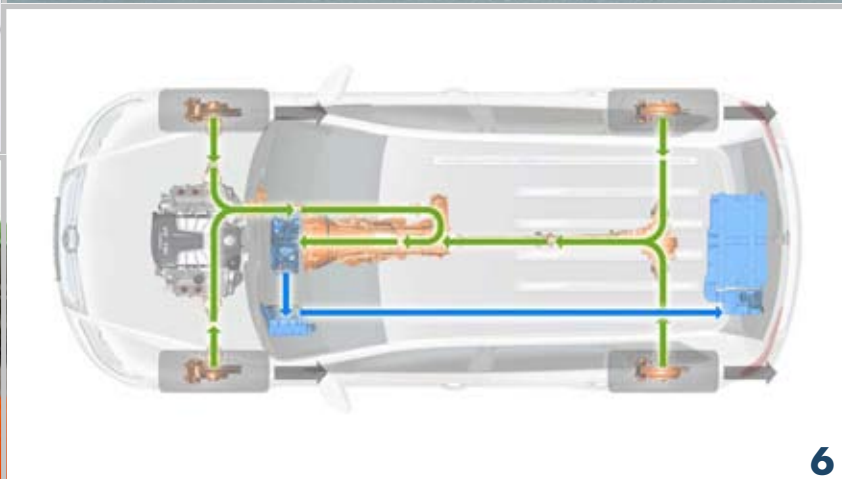


VIA VISION

INNOVATIONS FROM VOLKSWAGEN

NO 01
March 2009

Editorial – Dr. Ulrich Hackenberg	2
To Be Green is To Be Blue – BlueMotionTechnologies	3
Directives, Directives – CO ₂ -cap and the European exhaust emission standard	4
Brake, De-clutch, Save – Start-stop function	5
Brake – and Reover Energy – Recuperation	6
What Goes Around Comes Around – Exhaust gas recirculation and the NO _x -storage catalyst	7
A Different Kind of Gas – EcoFuel	8
The Future is Now – Hybrid	9
Wolfsburg Innovations at Geneva – The New Polo BlueMotion II	11
Imprint	12



Dear reader,



Dr. Ulrich Hackenberg, Member of the Board of Management with responsibility for Development for the Volkswagen brand

The challenges the automotive industry faces today are not easily met: The task is to ensure mobility in harmony with the environment, and to develop technologies that not only meet today's need of climate and environmental protection, but also show ways for us to be able to keep enjoying motorcar mobility.

Because we want to share our vision with you, we at Volkswagen AG will give you an insight into the latest innovations from our research and development department in this VIAVISION newsletter every two months.

Novelties and new approaches to current challenges for the automotive industry, such as the reduction of global CO₂-emissions, alternative energies and engines, safety and concepts of mobility, are presented and explained already during development, if possible.

This newsletter gives you access to the ideas and skills of the “engineering company” Volkswagen, serves as a working basis, offers ideas and provides contacts for discussion and further research.

The first edition of VIAVISION, marking the opening of the Geneva Motor Show, is therefore dedicated to BlueMotionTechnologies – our umbrella brand for sustainable mobility. Under this label, our long-term engine and fuel strategies are grouped, which take into account both the growing shortage of raw materials as well as general environmental protection.

We invest into new vehicles, second-generation bio fuel, and ecological technologies like the hybrid drive-train or the electric motor.

According to a recent survey carried out by Deutsche Automobil Treuhand – one of the leading market research institutions in Europe – and Motorpresse Publishers, we're on the right track: BlueMotion is by far the best known automotive eco-brand in Germany.

I hope you enjoy reading our newsletter and am looking forward to presenting more exciting topics in our May edition.

