

Green solutions in automotive industry

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Green marketing is part of a marketer's decisions and attitudes. Green solutions in the production process support the idea of being eco-friendly. Being green is a big challenge in the strategic planning of the auto makers and therefore, they are expected to reduce CO₂ car emissions and be eco-friendly in their whole business cycle. There are many restrictions on cars and their production which car producers must follow. Some of these restrictions strictly regulate the domain of environmental standards. Nevertheless, the selected producers have sophisticated CSR (corporate social responsibility) programs in which extensive attention is paid to their green behavior. The aim of the paper is to show the importance of green solutions in company practices to achieve the position of the „green corporation“ practicing green marketing. The discussion is supported by examples of green solutions in selected global players in the automotive industry. It also provides analysis of sustainability reports, green strategies and web sites of selected companies, to introduce major green solutions in practice. Green marketing uses a lot of techniques and marketing tools to communicate green activities with customers and other stakeholders.

Green marketing is an extension of the traditional marketing concept in terms of a company's social responsibility, long-term sustainability, environmental protection, the production and consumption of environmentally friendly products. Current knowledge in the field shows that most customers perceive the necessity of ecological behavior of any organization as well as individuals (Tiwari et al. 2011). The idea of environment protection is not new; the topic of environment has been present in holistic marketing concepts from the 70s of the 20th century. That view on the environmentalism was very limited and it was concentrated on predominantly local problems as pollution; from a customer base point of view, it was focused on intellectual elites and it served as defense of premium pricing (Peattie and Charter 2003). The concept of green marketing has changed the perception of companies as well as their customers (Arseculateratne and Yazdanifard 2014) and it is evident that both sides profit from it.

The beginning of 21st century has stated the subject matter as the problem of humanity and human survival, especially for young generations (Durmaz and Zengin 2011). People are more and more interested in sustainability and environmental protection, and the same companies are asked for it as well. The producers, especially global players, are often perceived as a source of the current environmental, economic, and social problems, therefore the customers demand to have the problems caused by car makers solved (Kramer and Porter 2011).

Car producers are often considered to be the main polluters and therefore, they plan enormous investments in green product-development. But in most cases, the green product itself is of main interest to the markets. The car makers must concentrate their attention on the complexity of all activities they do. They must act as green producers, accept green solutions in buying green resources, practice green production and logistics, and save natural resources anywhere, anytime. The car industry is responsible for environmental pollution; millions of cars all over the world exhale dangerous substances. The industry constitutes an ecological burden in raw materials extraction, parts manufacturing, or energy-intensive production. Sakris (2010) emphasizes the impact cause by the disposal of old used cars, producer's attitudes to recycling cars used with the aim to eliminate the environmental pollution.

Table 1 presents the ecological burden in manufacturing industries and construction. CO₂ emissions are not connected only with car usage. It is necessary to focus attention on the elimination of CO₂

emissions from manufacturing as such.

Country name	2008	2009	2010	2011	2012	2013	2014
Czech Republic	14,87967	15,13429	12,65255	12,98678	12,57689	12,82989	14,02382
Denmark	9,541435	8,932345	8,470987	9,469427	9,964703	8,891409	9,968125
Finland	16,11807	13,66355	14,55133	15,52168	15,89438	15,29579	16,68508
France	14,58154	12,76206	13,45566	14,68191	14,62624	15,80424	15,69588
Germany	12,87551	12,05453	12,7927	13,11892	12,48288	12,13573	12,4421
Russian Federation	11,08615	11,53021	11,65986	11,45787	10,91616	11,64377	12,32122
Slovak Republic	22,50141	19,6319	19,58912	20,42618	21,99104	22,08936	24,61643
Switzerland	13,72093	12,85372	12,87703	13,14578	12,83317	12,80385	13,646
United Kingdom	9,800795	8,841331	9,079088	8,775771	8,300874	8,669453	9,596901
Netherlands	14,41962	13,80391	13,6385	14,38243	14,70136	14,28847	14,73619

Table 1: CO₂ emissions from manufacturing industries and construction (% of total fuel combustion). Source: The World Bank (2017)

CO₂ emissions influence climate change and they are one of the most important targets for regulations. The often-regulated factors are:

- CO₂ emissions,
- production of electric energy,
- water, air and ground pollution,
- waste management and recycling.

