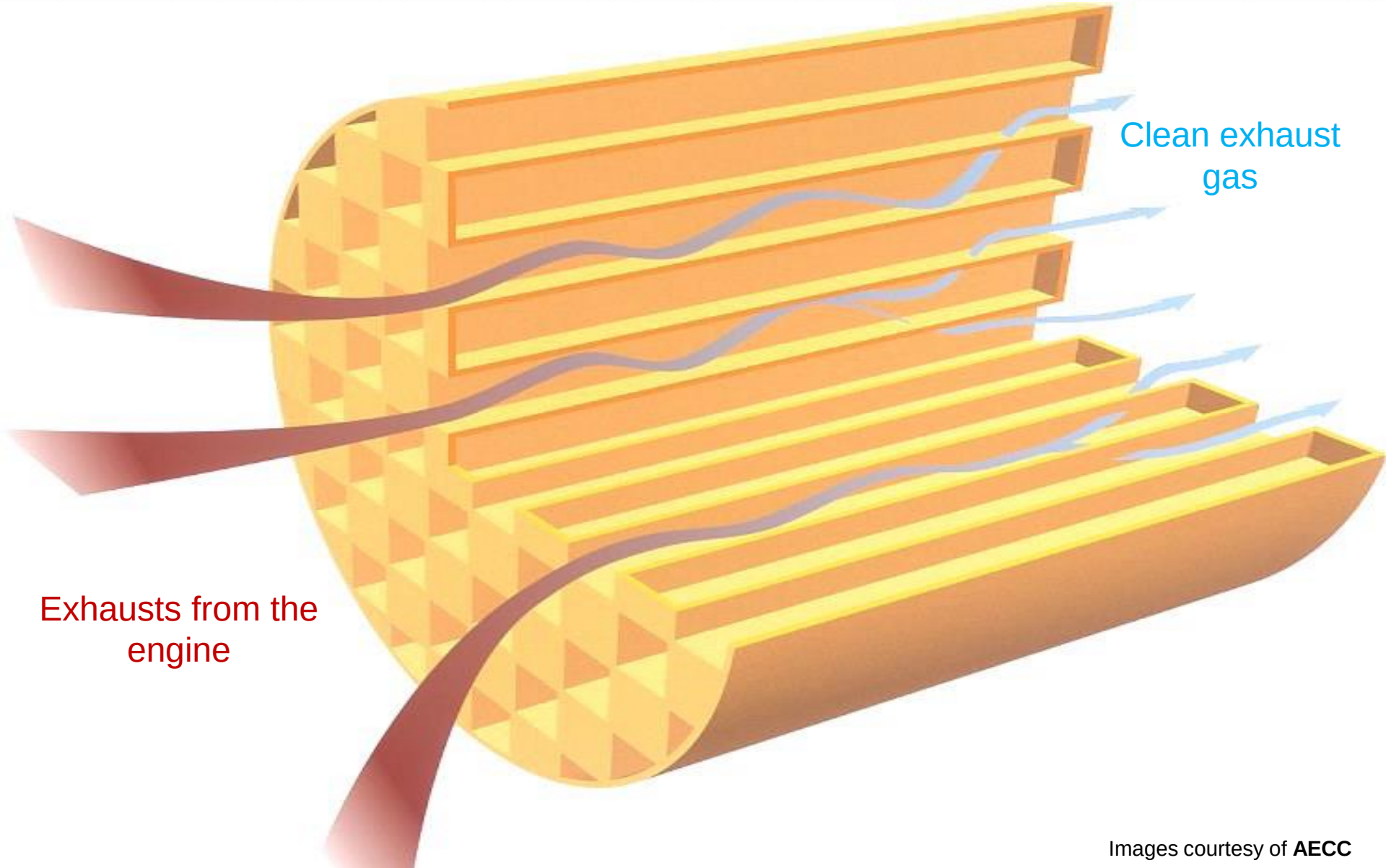
Advanced Gas technologies and stringent emission levels will reduce the Diesel vs. Gas fuel economy and CO2 gaps.