Yours sincerely,

Dr. Ulrich Hackenberg, Member of the Board of Management with responsibility for Development for the Volkswagen brand

To Be Green is To Be Blue

BlueMotionTechnologies

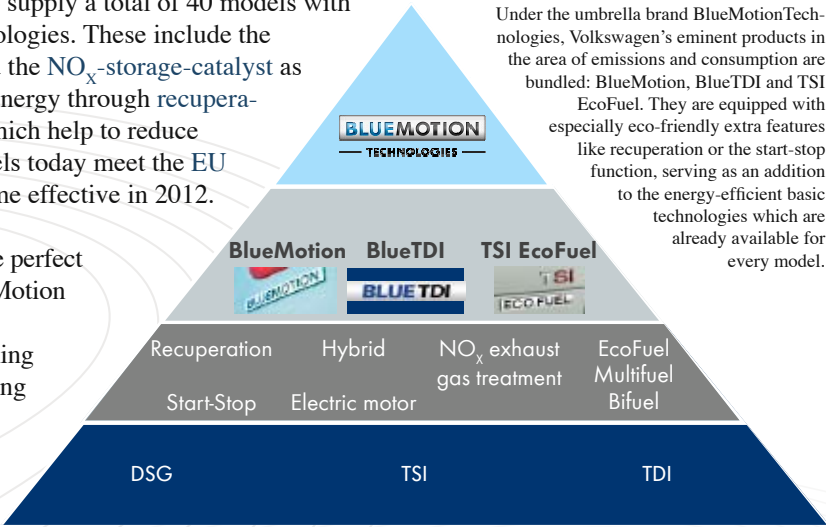
Climate change can justly be called one of the biggest ecological challenges facing mankind today. The Intergovernmental Panel on Climate Change (IPCC) has assessed that the effect could be held within a controllable scope – but only if CO₂-emissions are reduced drastically. In order to reach this – and other conservation goals – Volkswagen has set out to become not only Europe’s biggest, but also Europe’s greenest, car manufacturer.

Under the umbrella brand BlueMotionTechnologies, we have brought together all research and development activities of Volkswagen’s under a single environmental campaign. But why Blue? Blue is the colour of the ocean and the sky – Blue stands for freshness, dynamics and lightness – Blue is also the colour of the Volkswagen group – it envelops everything that characterises BlueMotionTechnologies.

While the Polo stood alone as the first model of the Blue range in 2006, it was quickly joined by no less than eight companions during the following eight years – starting with the Caddy and the Golf, all the way to the Touran. This development did not go unnoticed among the German public: a recent representative survey by the Deutsche Automobil Treuhand (DAT) has shown that 85 percent of German motorists are familiar with the BlueMotion brand.

This year Volkswagen launches the second generation within its sustainability strategy, planning to supply a total of 40 models with eco-friendly supplementary technologies. These include the fuel-saving start-stop function and the NO_x-storage-catalyst as well as the recovery of electrical energy through recuperation. Thanks to these measures, which help to reduce CO₂-emissions, many of our models today meet the EU emission standards that will become effective in 2012.

Complementing our pursuit of the perfect engine – the electric motor – BlueMotion engineers are also utilising engines powered by alternative fuels, attaining a model-like 75-60-40: implementing a 75 percent reduction of carbon monoxides, 60 percent less of nitrogen oxides and 40 percent less of hydrocarbons.



An SUV fitted with a hybrid drive-train will be launched already next year. It will be able to go short distances powered by electrical energy alone and have a consumption of less than nine litres per 100 kilometres. And – even if those might be the most fitting colours for it – it will also be available in other shades than just green or blue.

* IPCC Fourth Assessment Report (AR4) (2007).