The International Transport Forum of OECD defined 3 main market stimulation tools leading to sustainability: taxation, emissions standards and direct state support (OECD 2010). The best-known EU regulation is Euro VI, the latest emission standard covering all types of vehicles produced after August 2015 – passenger cars (category M), light commercial vehicles (category N1) and trucks, and buses (Cummins 2017).

Příkrylová and Jaderná (2016) presented the regulations in the Netherlands – Bijtelling and BPM, the regulations which affect the sales of all fleet cars of all manufacturers operating in the Netherlands. Bijtelling is a specific tax on fleet cars used for non-business purposes. BPM is paid when a car, motorcycle or light vehicle is registered in the Netherlands for the first time (Government of the Netherlands, 2017).

The regulations are not the only pressure on the car manufacturers. The European Commission supports the environmental protection in the document „Europe on the Move”. It encourages clean and sustainable mobility and it is focused on emission standards for commercial vehicles, smart charging, new technologies, and alternative fuels (European Commission 2017). In the year 2016, the European Strategy for Low-Emission Mobility was appointed with the main aim to „make an important contribution to modernizing the EU economy, helping to reduce emissions from the transport sector and meeting the EU’s commitments under the Paris Agreement“. (European Commission 2016, p. 13).

This document creates pressure on car manufacturers to introduce green solutions in their production processes as well as the final products. OECD (2010) expects a proactive approach of car manufacturers to the development of new green solutions with the complex use of the prescribed emission standards.

Green solutions in company practice mean technical solutions or activities aimed at reducing the impact of production on the environment. The most common green solutions in car production focus on:

- Waste reduction.
- Developing products that protect/ do not damage the environment.
- Ecological solutions for the current products.
- Transformation and improvement of the production process.
- Development of a relationship with suppliers (sustainable processes and supply chain).
- Controlling the product impact (whole production chain).

- Using renewable energy sources. (Přikrylová, Jaderná, 2016)

Selected examples of green solutions are presented in the following cases of three major European car makers.

SKODA AUTO

SKODA AUTO supports sustainable development with the SKODA Green Future strategy. The aim of SKODA AUTO is to produce efficient cars, and to use natural resources responsibly throughout the company. In the context of these facts the Green Future strategy is focused on savings in manufacturing, on the development of green products, and on providing green services/CRS activities.

The Green Future strategy is divided into 3 main areas:

1. Green Factory.
2. Green Product.
3. Green Retail.

The part of the Green Factory refers to energy savings; it recommends acting responsibly and saving water appropriately. It is focused on the impact of volatile organic compounds (VOCs), which are an ecological burden, as well as dangerous for human health. One of the car manufacturer's main goals are the reduction of CO₂ emissions linked to the production generating 539 thousand tons of CO₂ emissions every year, and to the production of CO₂ by a fleet of million ŠKODA Octavia in use. The part of the Green Factory presents the approach to the waste management, including waste sorting for further recycling in the whole production process.

The corroboration of the efficiency of the Green Future strategy and the green solutions can be seen in the decrease of total amount of CO₂ emissions in one car produced (see Figure 1). The difference between the total amount of emissions in 2010 and 2014 is about 504 kg, decreasing from 1101 to 597 kg CO₂ emissions for one car produced.

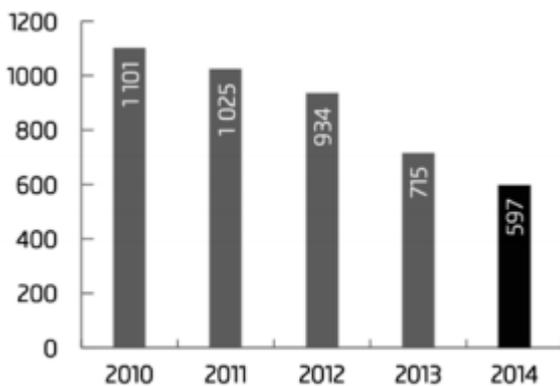


Figure 1: Total amount of CO₂ emissions (in Kg) for one car produced

Source: SKODA AUTO (2015)

SKODA AUTO produces and offers environmental-friendly products. As a result of green products, the value of CO₂ emissions is continuously decreasing and the recycling of used cars is increasing. New cars are min. from 85% recyclable. SKODA AUTO offers the models G-TECH or GreenLine; subsequently the company gives advice to drivers on how to save fuel and minimize exhaust gases if they improve their driving style. This type of cooperation with drivers can decrease fuel consumption and greenhouse gas emissions by ten per cent.