Source : Ford Motor Company

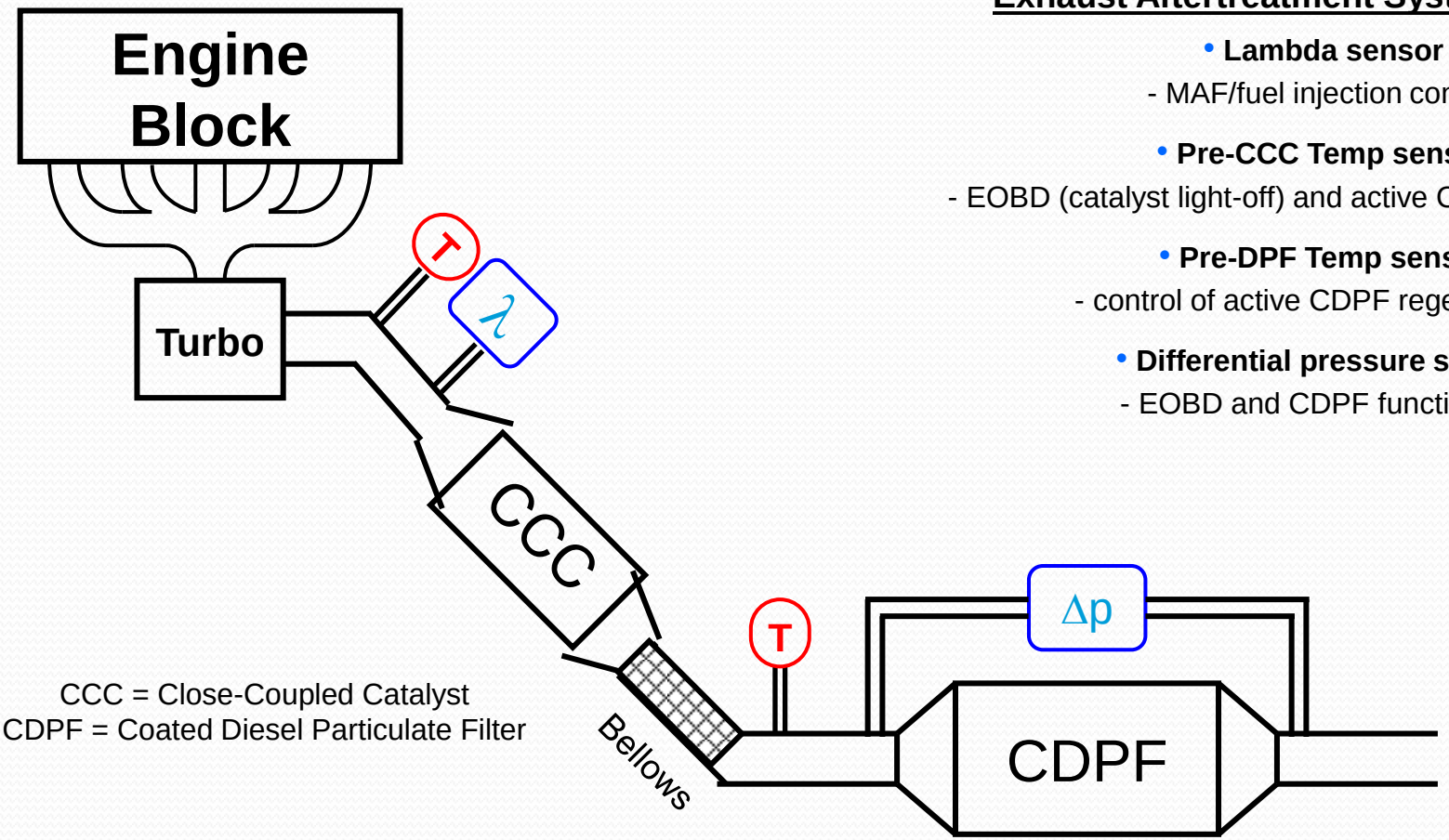
Low sulphur fuel benefits: Tailpipe emission reduction technology (non CO_2)