Directives, Directives

CO₂-cap and the European exhaust emission standard

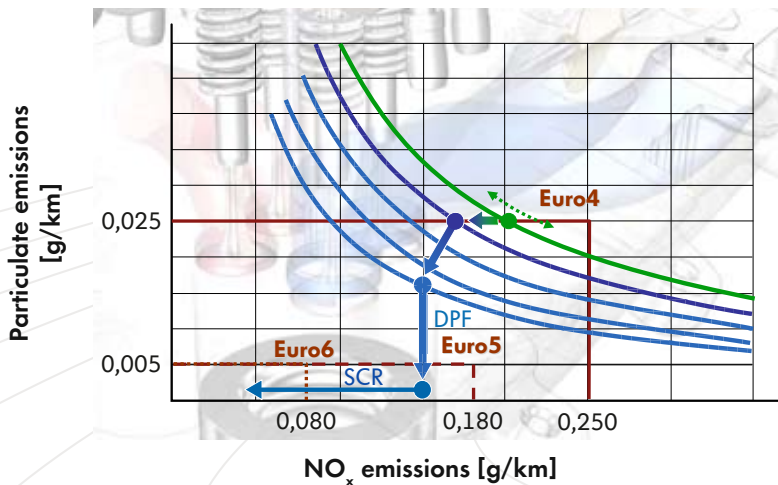
Climate change, global warming, the greenhouse effect – the IPCC’S Fourth Assessment Report, published in several parts in 2007, formulated very clear demands to the automotive industry. The bottomline: reduced emissions of the greenhouse gas CO₂ for all vehicles.

The European Parliament issued binding standards in December 2007 when it passed a cap on CO₂-emissions for the European Union: 120 grammes per kilometre will be the limit in the future.

The new standard is actually a concession to the automotive industry, since it is not binding from the very start but becomes effective at staggered intervals. By 2012, 65 percent of the new vehicle fleet of any

On the right track: The current European emission standard Euro 4 (red line) allows for relatively high particulate matter (PM) and nitrogen oxides emissions. From September 2009 onwards, however, engines are required to blow off 25 percent less in pollutants, and 70 percent less by 2014 when Euro 6 becomes effective. Car manufacturers are meeting the severe requirements step by step by perfecting several technologies: The combustion process is optimised by exhaust gas recirculation (dark blue line); components like pistons, cylinders and the injection unit are improved (light blue lines); diesel particulate filters (DFP) are standard (bottom line). But the last steps towards fulfilling the Euro 6 standard can only be taken with the help of a catalytic converter specially designed for chemically binding nitrogen oxides, the SCR (Selective Catalytic Reduction) catalyst.

- Starting configuration
- Low temperature EGR
- Optimisation
 - Piston
 - Cylinder head
 - Injection
- Serial configuration Euro 5 with Diesel particulate filter
- Serial configuration Euro 6 NO_x-aftertreatment with SCR



one manufacturer are supposed to meet the standard; by 2013 the requirement is 75 percent; by 2014 80 percent; while by the year 2015 all 100 percent are required to meet the standard. Should manufacturers fail to fulfil the requirements, they are going to face penalties. Things will get extremely expensive come 2019: from then on, each extra gramme of CO₂ emitted will cost the manufacturers no less than 95 Euros per vehicle.

Vehicle owners will have to pay more, too. In the future, motor vehicle tax will not only be based on cubic capacity alone, but also on the car's classification according to the EU's exhaust emission standards. The next standard will be Euro 5, which will become effective as of September 1, 2009. It will provide binding rules for NO_x-emissions. According to Euro 5, a passenger car with a petrol engine shall emit no more than 60 milligrammes of nitrogen oxides per kilometre, with a limit of 180 milligrammes for diesel engines. But even Euro 6 is already a fact: while the limits for petrol engines remain the same, the cap for diesel engines will be reduced to 80 milligrammes.

Brake, De-clutch, Save Start-stop function

At the beginning of the 1990s, people smiled at the Golf Ecomatic and its start-stop function, but now in the days of environmental consciousness – not to mention rocketing fuel prices – it is literally worth a fortune. The automatism guarantees that the engine is only running as long as it is really needed – invaluable for inner-city traffic. With the start-stop function you can save up to 0.2 litres in fuel per 100 kilometres.



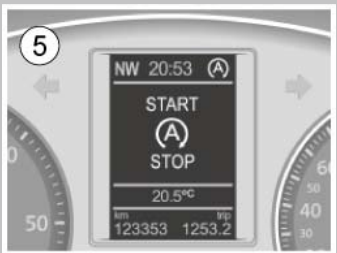
Start-Stop function – here is how it goes:



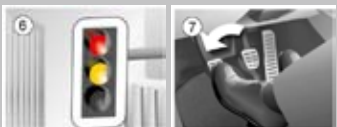
① The driver brakes until vehicle stops, ... ② ... shifts the manual gearbox in neutral, ...



