

# The New Polo Receives the Environmental Commendation

## The Authors



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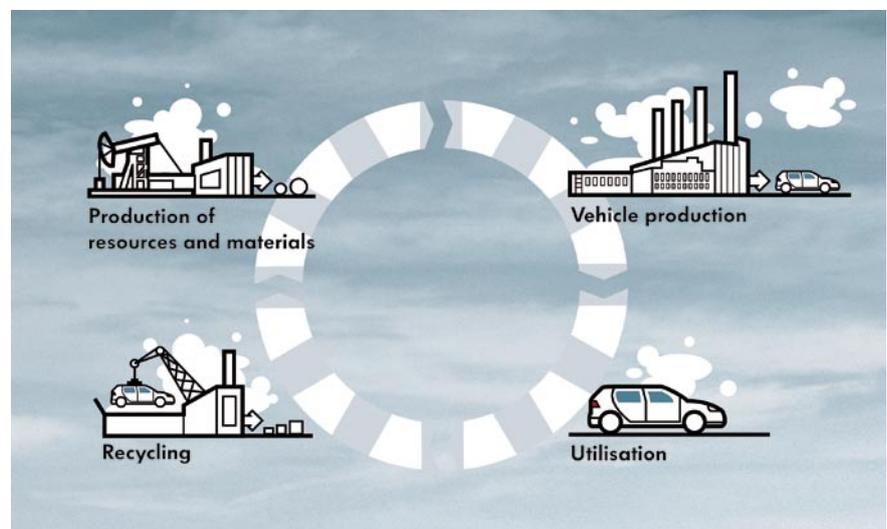
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Nowadays, customers pay great attention to the environmental properties of a vehicle. And they ask for detailed information about this. Volkswagen meets these requirements and documents ecological progress in vehicles and technologies compared to previous or comparable models in the form of environmental commendations. These commendations describe how products and processes are made more environmentally friendly, and what successes are achieved.

## 1 Introduction

All vehicles and components by the Volkswagen brand are planned and developed according to the Group-wide environmental targets of Technical Development (TE). These require that not only statutory regulations on emissions and materials must be met, but also that a comprehensive approach encompassing the entire life cycle must be pursued, **Figure 1**.

The intention is to deliver products onto the market that are not only better than their particular comparable predecessor in terms of driving comfort and safety, but also have better environmental characteristics throughout their entire life cycle. To ensure that the objectives are met, Volkswagen uses a management tool for quantifying environmental effects – referred to as Life Cycle Assessment (LCA) according to ISO standard 14040/44 [1].



**Figure 1:** Life cycle of a vehicle

## 2 Life Cycle Assessment at Volkswagen

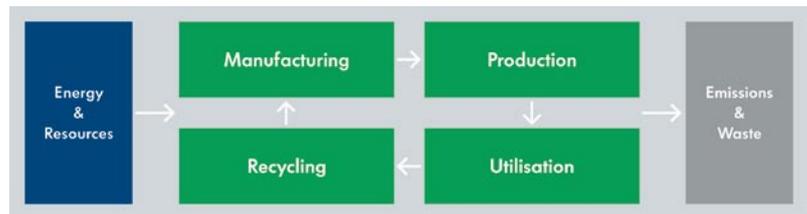
To ensure an integrated product policy, it is not only individual environmental aspects such as emissions from a vehicle that are investigated, but the entire life cycle of a product. This means all processes from manufacturing through to use and recycling are investigated with regard to their environmental influence. The environmental commendation for the Polo presents the results of a complete Life Cycle Assessment, and therefore underlines the continuous process that has been made in environmental product optimisation. An environmental commendation describes – with regard to the entire life cycle – the ecological progress made in a vehicle model compared to its predecessor. The functional unit defined for the comparison is passenger transport (five-seat vehicle) over a defined total distance of 150,000 km in the New European Driving Cycle (NEDC) with comparable utilisation features (driving performance, for example).