Cross section of a Particle Filter



Images courtesy of **AECC**

50ppm Sulphur Diesel: Diesel Particulate Filter

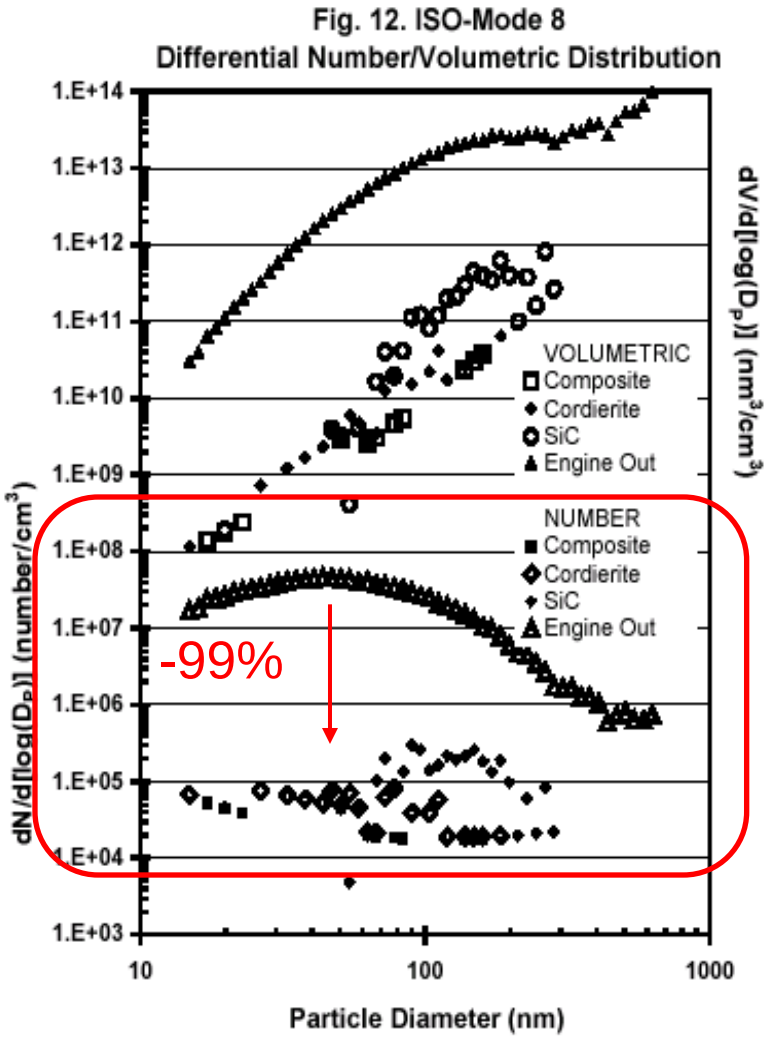


CCC = Close-Coupled Catalyst
CDPF = Coated Diesel Particulate Filter

Exhaust Aftertreatment System Sensors

- **Lambda sensor**
  - MAF/fuel injection control
- **Pre-CCC Temp sensor**
  - EOBD (catalyst light-off) and active CDPF regenerations
- **Pre-DPF Temp sensor**
  - control of active CDPF regenerations
- **Differential pressure sensor**
  - EOBD and CDPF functionality

How efficient is the filtration?



