

# How to reduce CO<sub>2</sub> Emissions from Cars by Retrofit

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# Fuel Consumption Reduction by Retrofit

Golf TSI 1,4 I 125 kW



# Comparison Petrol versus Diesel

## Petrol

1.4 TSI 125 kW 6- gear box

7,2 l/100km      CO<sub>2</sub> 169 g/km      Price 22.700,00 €

1.4 TSI 125 kW DSG

7,2 l/100km      CO<sub>2</sub> 169 g/km      Price 24.375,00 €

## Diesel

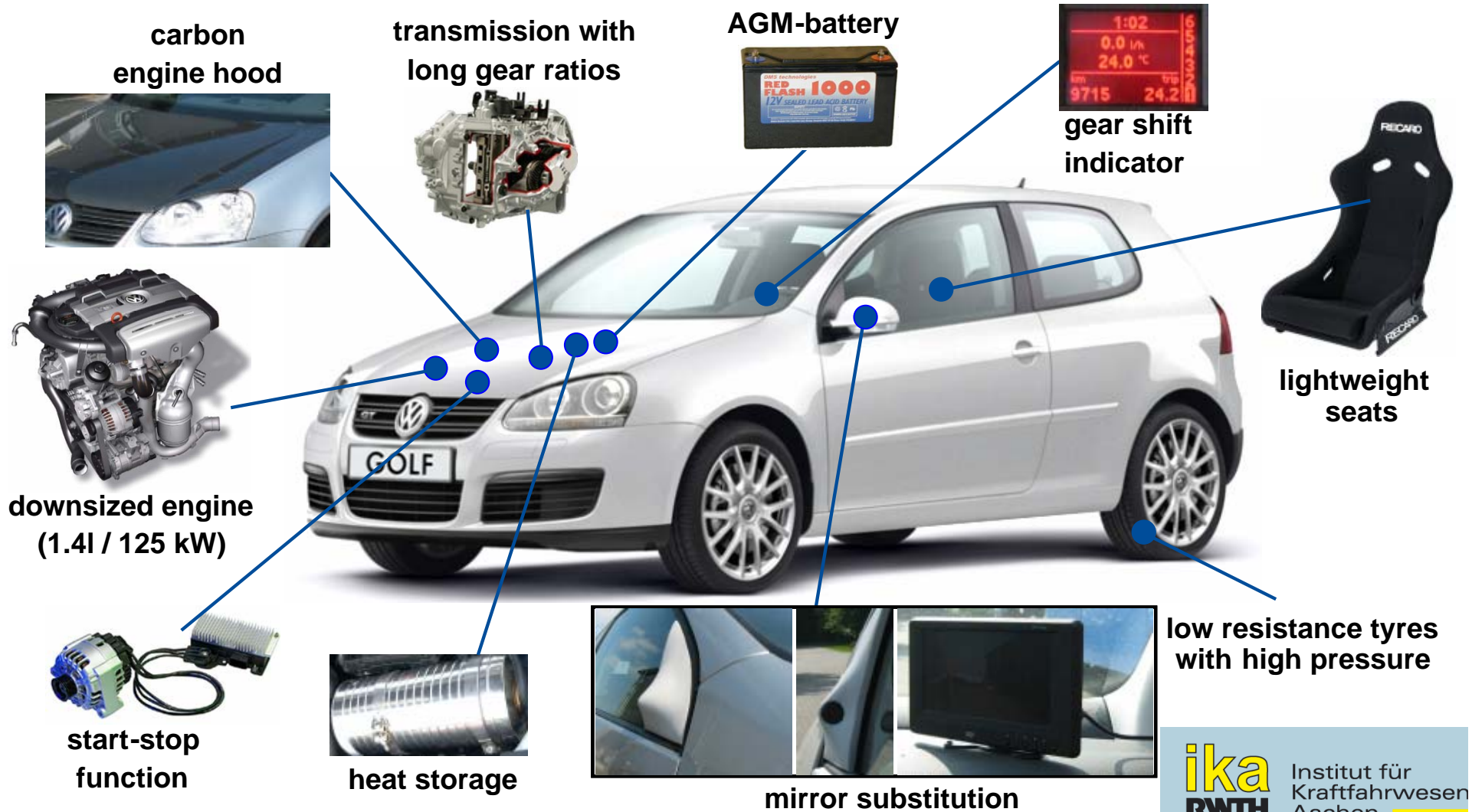
2.0 TDI DPF125 kW 6-gear box

6,0 l/100km      CO<sub>2</sub> 158 g/km      Price 25.175,00 €

2.0 TDI DPF125 kW DSG

6,4 l/100km      CO<sub>2</sub> 173 g/km      Price 26.850,00 €

# Fuel saving measures



# Reduction of CO<sub>2</sub>-emissions

Measures	Reduction of CO <sub>2</sub> -Emissions in NEDC [g/km]
<b>already implemented:</b>	
Narrow tyres (205/55 R16)	6
Transmission with long gear ratios	6
Gear shift indicator	12
Mirror substitution *	0
Heat storage	5
Start-stop-function	7
<b>planned:</b>	
Regenerative braking *	2 - 5
Low-viscosity engine and transmission oil *	5 - 7
Weight reduction *	2 - 5
Narrow tyres (185/65 R15) *	2 - 5

CO<sub>2</sub>-emissions  
of base vehicle:

**172 g/km**



**-24 %**

current CO<sub>2</sub>-emissions of  
demonstrator vehicle:

**131 g/km**

\* impact calculated / estimated