### 2.1 Life Cycle Inventory – LCI

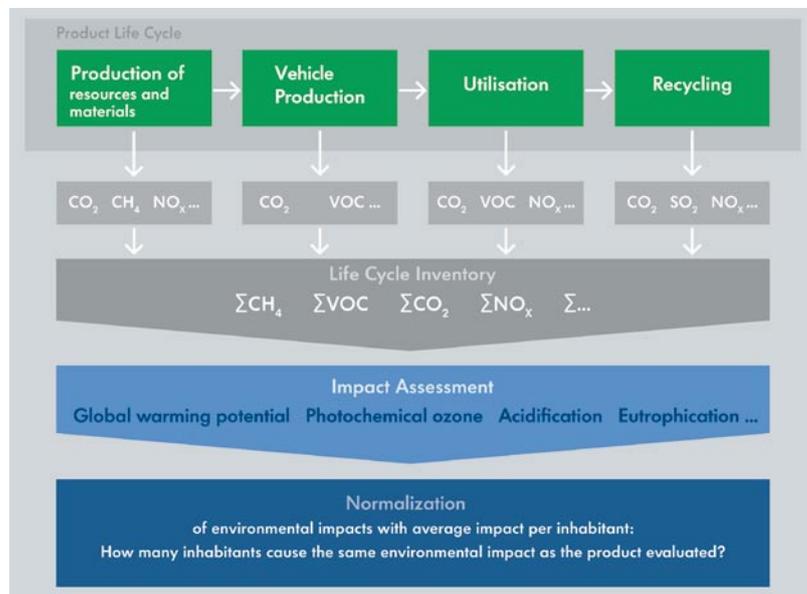
The Life Cycle Inventory quantifies the inputs and outputs of the product under investigation. Compiling one means including the data for all processes along the product life cycle. Therefore the inputs in terms of raw materials and energy resources and the outputs in terms of emissions and waste have to be quantified for each process, **Figure 2**. The Life Cycle Inventory for an entire product life cycle includes a large number of different input and output streams which are added together to create the Life Cycle Inventory. Volkswagen uses the “slimLCI” interface system for this purpose. It offers automation functions that not only significantly reduce the amount of work involved in preparing the balance sheet but will also further improve the consistency and quality of Life Cycle Assessments [2]. This represents significant progress, because thousands of parts and associated preliminary sequences and processes have to be recorded in order to arrive at a Life Cycle Inventory of a complete vehicle.

### 2.2 Life Cycle Impact Assessment – LCIA

The Life Cycle Impact Assessment is conducted after the Life Cycle Inventory in



**Figure 2:** Input and output flows for a Life Cycle Inventory



**Figure 3:** Life Cycle Impact Assessment

order to assess the potential environmental effects. The Life Cycle Impact Assessment involves assigning the various material flows to the corresponding Life Cycle Impact Assessment categories of greenhouse effect, summer smog and acid rain as well as eutrophication of water and soil.

An indicator substance is defined for each environmental impact, for example carbon dioxide (CO<sub>2</sub>) for the greenhouse effect impact category. Following this, all substances that can also contribute to the greenhouse effect are converted into CO<sub>2</sub> equivalents, **Figure 3**.

### 2.3 Evaluation

The third step involves the evaluation, where the results from the Life Cycle Inventory and the Life Cycle Impact Assessment are interpreted. In this case, evaluation is performed with reference to the defined target, namely better environmental properties over the complete life cycle.

## 3 From Life Cycle Assessment to Environmental Commendation

Volkswagen has many years of experience with Life Cycle Assessments as tool for product and process optimisation. Volkswagen has even assumed a leading role in implementing and publishing Life Cycle Inventories of complete vehicles. For instance, in 1996 Volkswagen was the first car manufacturer in the world to prepare a Life Cycle Inventory study for the Golf III. Volkswagen is also making long-term investments in further developing and optimising Life Cycle Assessment methods. Thanks to intensive research Volkswagen has succeeded in considerably reducing the workload involved in preparing Life Cycle Inventories. The results of the Life Cycle Assessment studies are checked by independent experts in accordance with ISO 14040/44 (for the Polo, this was done by TÜV Nord). They form the basis for environmental commendations that Volkswa-

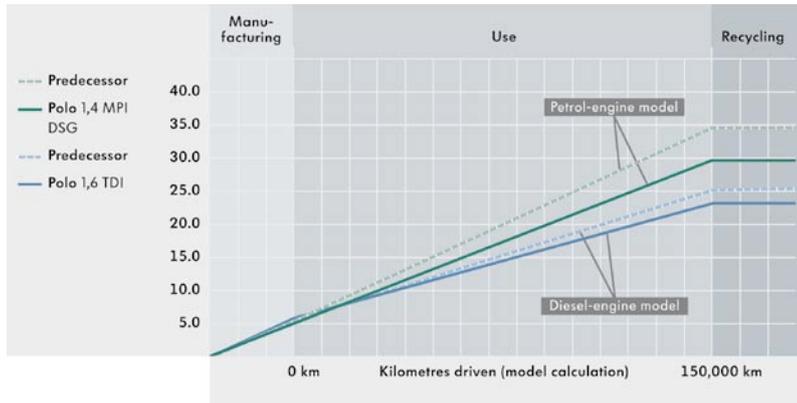


Figure 4: Comparison of impact on the greenhouse effect (CO<sub>2</sub> equivalents in t)

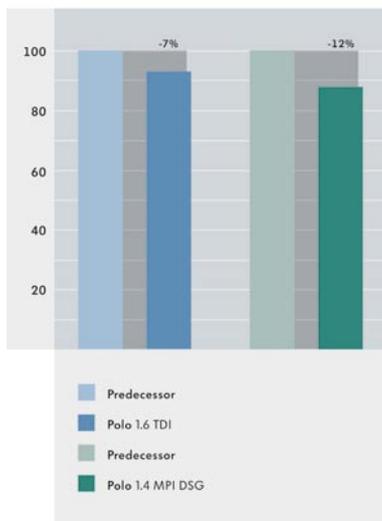


Figure 5: Reduction of greenhouse effect over full life cycle (petrol-engine and diesel-engine model in %)