③ ... releases the clutch ... ④ ... the engine is turned off automatically



⑤ ... "Start-Stop" appears on the display.



⑥ The driver wants to continue the journey, ... ⑦ ... depresses the clutch, ...



⑧ ... the engine is restarted, ...



⑨ ... "Start-Stop" disappears... ⑩ ... the driver selects first gear and drive away.



Fuel-saving tips by Volkswagen and the Nature and Biodiversity Conservation Union (NABU)

Apart from the technical equipment, a vehicle's consumption strongly depends on the motorist's driving style. Here are a few tips – you can also practice them at one of our training courses.

1. Avoid unnecessary loads

Fuel-saving starts before you even hit the road: Clear out your trunk. Every extra kilogramme increases the fuel consumption, the rule of thumb is: An extra 100 kilogrammes cost you half a litre. Especially equipment like roof boxes weighs heavily on the fuel tank.

2. Check the tyre pressures

Check the tyre pressures regularly, and use the pressure recommended by your manufacturer for full loads. This reduces road resistance and therefore fuel consumption by up to five percent.

3. Avoid short journeys

On trips shorter than five kilometres, the engine remains cold and consumes more fuel. Directly after the start, a medium-sized vehicle consumes an average 30 litres or more per 100 kilometres.

4. Use high gears and »swim« with the traffic

The rule of thumb is: petrol engines should run at less than 2,500, diesel engines at less than 2,000 rpm. You can use third gear in traffic already at 30 kilometres per hour. Anticipation can also help you to drive economically: Look ahead when driving and always maintain sufficient distance between you and the vehicle in front. This way you can react more fluidly to changes in the flow of traffic, which saves petrol since accelerating burns more fuel.

5. Buckle up, start the engine, go

Don't start the motor before you're ready: Buckle up, adjust your rearview mirrors and your seat, stow away your luggage. Don't wait for passengers with the motor running. It's also not necessary to warm-up the motor before you start, for example while you're

Brake – and Revover Energy Recuperation

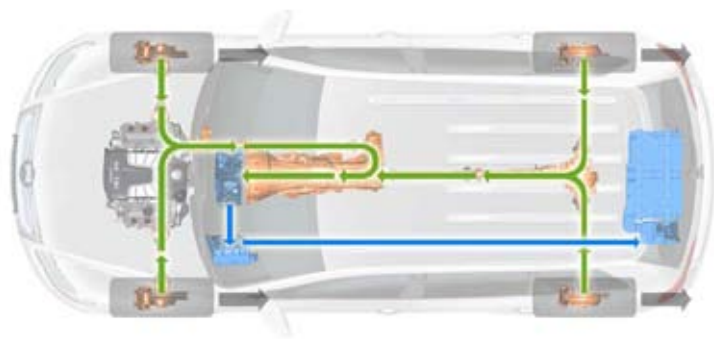
“Knee-brace could charge batteries” the headlines ran last year. What seems, at first sight, like the slightly crazy idea of some scientist, actually follows a principle that has been in use in the automotive industry for years: the recovery of electrical energy released during braking – the technical term for which is “recuperation”.

It's a simple idea – The energy that is released every time you push down, or release, the brake pedal – which would normally go wasted – is harvested by means of a generator and fed back into the engine or the battery. In practice, this means that you can actually generate electrical energy during braking and downhill driving.

The technology can reduce consumption and with it CO₂-emissions; especially in hybrid cars, i.e. vehicles powered by an electric motor combined with a combustion engine.

But even cars fuelled by a combustion engine alone can benefit from recuperation. The energy harvested during braking powers the radio, heater and headlights, so that the engine itself has to produce less energy.

By the way, the subjects testing the knee device during the US study generated an average of five watts – enough to power a small guitar amplifier.