Apart from the green products and responsible production, the interest of SKODA AUTO is focused on green dealerships. Over 3300 authorized services all over the world have obtained a new modern design with advice on how to reduce energy consumption (Internal materials of SKODA AUTO); the

company offers training programs in ecofriendly service for all dealerships. The company's CSR activity in eco-behavior is supported for example by the project „One tree planted for each car sold in the Czech Republic“.

SKODA AUTO proclaims its green attitude in „Extended producer responsibility“. The environment protection does not end with the sale of the car or in ecofriendly service. If the owner of an old car likes to behave eco-friendly, he/she can ask an authorized SKODA AUTO dealer for help and leave the car for free environmental friendly recycling, where there is reassurance that a maximum of the material is going to be re-used.

All models of SKODA AUTO are certified in accordance with the European directive 2005/64/EC, which states that just less than 5% of the car's weight is unusable for the current recycling technologies and can end up in landfills.

Volkswagen Group (VW)

The Volkswagen group reports sustainable development of the Group. Individual brands have their own attitude but include the basic guidelines of the Group. Volkswagen aims to fulfill several problems as:

- To save all-natural resources, especially to preserve water, soil and air quality, as well as to save energy and raw materials.
- To employ a holistic approach by researching, developing and democratizing environmentally friendly innovations, significantly reducing environmental impacts in all the business activities.
- To reduce the environmental impacts of the entire product life cycle by setting ambitious goals and acting as a driving force in both the production phase (supply chain) and use phase of products.
- To communicate measures, achievements and projects as transparently as possible.
- To achieve support by top rankings in environmental awards.

The Volkswagen group's future program (Together - Strategy 2025) presents the direction towards achieving the marked goals. The Group takes the responsibility for environmental issues and intends to become a role model in all things related to the environment. It is focused on the emissions reduction and the resource utilization in its product portfolio, its locations, and plants. Its targets are to reduce the carbon footprint, the pollutant emissions and the resource consumption.

The main target is the green product. VW invested 11,5 billion Euro in the research and development of products with the aim to improve functionality, quality, safety, and to decrease the ecological burden. The new cars of all the Group's brands made in 2016, emitted 120 CO₂/km on average.

The strategy is anchored in conventional drive, hybrid cars, and electric cars. It supports the United Nations' Sustainable Development Goals. The Group improves the gas engine with fitting petrol engines with gasoline particulate filters, diesel engines with the latest and most efficient SCR catalytic converters. Volkswagen offers full electric cars - E-up! and E-load! - with the run-out distance of 160 km and E-Golf with the maximum run-out of 300 km (Volkswagen AG 2016).

Table 2 presents the Eco-friendly drivetrain technologies in the Volkswagen Group (VW PC, Audi, SKODA, SEAT, VW light commercial vehicles, Audi light commercial vehicles excl. luxury brands) globally, and in Western Europe: BEL, DNK, DEU, FIN, FRA, GRC, GBR, IRL, ISL, ITA, LUX, NLD, NOR, AUT, PRT, SWE, CHE, ESP, rest of W. Europe). The total amount of eco-friendly drives is 127.72 globally - 1,27% and 73,509 eco-friendly drives in Western Europe (2,16%). It seems to be positive for Western Europe, but the decreasing amount of eco-friendly drives between 2015 and 2016 is not convincing.

The interest of customers for eco-friendly drives is not rising constantly, the production of cars of all-electric drives decreased. The Governments of countries in the Western Europe would like to substitute the gas drives for eco-friendly drives, but it is necessary to follow the demand and interest of customers.