# The 3L Project

**VOX - Magazin Auto Motor und Sport TV and 9ff convert a VW Golf 1,9 TDI to a low energy car. . Auto Motor und Sport TV documents the retrofit of the car from the 6th of May in ten broadcasts. The last is on the 15th of July 2007.**

**9ff has dismantled the Golf completely to check where to save weight. Narrower tires and better engine technology helps to reduce fuel consumption to 3 liter per 100km, which is 80g CO<sub>2</sub>/ km.**



# Retrofit Measures of the VOX-TV Projects in Cooperation with 9ff Dortmund

Basic vehicle: Golf V, 1,9 TDI, 90 kw, 5-doors

Basic weight:1360 kg; Basic CO<sub>2</sub>:151 g/km = 5,61l/km

Measure	supplied by	red. weight
Lighter construction front axle	9ff Fahrzeugtechnik	25 KG
Lighter construction rear axle	9ff Fahrzeugtechnik	25 KG
Engine hood, roof cover, back door: Carbon	Die Wethje GmbH Kunststofftechnik	31 KG
Front doors:Carbon	Die Wethje GmbH Kunststofftechnik	22 KG

<b>Lighter wheels</b>	<b>Otto Fuchs KG</b>	<b>11 KG</b>
<b>Special low rolling resistance tires</b>	<b>Vredestein</b>	<b>8 KG</b>
<b>Lighter front seats</b>	<b>Recaro</b>	<b>40 KG</b>
<b>Improved back seats</b>	<b>9ff</b>	<b>11 KG</b>
<b>Smaller lighter tank</b>	<b>Continental Contitech</b>	<b>31 KG</b>
<b>Ceramic brake disks</b>		<b>16 KG</b>
<b>Engine and gear box from 3-L-Lupo (1,2 TDI)</b>	<b>9ff</b>	<b>70 KG</b>