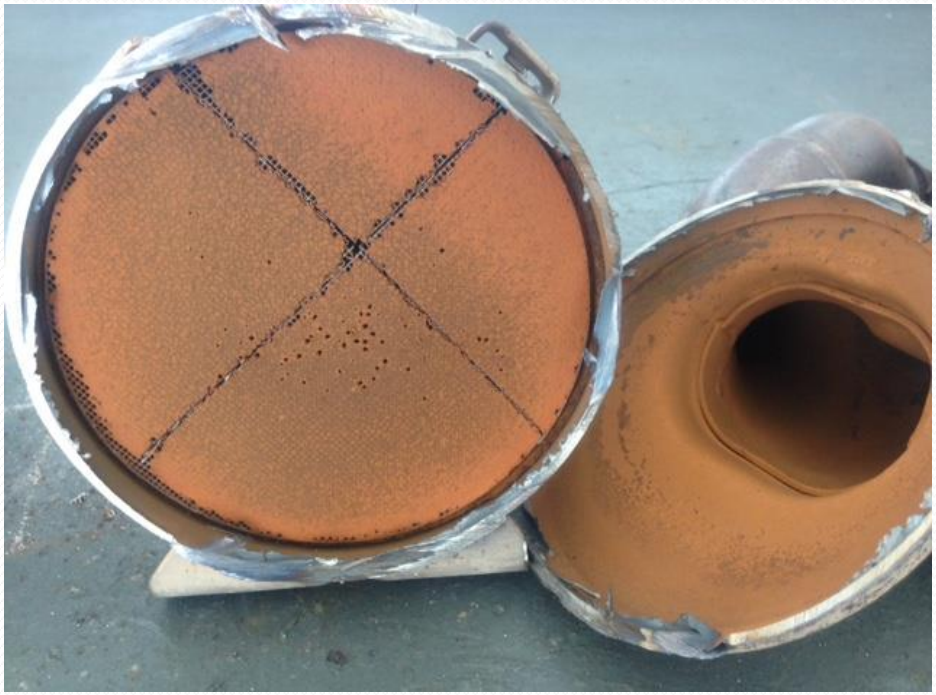
- Filtration efficiency between 95-99%
- Requires sub 50 ppm diesel
- Also to be applied to petrol vehicles

Diesel sulphur level : Service Interval implications

- 3000 ppm sulphur diesel resulted in service intervals of 5000 kms in SA – unacceptable to many operators.
- 500 ppm diesel resulted in an increase to at least 10,000 km (in conjunction with lubricity specs) making diesel light vehicles more viable
- In South Africa diesel service intervals are now typically between 15,000 and 20,000 km with widespead availability of 50 ppm diesel
- Effect on service intervals was perhaps the most significant benefit of the sulphur reduction for SA manufacturers and importers
- Full alignment with European intervals will require further sulphur reductions in line with EU standards.

Metal additives in petrol

Recent issues in East Africa



ISSUE : Manganese being increasingly used at uncontrolled levels at a time when catalyst cell mesh density is increasing

EU Mn limit – 2mg/l (with warning label)

Manganese related blockages of catalytic converters : Tanzania 2016

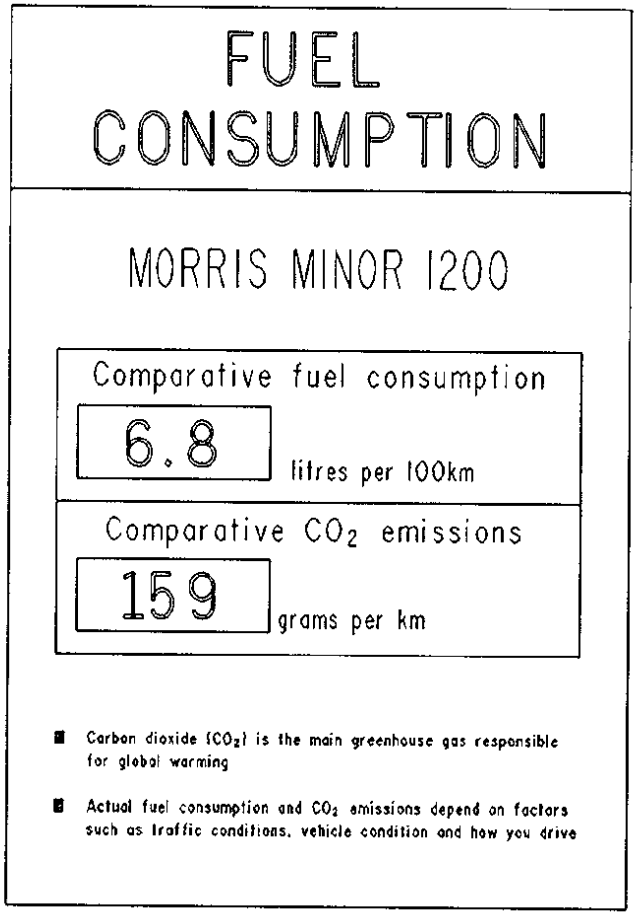
SA Government initiatives(1) Department of Energy