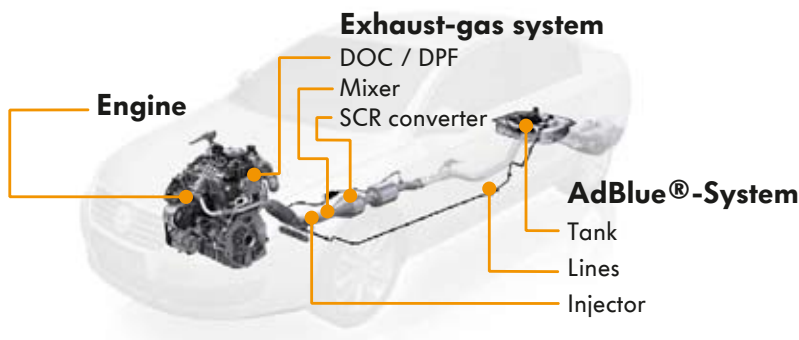
When the brake pedal is released or pushed down, the wheels' kinetic energy (green line) is harvested by a generator (blue) which converts it into electric energy and passes it on to the battery or electric motor (blue line).

What Goes Around Comes Around Exhaust gas recirculation and the NO_x-storage catalyst

The main aim of the new Euro emission standards Euro 5 and 6 is to reduce the pollution caused by harmful nitrogen oxides (NO_x) that are produced during combustion processes.

In a petrol engine's combustion chamber, nitrogen oxides are created mainly due to the high temperatures at which the mixture of fuel and oxygen is burned. To avoid excessive heat, modern combustion engines re-inject part of the exhaust gas into the combustion chamber so that less nitrogen oxides are produced.

But this technology alone, known as exhaust gas recirculation, is not enough meet the severe emission standards. The amount of harmful nitrogen oxides has to be reduced even further. This can be done with special types of catalysts: called the NO_x-storage catalyst and the SCR converter. Together, they reduce NO_x-emissions. The exhaust gas first passes through the NO_x-storage catalyst and then through the SCR unit. Using AdBlue, a synthetic high-purity urea solution, the nitrogen oxides are converted to harmless diatomic nitrogen and water.



Mounted between motor and exhaust pipe, NO_x-storage catalyst and SCR unit make sure harmful nitrogen oxides from combustion processes are rendered relatively harmless. The chemical reaction is made possible by a liquid named AdBlue, a synthetic urea solution, which helps to split nitrogen oxides into nitrogen and water.

scraping ice off your car windows. It only burns extra fuel.

6. Switch gears quickly, accelerate quickly

Shift into second gear already a car's length after starting. As you accelerate further, push the pedal far down and switch gears soon.

7. Use additional devices with moderation

The more the alternator is strained by using devices like air-conditioning, the higher the consumption. Use additional fuel-burning devices moderately. Air-conditioning, rear-window heating etc. cost you at least 0.6 litres per 100 kilometres.

8. Turn it off!

Switch off the engine not only at railroad crossings, but also if you have to wait longer at traffic lights - unless the engine is still cold. Anything over 30 seconds saves you fuel, since the engine consumes between 0.8 and 1.5 litres per hour even in neutral.

9. Let it roll

Take your foot off the accelerator when you go downhill. If you become too slow due to engine braking, throw out of gear and use the momentum as long as possible.

10. Drive smoothly and calmly

Don't speed - fuel consumption goes up disproportionately above 100 kph. A steady pace of about 100 to 130 kph also helps you to avoid frequent braking.

Training Courses:

March 7: Mainz
Scherer GmbH, Robert-Koch-Straße 18,
55129 Mainz, Register at:
Info@NABU-Rheinhausen.de

March 14: Saarbrücken
Grossklos GmbH, Wiesenstr. 1, 66115
Saarbrücken, Register at:
LGS@NABU-Saar.de

March 28: Bad Harzburg
Autohaus Scholl, Dr.-Heinrich-Jasper-Str. 59,
38667 Bad Harzburg, Register at:
info@autohauscholl.de

April 25: Mutterstadt
Autohaus Henzel, An der Fohlenweide 3,
67112 Mutterstadt, Register at:
NABU.Sued@NABU-RLP.de

A Different Kind of Gas EcoFuel

Taking a leaf out of Jules Verne’s novel “Around the World in Eighty Days”, an adventurous man from Mannheim is travelling across Germany in 80 days like a modern day Phileas Fogg. While in 1873 the fictitious gentleman had to cope with a poor railway system, stubborn elephants and slow-going steamers, Rainer Zietlow is facing a slightly more modern kind of challenge.

