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IMPLEMENTING THE LIFE CYCLE APPROACH AT VOLKSWAGEN

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ABSTRACT

With its environmental strategy, Volkswagen is not only working on developing the most environmentally-friendly vehicles, but also on building them with the greatest possible sustainability. In order to manage the implementation of this strategy in a targeted manner, an approach is needed that considers environmental impacts of a product from a life cycle perspective. Thus, with Think Blue. Engineering Volkswagen introduces a concept that aims to identify aspects which are relevant for environmental compatibility at an early stage and to consider them throughout the organization and at all stages of the product life-cycle.

INTRODUCTION

The car industry is facing new challenges. It must not only make its cars ever more comfortable, faster and safer, but must at the same time improve their environmental performance. In the past, this was usually achieved by reductions in fuel consumption (and, correspondingly, emissions) during the service life of the vehicle. Today, the development of sustainable mobility requires a more comprehensive approach. Efforts to minimize the environmental impacts of the vehicle must focus on the entire product life cycle. This means that the potential environmental impacts of new vehicles, components and materials must be assessed before they have even left the drawing board, looking at all aspects from the initial concept and design sketches to the production process, subsequent vehicle operation and recycling. A life cycle perspective is therefore key to environmentally sustainable vehicle development. It allows the company to identify those areas in which improvements will have maximum effect, and to prioritise its innovations accordingly. However, to be applicable such an approach must be based on a binding strategy and practical targets.

FUNDAMENTALS

Volkswagen has set itself the strategic goal of becoming the world's leading automaker in environmental terms by 2018. This strategy implies a fundamental ecological restructuring of the Volkswagen Group coming along with investments directly or indirectly in ever more efficient vehicles, new powertrains and technologies as well as environmentally compatible production at its plants all over the world. In this context, Volkswagen is committing to reducing the CO₂ output of the European new car fleet to emissions below the threshold of

120 grams CO₂/km by 2015 and furthermore to 95 grams per kilometer by 2020. Another target is to make the production in the Volkswagen Group 25 percent more environmentally compatible by 2018. Furthermore, the Group aims for a 40 percent reduction in greenhouse gas emissions associated with production-related energy supplies by 2020.

A prerequisite for a successful implementation of this strategy is the translation and integration of the overarching targets into specific company policy and processes. Due to this, in its environmental policy Volkswagen considers climate change, health/air quality and sustainable resource use the biggest environmental challenges. This applies for all activities within our production sites worldwide as well as for the process of product development. Consequently, the three areas of environmental protection also have been incorporated into the environmental goals for product development at the Volkswagen brand [Volkswagen, 2003].

IMPLEMENTATION

Concept of Think Blue. Engineering.

The ongoing improvement of our vehicle fleet in terms of environmental impacts and resource conservation forms an integral part of Volkswagen's corporate policy. Thus, the Technical Development department has set itself the goal to continuously improve the environmental compatibility of its facilities and the products it develops. All activities and processes within the life cycle of our products are laid out to be environmentally friendly. We identify aspects which are relevant for environmental compatibility at an early stage and consider them throughout the organization and at all stages of the product life-cycle. This is what we call Think Blue. Engineering (Figure 1). Facing the three environmental challenges mentioned before, with Think Blue. Engineering we set ourselves the following objectives:

1. Climate protection

- Reducing CO₂ emissions of the 2015 new vehicle fleet to below 120 g/km for EU27 countries
- Increasing efficiency by 10–15% for every new generation of cars compared to its predecessor
- Developing the most fuel-efficient model in every segment and every vehicle class
- Developing and providing technical solutions for reducing fuel consumption over the vehicle's service life with the customer
- Reducing greenhouse gas emissions over the entire product life-cycle

2. Resource conservation

- Increasing resource efficiency
- Continuously increasing the use of renewable and secondary raw materials
- Engineering new models that have ideal recycling and recovery characteristics, employing innovative recovery technologies
- Develop and make available alternative powertrain technologies
- Enabling the use of alternative fuels

3. Health protection

- Reducing regulated and non-regulated emissions
- Avoiding the use of hazardous and harmful substances within the framework of the strictest materials legislation of the world
- Minimizing passenger compartment emissions, including odours
- Attaining best possible exterior and interior noise levels

Furthermore, for the activities and processes at the Technical Development department in Wolfsburg five key performance indices (KPI) have been defined. Setting 2010 as a reference, we will have achieved a 25% reduction in energy consumption, waste accumulation, emissions, water consumption, and CO₂ emissions by 2018.