Vehicles produced		2015	2016
Globally	Gas drives (natural gas and LPG)	86,781 (0.90%)	72,955 (0.73%)
	Hybrid drives	39,107 (0.40%)	39,037 (0.39%)
	All-electric drives	17,076 (0.18%)	15,729 (0.16%)
	Eco-friendly drives (total)	142,949 (1.48%)	127,721 (1.27%)
Western Europe	Gas drives (natural gas and LPG)	34,678 (1.04%)	30,807 (0.90%)
	Hybrid drives	33,759 (1.01%)	33,222 (0.97%)
	All-electric drives	12,987 (0.39%)	9,480 (0.28%)
	Eco-friendly drives (total)	81,424 (2.43%)	73,509 (2.16%)

Table 2: Eco-friendly drivetrain technologies in the Volkswagen Group
Source: Volkswagen AG (2016)

VW solves environmental problems in the entire production life cycle - from the raw materials extraction, through the material processing, manufacturing in the suppliers' establishments, and own final production to the product use and recycling. It applies the Life Cycle Assessment for evaluation of new cars, drives, components and materials to improve the environmental effectiveness of the car in the life cycle.

The aim of the Volkswagen group is to minimize an amount of the material input for car manufacturing and use recyclable and renewable materials. The result should be a decrease in energy and water consumption, reduction of waste and CO₂ and VOS emissions of one car by 25% compared to 2010. This goal was achieved in 2016.

The program Think Blue Factory (2010) is focused on ecologic sustainable production. In 2025, it is expected that the production of cars and their parts to be 45% eco-friendlier compared to 2010 (Günneel 2017).

The company logistics optimizes the supply chains and decreases CO₂ emissions. It strives to optimize the delivery frequency and use eco-friendly transport (preferably naval).

As often as possible, the Group saves energy using renewable resources. The good practices in water management took shape in the water consumption which decreased from 4.1 m³ (2015) to 3.9 m³ in 2016, per car produced.

Similarly, to SKODA's GreenFuture strategy, Volkswagen takes care of the whole life of the car and its final recycling. The company is aware of the high importance of the driver's appropriate behavior. That is the reason why it is offering special driving courses with the objective to teach drivers to drive in an ecologic way. A part of the company's social responsibility is the focus on the elimination of noise in cities by developing new technologies with the aim to produce quieter vehicles (Volkswagen AG 2016).

Renault

Renault was the first car manufacturer with a public environmental strategy to minimize the global carbon footprint. The strategy encompasses Renault's ambitious environmental policy. The company understands the ecological burden in every phase of the product life cycle and thus all employees in the company are informed about the ecological policy and all environmental activities are consistent with it. In view of this policy the company became more efficient and competitive.

Renault's strategy has reduced the environmental footprint in all product lifecycle stages for nearly 20 years. Environmental aspects keep designers drawing their first sketches, suppliers delivering eco-friendly parts, and keep production clean. The company plans to improve the process of reducing the production facilities' environmental impact, and to receive the ISO 14001 certificate. More than 81% of the greenhouse gases in the product life cycle are emitted during the utilization phase. Renault cuts the fuel consumption of cars and teaches car users to drive more economically and ecologically. The brand has introduced the ECO2 Driving program helping drivers to reduce their eco-impact. It is based on driving aids such as R-link connected services plus driver training. It is possible to reduce fuel consumption and CO₂ emissions by about 25%.

Because of the increasing demand for EV's, Renault offers a full range of electric cars. According to Renault, electric power is the most environmentally sound automotive solution (Group Renault

2017a).

Similarly to Volkswagen Group and SKODA AUTO, Renault achieves a recycling rate of 95%. Materials and parts can be reused in the automotive industry. Renault designs vehicles containing fewer materials - fewer natural resources in vehicle production. More than 30% have been recycled. The company proposes a „second life” of parts and vehicles by collecting the parts and transforming waste into usable materials. Renault reuses materials through a short-loop recycle process, which means recycling raw materials (steel, copper, textiles, noryl and polypropylene) within the automotive industry (Group Renault 2017b).