His ambition is to stop at every single one of the 800 natural gas filling stations in Germany, together with his team and their Passat EcoFuel which runs on natural gas. ”We are doing this to promote the nationwide network of natural gas filling stations and its expansion,“ Zietlow says about the campaign. They started in Irschenberg on January 7: the small town in Bavaria hosts Germany’s south-easternmost natural gas filling station. Since then, they have been up and down the country; past Germany’s largest natural gas field in the Münsterland region, a natural gas filling station that only sells German natural gas as well as filling stations for public transport buses.

The journey is scheduled to end in Westerland on the island of Sylt on March 22. You can follow the “800 CNG EcoFuelTour” (Compressed Natural Gas) on their website www.800cng.de. It is updated daily with recent photos and comments. You can even click yourself right into the Passat’s cockpit via livestream.

The distance of about 20,000 kilometres is the perfect opportunity to show that a passion for driving and a green engine go together very well. With the price of petrol rising every day, and growing ecological awareness, drive-trains like EcoFuel have become a true alternative. Not only is the raw material cheaper but it is also much more eco-friendly because it produces lower CO₂-emissions. During the tour, the amount of CO₂ saved in comparison to a petrol engine is documented in real time on the website. And this is no mean sum: at a mileage of about 13,000 kilometres, the Passat had already saved 589.702 kilogrammes of CO₂.



800 natural gas filling stations in 80 days – this is the challenge Rainer Zietlow (above, right) and his colleague Franz Janusiewicz are facing in their new Passat EcoFuel.

EcoFuel – drive with natural gas
Already in 2005 Volkswagen presented two vehicles with the new EcoFuel drive-trains at the International Motor Show (IAA) in Frankfurt. EcoFuel means that these vehicles run primarily on natural gas. In contrast to the BiFuel concept, where the overall range of 900 kilometres is mainly achieved using the petrol engine, EcoFuel is a “quasi monovalent” concept for natural gas mode, with the petrol tank mainly acting as a back-up.



Natural gas – diamond among alternative fuels

Under the term natural gas all combustible gaseous hydrocarbons of natural origin are grouped. Dead organisms, plankton and algae that deposited at the bottom of the sea millions of years ago were covered and sealed off by rock formations and layers of earth. Through an anaerobic long-term process under high pressure, the organic substances were converted into gaseous hydrocarbons, today's natural gas. In order to store it in a fuel tank, it has to be compressed – hence the term Compressed Natural Gas. According to its methane content, natural gas is classified as low (L) or high (H). A higher concentration of methane also means a higher energy density.



On day 38 of the “800 CNG EcoFuel Tour”, the Passat is already greeted by a friendly cardboard filling station assistant in Iserlohn.

Save and conserve with natural gas

The energy content of one kilogramme of natural gas corresponds to:

- 2 litres liquefied petroleum gas • 1.5 litres petrol • 1.3 litres diesel

Natural gas vehicles can save you a lot of costs. In Germany, natural gas is good value for money because of its low CO₂-emissions, which means it is taxed relatively low. At 0.90 Cent/kg natural gas cuts the costs for petrol by 50 percent, and those for diesel by 30 percent. It also has considerably lower emissions.

Compared to a petrol-run vehicle, a natural gas vehicle produces

- 75% less carbon monoxide • 80% fewer hydrocarbons • 25% less CO₂
- 20% less hydrocarbon and nitrogen oxides.

The Future is Now

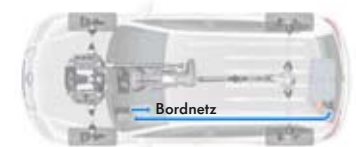
Hybrid

Zero emissions – that is what every sustainability-oriented car engineer dreams of. The perfect solution would be a vehicle driven by an electric motor whose energy is generated from renewable sources alone.