Figure 1. Think Blue. Engineering Logo

From Life Cycle Assessment to Think Blue. Engineering

In accordance with Think Blue. Engineering we develop each model in such a way that, over its entire life-cycle, it presents better environmental properties than its predecessor. The tool chosen by Volkswagen to implement this approach is the life cycle assessment (LCA) in line with ISO standards 14040 and 14044 [2,3]. The purpose of a LCA study – not just at Volkswagen – is to analyse and assess in detail all the data on energy consumption, emissions and the other environmental impacts generated during the production of vehicles or technologies and/or during related processes. Making LCAs at Volkswagen means to collect all the important facts over the entire life cycle of a vehicle, component or technology and back them up with figures. For each step in the process we determine the volume of raw materials and energy that goes into its production and the production of the fuel it requires. This process is carried over into the vehicle's service life. The fuel consumption and the resultant emissions during this phase are worked out based on the legally prescribed New European Driving Cycle (NEDC). In addition, the amount of energy consumed during the dismantling and/or recycling of the vehicle parts is calculated. The data collection process is based on the vehicle parts lists, material and weight information stored in the company's own Material Information System (MISS), technical datasheets and drawings, as well as the threshold values for regulated emissions in line with the current EU regulations [Koffler et al., 2007]. These are joined by processing-related data taken from the GaBi database or drawn up in conjunction with the production plants, suppliers or industrial partners.

However, the process of performing reliable and scientific sound LCAs is just one aspect for the implementation of the Life Cycle Approach into Think Blue. Engineering. Another challenge is the need to integrate two different perspectives: that of the LCA modeling expert, who profiles the environmental performance of the product, and that of the engineer who

develops the products and technical solutions that actually impact the environment. In order to integrate the LCA methodology and its results into the product development process, it is necessary to translate the results into technical goals. These goals must be expressed in a form that is sufficiently specific and concrete to allow an engineer or planner to apply them to a particular concrete project, even if he/she has no specific knowledge of life cycle assessments and their underlying methodology. Typical examples of LCA-derived goals include a maximum weight for a given component made from a given combination of materials, or the use of particularly efficient production and processing methods for given materials.

Communication of target achievement

When a LCA confirms that the vehicle, technology or process analyzed has met the goals of Think Blue. Engineering, then they qualify for an Environmental Commendation (see www.environmental-commendations.com). Through the Environmental Commendation, Volkswagen documents ecological progress in a vehicle or technology compared to its predecessor. Environmental Commendations provide our customers, shareholders and other stakeholders inside and outside the company with detailed information about how we are making our vehicles, components and processes more environmentally compatible and what we have achieved in this respect.

CONCLUSIONS

A life cycle perspective is a key requirement for targeted and effective environmentally sustainable vehicle development. Life Cycle Assessments based on ISO 14040/44 provide an appropriate environmental management tool for quantifying and evaluating the product development process with regard to environmental impacts across the full life cycle of the vehicle. With the concept of Think Blue. Engineering, Life Cycle Thinking becomes embedded to relevant business processes at Volkswagen that allow environmentally compatible product development to be implemented throughout the different sectors of the company and along the entire value chain. Being based on Volkswagens overarching environmental strategy and referring to the environmental goals for product development at the Volkswagen brand, Think Blue. Engineering facilitates the translation of LCA findings into quantifiable targets and into practical actions that produce genuine environmental benefits.

REFERENCES

ISO.(2006).ISO 14040: Environmental Management – Life Cycle Assessment – Principles and Framework. ISO, Geneva

ISO.(2006).ISO 14044: Environmental Management – Life Cycle Assessment – Requirements and Guidelines. ISO, Geneva

Koffler, C.; Krinke, S.; Schebek, L.; Buchgeister, J.(2007).Volkswagen slimLCI – a Procedure for Streamlined Inventory Modelling within Life Cycle Assessment (LCA) of Vehicles. In: International Journal of Vehicle Design (Special Issue on Sustainable Mobility, Vehicle Design and Development). Olney: Inderscience Publishers

Volkswagen.(2013). Environmental Goals of the Technical Development Department. <http://en.volkswagen.com/en/company/responsibility.html>