The improvement of the production process is open for the employees. They are trained in environmental protection and they adopt this concept as a part of their everyday private and work life. All production projects in all production places have their environmental managers or specialists for the coordination of environmental protection and for keeping all guidelines working.

Renault introduced (as VW Group) an LCA analysis (Life-Cycle Analysis) that stands for international methodology and meeting the ISO 14040 standards. The methodology measures the environmental footprint of products and services in the entire life cycle (from extraction of raw materials, manufacturing, use and end-of-life recycling).

Figure 2 indicates the application of the method in analysis between New Twingo vs Twingo II. This method is appropriate to identify possible future improvements.



Figure 2: Life-cycle analysis - New Twingo vs. Twingo II

Source: Group Renault (2017a)

Renault declares as results 17% reduction in carbon footprint in five years in 2015 (compared to 2010). It corresponds to the greenhouse gas emissions generated by the whole life cycle of vehicles and by all activities (design, production, transport, parts and vehicle sales, and all the company's support functions) of the company. Renault plans on continuing to eliminate environmental impacts and to shrink the carbon footprint of vehicles for next generations.

Conclusions

Green marketing plays an important part in communication with customers. They like to feel that companies, primarily in automotive industry, are interested in environmental protection. The automotive industry is one of the most dominant pollutants. Green marketing supports the positioning of green producers. Car producers publish sustainability reports, green strategies, strategies of corporate social responsibility. They communicate the green approach towards their customers and other stakeholders through online marketing. Car producers support the position of green producers in many ways.

The desperate need for environmental protection has been adopted by society, as well as

governments and businesses. European Commission and national governments introduce regulations to shrink the footprint of car production and the use of cars. Car manufacturers react with employing new green solutions in the entire product life-cycle. They declare and implement environmental attitudes in their long-term business strategies.

Car producers are solving the problems of energy intensity and water consumption. They substitute natural resources with renewable or recyclable sources. They must consider CO₂ and VOC emissions in manufacturing, and during the life of the car. They are focused on the reduction in carbon footprint, and the recycling rate. Materials and parts can be reused in the automotive industry. Furthermore, car producers are interested in eco-retail and an ecofriendly use of car. They offer ecofriendly service and provide for free, environmental friendly recycling of old cars. Dealerships have new, modern designs in line with the reduction of energy consumption. Car makers are focused on the elimination of noise in cities by developing new technologies with the aim to produce quieter vehicles. Trying to reduce emissions, authorized dealers of brands offer special driving courses to teach drivers how to drive in an eco-way.

One of the very popular topics in the automotive industry is the electric car. All car manufacturers plan to add them in their portfolio or to substitute the conventional engine with an electric one within the next 10 years. Electrification of cars is subsidized by some states but it is questionable if the electric cars are really eco-friendly from the very beginning of their production, the sources of electric energy during their life, and especially the way of their disposal. But this topic is to be researched in the future.

Poznámky/Notes

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L62, M11, M31

Résumé

Zelené řešení v automobilovém průmyslu

Článek uvádí příklady zelených řešení vybraných globálních hráčů v automobilovém průmyslu. Být

zelený je velká výzva v rámci strategického plánování výrobců aut a proto se snaží snižovat emise a být ekologicky zodpovědní v rámci všech procesů. Výrobci aut musí následovat mnoho omezení uvalených na auta i jejich produkci. Některá omezení jsou striktně regulována standardy ochrany životního prostředí. Sami automobiloví producenti mají své strategie tzv. CSR (corporate social responsibility – společenská odpovědnost firem), ve kterých věnují velkou pozornost zelenému chování.

Kontakt na autorov/Address

Ing. Eva Jaderná, Ph.D. ŠKODA AUTO Vysoká škola o.p.s., Katedra marketingu a managementu, Na Karmeli 1457, 293 01 Mladá Boleslav, Česká republika, e-mail: eva.jaderna@savs.cz

doc. Ing. Jana Přikrylová, PhD. ŠKODA AUTO Vysoká škola o.p.s., Katedra marketingu a managementu, Na Karmeli 1457, 293 01 Mladá Boleslav, Česká republika, e-mail: jana.prikrylova@savs.cz

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