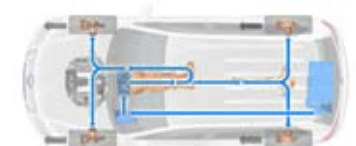
Today, this is still fiction, because so far, batteries cannot store enough energy for a long enough to enable time in order to power a car engine. While waiting for energy carriers to become sophisticated enough for a car to run on them sufficiently fast, as well as for a sufficient period, the hybrid system is the most effective alternative. The combination of a combustion engine and an electric motor already makes it possible to drive short distances emission-free today.

The technical term covers a whole range of different types of drive-trains. In all cases, a combustion engine, or a fuel cell, are combined with a generator, a battery and one or more electric motors which can be assembled in different ways.

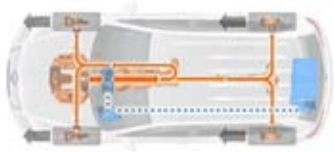
Driving with a hybrid system – the different types of drive-train



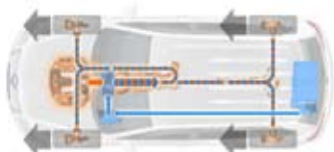
Standstill: The cut out clutch is open, the combustion engine is off.



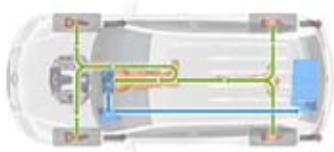
Electric driving: The cut out clutch is open, the combustion engine is off. The car is run by the electric motor.



Combustion propulsion with load levelling:
At higher load requirements, i.e. when accelerating, the electric motor starts the combustion engine. The vehicle is now driven by the combustion engine. Depending on the power level, the battery is charged by the combustion engine.



Boost: At very high load requirements, the electric motor supports the combustion engine.



Regenerative braking: The cut out clutch is opened and the combustion engine is turned off. The kinetic energy is converted into electric energy by the generator and stored in the battery (cf. page 6).

The hybrid system switches between engines, always using the most efficient one, while the combustion engine remains the vehicle's main drive-train. Compared to a conventional combustion engine, the one in a hybrid vehicle is smaller, lighter and less powerful.

The electric motor is switched on when needed. It also charges the battery during driving and serves as the starter for the petrol or diesel engine. Additionally, it stores surplus energy in a battery, through recuperation for example. The surplus energy can be used if necessary, or can feed the electric motor.

The combustion engine is shut off when it idles – such as at traffic lights or in a traffic jam. Similarly, it is switched off during braking, or it runs

**By definition, a hybrid vehicle has
to be able to run on its electric motor
alone at least for a while.**

along in neutral gear. The combustion engine is only used for longer distances and higher speeds.

On the way towards an affordable and safe large-scale production electric vehicle, Volkswagen is bringing on board a new partner: the automotive group and Toshiba Corporation have signed a letter of intent in February. The aim is to push the development of electric drive units and accompanying power electronics.

Furthermore, the two corporations plan to develop battery systems with a high specific energy density for "the next generation" of electric vehicles. The Chairman of the Board of Management at Volkswagen AG Prof Dr Martin Winterkorn is convinced "that this will be a major step forward towards the development of series production electric vehicles for our customers."

Wolfsburg Innovations at Geneva The New Polo BlueMotion II

The BlueMotion campaign began with the Polo in 2006 – the Polo is also in the second generation's front line. At the Geneva Motor Show 2009 a study about the Polo BlueMotion II will be presented – the world's most economical five-seater.

With a consumption of 3.3 litres and a mere 87 grammes of CO₂ emitted per kilometre, it is set to hit German roads at the beginning of 2010.

The team grouped around

Member of the Board
Dr Ulrich

Hackenberg is on a tight schedule

because the development of the new 1.2-litre-TDI with

Common Rail direct fuel

injection has to be completed first.