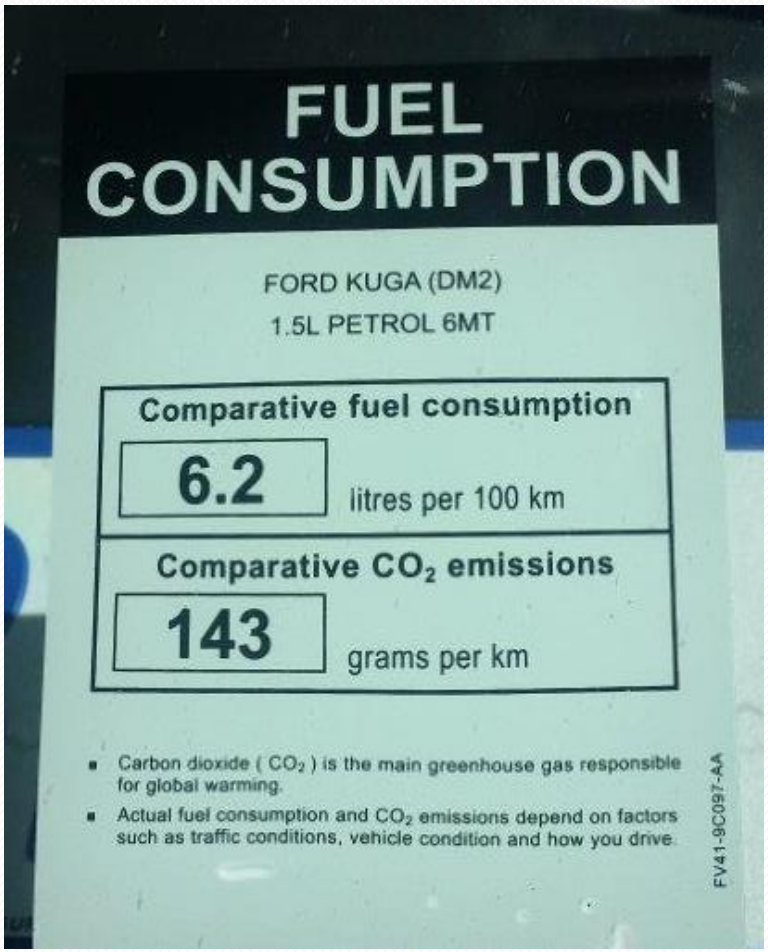
- Energy Efficiency Strategy
- Energy Efficiency Accord