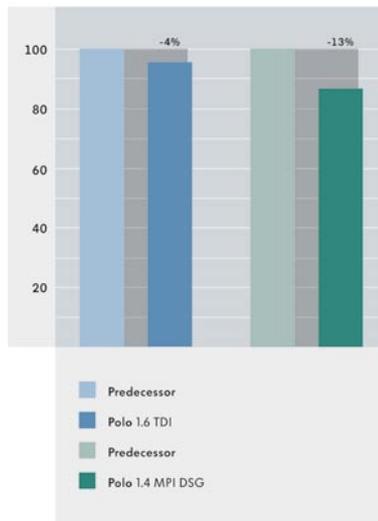


Figure 6: Reduction of summer smog over full life cycle (petrol-engine and diesel-engine model in %)

gen has used since 2007 to inform its customers, shareholders and other interested parties about the environmental properties of its vehicles. To date, environmental commendations have been awarded to the Passat and the Golf as well as the dual clutch gearbox DSG [3]. Environmental commendations are available from the Volkswagen dealer network as well as from [www.environmental-commendation.com](http://www.environmental-commendation.com).

#### 4 Environmental Profile of the Polo

The Polo is the third model to receive an environmental commendation, which means it has also been subjected to a de-

tailed environmental assessment. This involved comparing a 1.6 l engine with 55 kW and diesel particulate filter (DPF) with a predecessor of almost the same power (1.4 l TDI engine, 59 kW). The comparison also included a model with the 1.4 l SRE gasoline engine (63 kW) and dual clutch gearbox DSG as well as a predecessor with a similar engine (1.6 l SRE engine, 77 kW). The new Polo is somewhat larger than its predecessor, but not heavier in spite of more exacting requirements in terms of safety and comfort. Furthermore, improvements have been achieved in fuel consumption and the associated CO<sub>2</sub> emissions. For example, the 1.6 l TDI engine with 55 kW only consumes 4.2 l/100 km in the NEDC in-

stead of 4.5 l/100 km (diesel fuel). This means CO<sub>2</sub> emissions of 109 g/km instead of 119 g/km. The new gasoline engine achieved better values as well. Its consumption is 5.8 instead of 6.7 l/100 km. As a result, the CO<sub>2</sub> value improved from 159 to 135 g/km. In addition, the environmental profile of the new Polo is improved because its emissions are below the limits required in the EU5 standard.

Compared to its predecessor, the new Polo achieves a better environmental profile throughout its entire life cycle in terms of greenhouse effect and summer smog potential. These savings are achieved in particular in the use phase, Figure 4. When measured against the environmental effects of the entire life cycle of a car, the manufacturing and recycling phases only impact slightly on the environment. The main pollution comes during utilisation, the exhaust emissions and the fuel production account for the lion's share of this. Direct emissions during driving are the major factor when it comes to the greenhouse effect. The mileage assumed for preparing the balance sheet is 150,000 km, and over this distance both the diesel model will output 16.4 t carbon dioxide. In relation to the greenhouse potential and the entire life cycle of the vehicle, this means an overall reduction of 7 % compared to the predecessor. As far as summer smog potential is concerned, the new diesel Polo achieves an improvement of 4 %, Figure 5. The Life Cycle Assessment of the new diesel engine is even further enhanced in combination with products from "BlueMotion" Technologies. Innovations such as the start-stop system and brake energy recovery permit emission levels of below 100 g CO<sub>2</sub>/km as well as helping to reduce other environmental impacts.

However, a greater reduction in environmental pollution was possible in the gasoline engine. When combined with the seven-speed dual clutch gearbox, the 1.4 l engine emits about 20.3 t CO<sub>2</sub> throughout its utilisation phase, amounting to a reduction of about 12 % in environmental impact in terms of greenhouse potential. The pollution expressed as summer smog potential is 13 % below the value of the previous model, Figure 6. Lower fuel consumption and associated savings in fuel provision will reduce further environmental impacts.

## 5 Summary

The new Polo, despite its compact dimensions, not only meets exacting requirements for safety, comfort and performance, but also achieves the targets defined during environmental product development. The environmental commendation confirms all the progress achieved compared to the previous model. The models included in the comparison not only feature low fuel consumption and emission values throughout their utilisation phase but also very slight environmental influences during the manufacturing and recycling phases. This means the new Polo achieves an overall improvement in its environmental profile compared to its predecessor throughout the entire life cycle.

## References

- [1] International Organization for Standardization: ISO 14040: Environmental Management – Life Cycle Assessment – Principles and Framework. 2nd ed. Geneva: International Organization for Standardization
- [2] Koffler, C.; Krinke, S.; Schebek, L.; Buchgeister, J.: Volkswagen slimLCl – a procedure for streamlined inventory modelling within Life Cycle Assessment (LCA) of vehicles. *Int. J. Vehicle Design*, Vol. 46, No. 2, 2008
- [3] [www.umweltpraedikat.de](http://www.umweltpraedikat.de) or [www.environmental-commendation.com](http://www.environmental-commendation.com)