But the development team remains

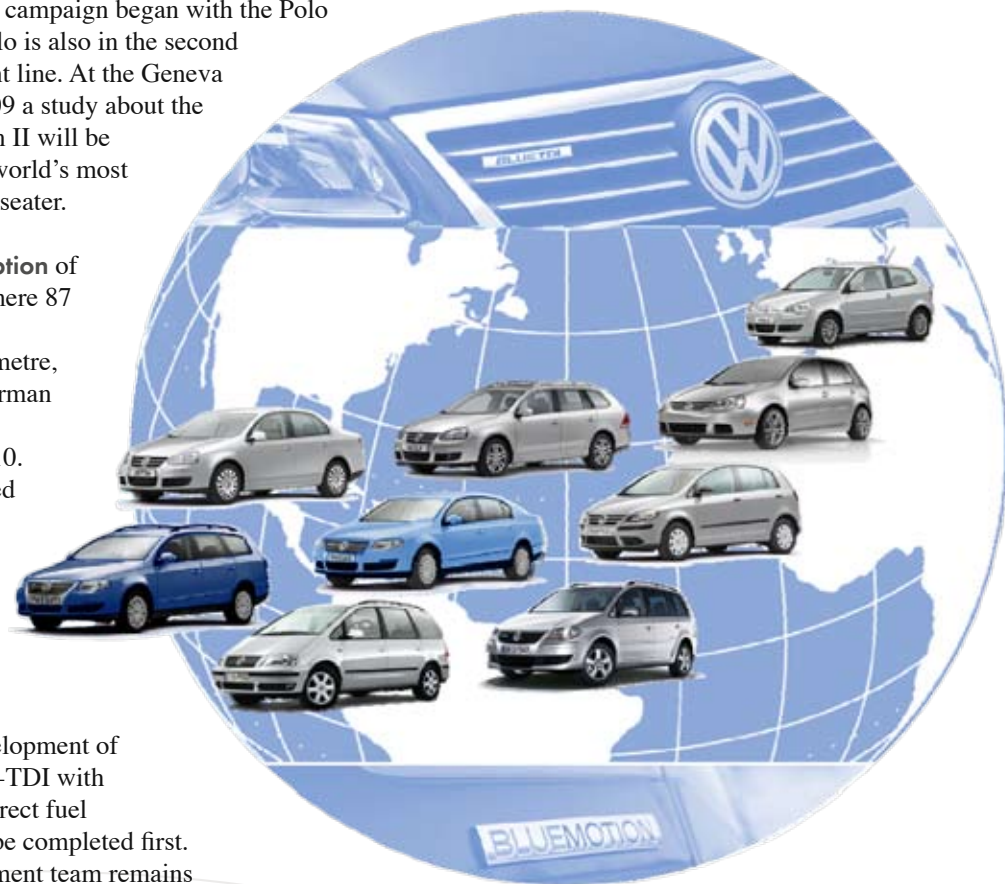
optimistic: "The motor and other systems

like the start-stop function and recuperation

function at a very promising level. I think we can start production in

February 2010," said Hackenberg. So it looks like the VW-team is set to travel to the next Motor Show in a car painted "emotion-blue".

Volkswagen will also present the new Passat models BlueMotion, BlueTDI and EcoFuel as well as the Touareg V6 TSI Hybrid as part of the BlueMotion range.





Imprint

Edited by

Volkswagen Aktiengesellschaft
Konzern Kommunikation
Brieffach 1972, 38436 Wolfsburg
Telefon: 05361/9-77604, Fax: 05361/9-74629

V.i.S.d.P. (Person responsible according to the German Press Law)

Peik von Bestenbostel, Leiter Kommunikation
Unternehmen & Wirtschaft
Peter Thul, Leiter Kommunikation Marke & Produkt

Published by

Medienfachverlag Rommerskirchen GmbH
Mainzer Straße 16-18, 53424 Remagen-Rolandseck
Telefon: 02228/931-0, Fax: 02228/931-149
www.rommerskirchen.com

Printed by

L.N. Schaffrath GmbH
Marktweg 42-50, 47608 Geldern