Department of Energy: Energy Efficiency Strategy 2009: Objectives

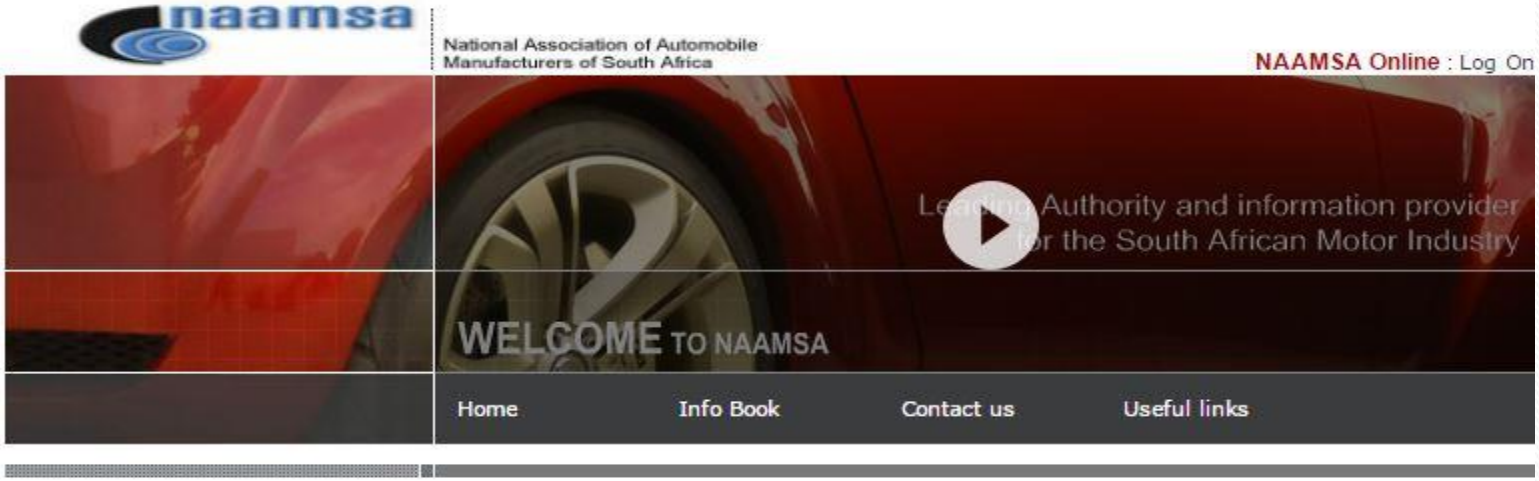
- Targets to be met by 2015
- Industry and Mining – 15% final energy demand reduction
- Power Generation – 15% reduction in parasitic electrical usage
- Commercial and Public Sector Buildings – 15% final energy demand reduction
- Residential sector – 10% final energy demand reduction
- **Transport sector – 9% final energy demand reduction (achieved)**

South Africa: New passenger car Fuel Economy/CO_2 label





NAAMSA Fuel Economy/CO_2 Database



COMPARATIVE PASSENGER CAR FUEL ECONOMY AND CO2 EMISSIONS DATA

Firstly, please select the **MAKE** of your vehicle.
Then select from the next dropdown box for the **TYPE** of your vehicle (eg FORD Focus).
Then click the **SHOW MODELS** button. Upon clicking this, your results will appear.

Make: FORD Type: FORD Fiesta

Model	Body shape	Transmission	Fuel	CC	Consumption (l/100KM)	CO2 Emissions (g/KM)
Fiesta 1.0 EcoBoost Ambiente 5-dr MY15 Powershift	Hatch (5-dr)	Elec	Petrol	1.0	4.9	114
Fiesta 1.0 EcoBoost Ambiente 5-dr MY16	Hatch (5-dr)	Man	Petrol	1.0	4.3	99
Fiesta 1.0 EcoBoost Titanium 5-dr MY13	Hatch (5-dr)	Man	Petrol	1.0	4.3	99
Fiesta 1.0 EcoBoost Titanium 5-dr MY15 Powershift	Hatch (5-dr)	Elec	Petrol	1.0	4.9	114
Fiesta 1.0 EcoBoost Trend 5-dr MY13 Powershift	Hatch (5-dr)	Elec	Petrol	1.0	4.9	114
Fiesta 1.0 EcoBoost Trend ESP 5-dr MY16	Hatch (5-dr)	Man	Petrol	1.0	4.3	99
Fiesta 1.4 Ambiente 5-dr MY14	Hatch (5-dr)	Man	Petrol	1.4	5.7	130
Fiesta 1.5 TDCi Ambiente 5-dr Dsl MY16	Hatch (5-dr)	Man	Diesel	1.5	3.6	94
Fiesta 1.5 TDCi Trend 5-dr Dsl MY16	Hatch (5-dr)	Man	Diesel	1.5	3.6	94
Fiesta 1.6 ST 3-dr MY13	Hatch (3-dr)	Man	Petrol	1.6	5.9	138
Fiesta 1.6 TDCi Trend 5-dr Dsl MY13	Hatch (5-dr)	Man	Diesel	1.6	3.6	95

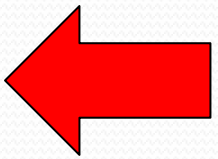
SA Government initiatives (2) National Treasury

- Environmental based taxation proposals: April 2006
- CO_2 taxation: New passenger cars and D/Cab LCV's.