**Total reduction**

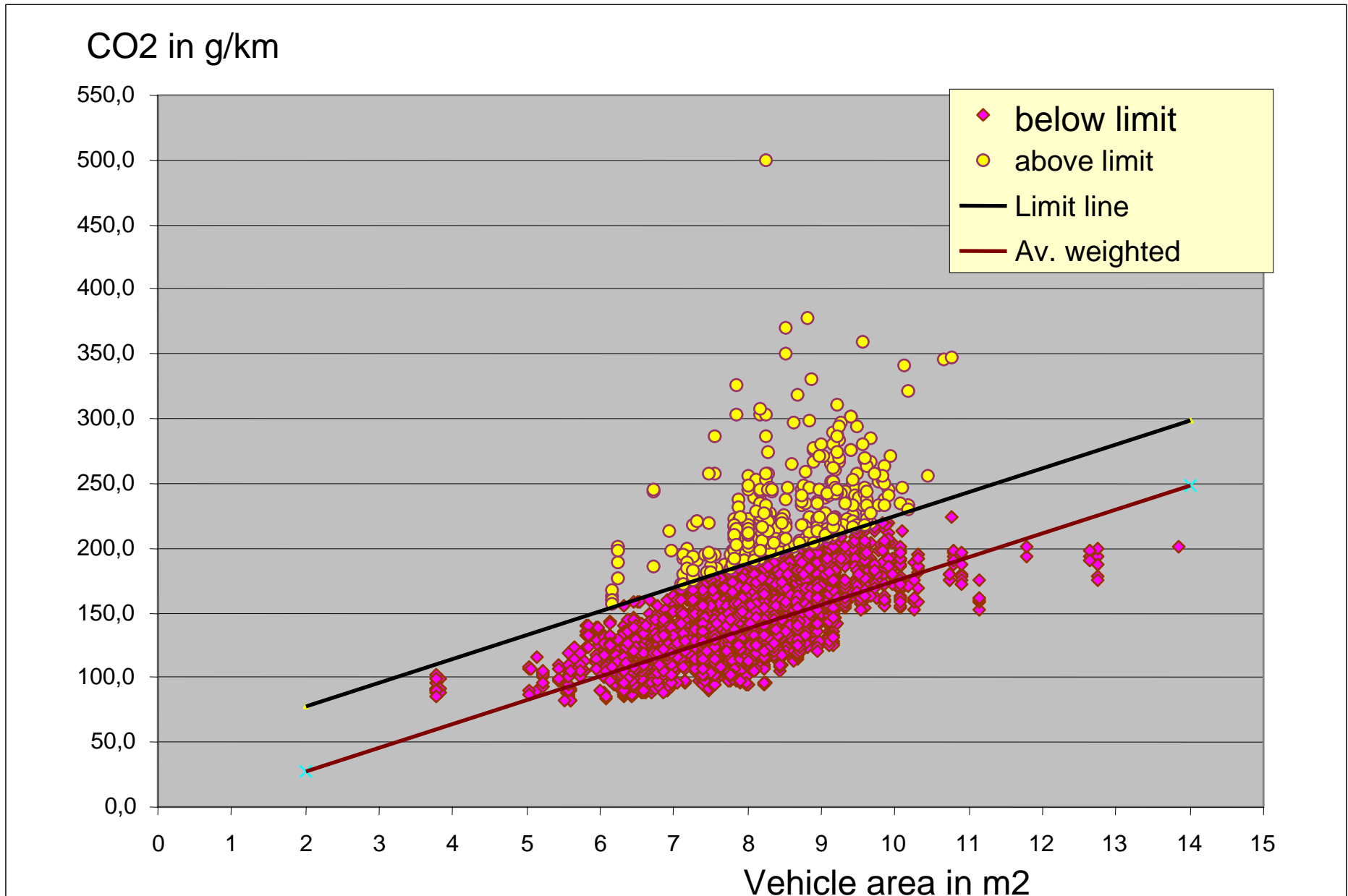
**368 KG**

**Goal: below 90 g/km**





# Proposal for a CO<sub>2</sub> Limit



# Conclusions

There is a clear need to control the carbon dioxide emission as other pollutants.

It should be emission limit per vehicle based on the vehicle area.

It is no need to develop new vehicles.

Only exchange of parts and improvements are enough to meet the 130 g/km target in 2012

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