National Treasury Environmental Fiscal Reform Draft: Reforming existing tax

Table 7: Options for reforming existing environmentally-related taxes

Theme	Instrument	Incentive mechanism	Shortcomings and key technical considerations
Transport (National Government)	General fuel levy	• Increases the price of transport fuels, thereby suppressing demand; • Discourage vehicle use; • Encourage the use of public transport / vehicle sharing; • Encourage the development of fuel efficient technologies; and • Could encourage the use of certain fuels over others.	• Not differentiable for time and location of infrastructure use; • Relatively far removed from the main source of environmental externality; • Complementary policies required to increase its effectiveness such as information campaigns; • Potentially regressive.
	Vehicle customs and excise duties	• Increase the price of certain vehicles (building on the idea of a luxury tax) thereby suppressing demand for passenger and light commercial vehicles; • Encourage the use of public transport / vehicle sharing; • Could encourage the use of selected types of vehicles / technologies through differential taxation.	• High information requirements on vehicle types and technologies; • Difficult to link tax to the time and frequency of infrastructure use (if desirable);
Transport (Provincial Government)	Vehicle licensing fees	• Increase vehicle ownership costs and therefore suppress vehicle demand; • By altering the fee structure to include environmental criteria, appropriate incentives could be offered to vehicle users; • Could be used to increase scrapping rate of older vehicles (i.e. differentiate fees according to the age of the vehicle).	• The environmental incentive is likely to be small; • Must avoid over-complication of fee structure; and • Potentially regressive.

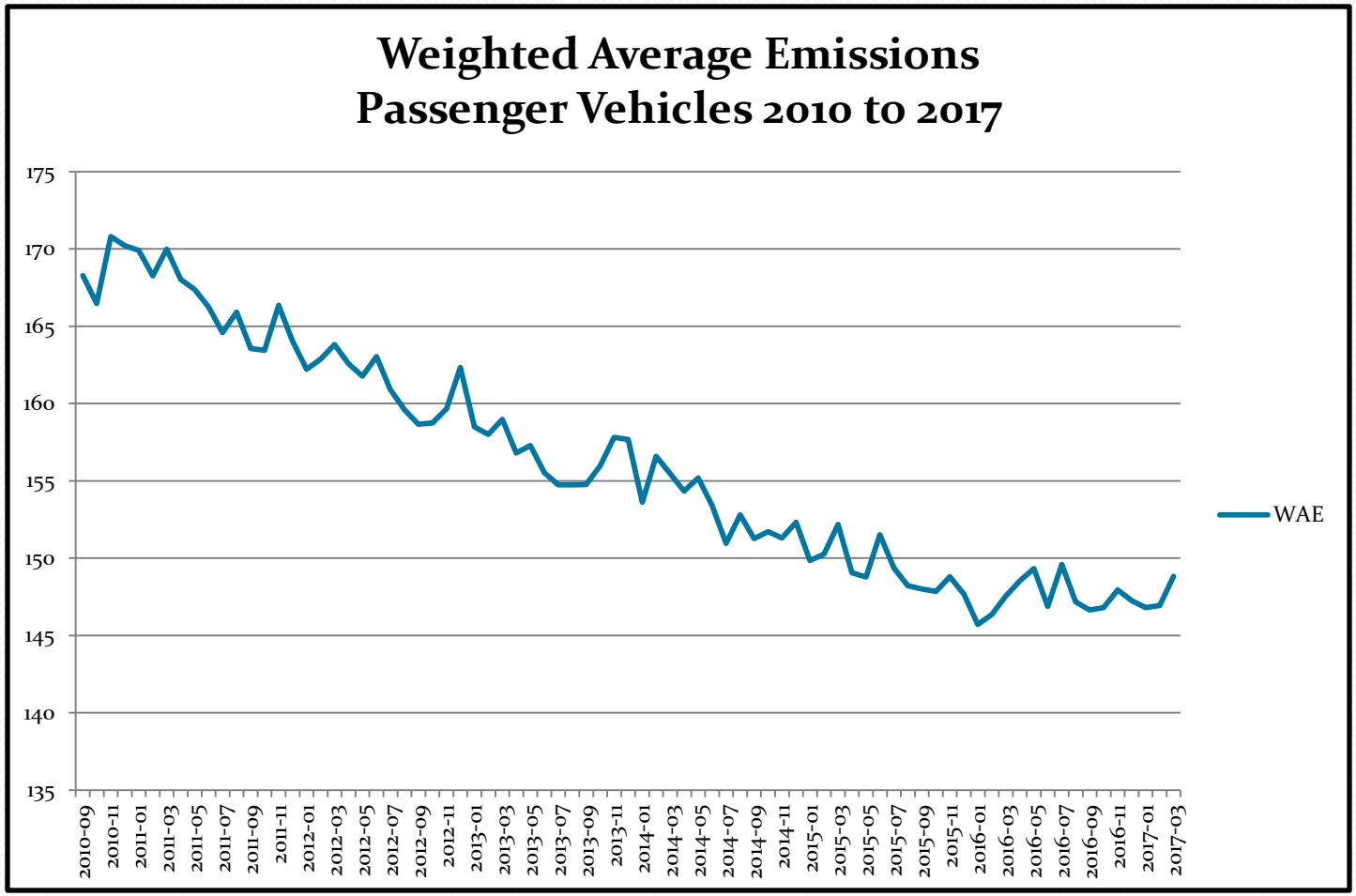


Final CO2 Standards and Taxation

- **The rate of emissions tax on passenger vehicles is R75* per gram CO_2 emissions in excess of 120 g/km based on test reports.**
- **The rate of emissions tax on double cabs is R100 per gram CO_2 emissions in excess of 175 g/km based on test reports.**
- **If no test report is available the CO_2 emissions will be calculated according to the following formula:**
  - Passenger vehicles < 3000 cm^3: 120 + (0.05 x cm^3) = g/km CO_2
  - Passenger vehicles > 3000 cm^3: 175 + (0.05 x cm^3) = g/km CO_2
  - Double-cabs: 195 + (0.07 x cm^3) = g/km CO_2

*** R100 per gram CO_2 from April 2016**

South Africa: Passenger car CO_2 emission data and trend



Data source: Lightstone/NAAMSA

Key points

- Globally all developed markets have moved towards high fuel economy and low emission vehicle technology ,utilising progressively **reduced sulphur level fuels.**

- In the case of Southern Africa, the benefits of enabling fuel and legislated CO2 standards and taxation was showing an approximate 1% pa CO2 improvement for passenger cars until 2016. **Further progress towards more fuel efficient technology, is subject to appropriate quality fuels becoming available.**

- Comparison of typical 'developing market' spec vehicles with that of the EU indicates **significant improvements in CO2/fuel economy are possible, given the appropriate fuel quality**.

- The **South African Bureau of Standards petrol and diesel specifications (SANS 1598 & SANS 342)** can be considered a practical compromise between local needs and EU standards, sufficient to support the introduction of the latest low emission vehicles into the region.

World-Wide Fuel Charter

- First established in 1998 to promote greater understanding of fuel quality needs of motor vehicle technologies and to harmonize fuel quality world-wide in accordance with vehicle needs
- This is the go-to document for fuel quality information.
- Covers both gasoline and diesel, with four levels of each for fuel quality based on emission requirements
- Biofuels covered by separate document
- Access from AutoAlliance.org
  - http://www.autoalliance.org/files/WWFC.pdf

End

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