

Comparative life cycle assessment

- Conventional powertrain and plug-in hybrid

Emissions from the automotive industry include both the manufacturing process and the emissions produced when the product is used. For the automotive industry, both the type of fuel and its production play a crucial role in its overall environmental impact. Thanks to its life cycle approach Volvo Cars Corporation can focus on the car's entire life cycle and not just take action on the environmental impact associated with emissions in the use phase.

In this example Volvo Cars Corporation demonstrates how to adopt a life cycle perspective to carry out comparative studies. By using a life cycle assessment Volvo Cars Corporation was able to compare a conventional powertrain with a plug-in hybrid, and also highlight major differences between the different power generation mixes.

Volvo Cars Corporation has supplied cars since 1927. The company's headquarter is based in Gothenburg, Sweden with production sites in China and Belgium as well as Sweden. 62.5% of its employees, 17,806 people, work in Sweden. Nowadays, its largest market is China, followed by Sweden and the USA.¹ Volvo Cars Corporation applies the life cycle perspective both in relation to emissions of exhaust gases and in terms of providing sustainable products through the use of sustainable materials and remanufacturing.²

Jessica Andreasson, Environmental Analyst at Volvo Cars Corporation explains in further detail:

- At Volvo we have a long tradition of focusing on environmental issues, both in our factories and in the product development process. Our CEO, Håkan Samuelsson, has ensured that the environment will be a core value permeating everything we do.

“The life cycle perspective has given us a tool to understand the phase in which our cars have the greatest environmental impact.”

What does applying a life cycle perspective mean for you?

- By applying a life cycle perspective, you can see the overall environmental impact of the product, from the raw materials used, through the use phase until the car is recycled. We are increasingly viewing the car's environmental impact from a holistic perspective.

Why has the life cycle perspective become important?

- New conditions and the electrification of cars have made us become more proactive in our life cycle approach. We are working towards a fleet of vehicles that is more and more electrified, which will lead to reduced exhaust emissions in the use phase. Other phases of the car's life cycle will thus increase in importance instead

and we will need to focus more on them. Another issue that has caused us to turn more to the life cycle perspective is the fact that more and more rare earth metals and other resource-critical materials are coming into cars via electronics and we need to keep an eye on this. By applying a life cycle perspective, we can give our customers on different markets information about the environmental impact associated with powertrains.

How has the life cycle perspective advanced environmental issues?

- The life cycle perspective has given us a tool to understand the phase in which our cars have the greatest environmental impact. We can also visualise this down to the component level. This has allowed us to work on the components that have the greatest environmental impact. We have also begun a research project with Swedish Life Cycle Center, IVL Swedish Environmental Research Institute, and RISE Research Institutes of Sweden to investigate further how we can apply the life cycle perspective in Volvo Cars Corporation.

What do you consider to be the biggest motivators for intensifying the life cycle approach in your organisation?

- At Volvo Cars Corporation we have previously worked on the environmental impact of our cars by introducing lightweight materials and different technical solutions for improving fuel economy. We have now reached a stage where we realise that we need to focus on the environmental impact of the entire car, especially since we are aiming to sell a million electrified cars by 2025.

Which parts of the company have been involved in the work?

- Those of us carrying out the life cycle assessments work in the Environmental Attribute and Material Management section and we disseminate this knowledge within R&D, where everyone needs to be aware of the environmental impact of a component or characteristic. There has been a particular focus on the area of R&D

1. Volvo Cars, 2016: <http://www.volvocars.com/int/about/our-company/our-company-at-a-glance>

2. Volvo Cars 2016: <http://www.volvocars.com/int/about/our-company/sustainability/the-impacts-of-our-products>

working on the type of powertrain that our cars should have in future. They are interested in ensuring that we move towards cars with a reduced overall environmental impact, not just when our customers are driving the cars. In the long term, we will also disseminate and use the life cycle results throughout the entire organisation.

Do you have an example of a change that has led to reduced environmental impact thanks to your life cycle perspective?

- In our latest life cycle assessment we looked at two new XC90s with different powertrains – a conventional one and a plug-in hybrid. We expect the car to have a service life of 250,000 km, in other words customers drive our cars for a total of 250,000 km in the use phase, and with two different electric markets for charging. In the first instance the car was charged with electricity from a Nordic power generation mix and the other was charged with a Chinese power generation mix.

What were the results of the life cycle assessment?

- In the results we looked at the climate impact of both the XC90 cars throughout their life cycles. We could also see that the significance of the different life cycle phases varied between the cars. We saw that the impact of the use phase decreases significantly in the case of the plug-in hybrid while the impact from the raw materials used and the production phase increases. The extent of the decrease in the use phase is greatest when the hybrid is charged using a Nordic power generation mix.

What did you find most surprising?

- The most interesting was that the hybrid has a 50% lower overall climate impact when the hybrid is charged with a Nordic power generation mix compared with an XC90 with a conventional powertrain. I must stress here that this is the case when the car is charged with a Nordic power generation mix. The assessment results obtained when the car is charged with a Chinese power generation mix, which is not as clean as our Nordic electricity and is based to some extent on the use of lignite to generate electricity, is different.

Why is this an inspiring example?

- We are an automotive manufacturer with a clear core value that the 'environment must permeate everything we do' and we are ensuring this through our new focus on the car's entire life cycle and by taking action on environmental impacts other than emissions in the use phase.

Have there been any challenges with the work?

- The greatest challenge now is to ensure that the environmental impact of our future cars is less than that of our current ones, and to ensure that the environmental impact of our cars overall is decreasing through all life

cycles. Another challenge is to remain focused on several impact aspects and not just carbon dioxide, which is the natural focus of the automotive industry.

What is your main obstacle to intensifying your life cycle approach?

- It's difficult to reach out with the results to the right part of the organisation, and to translate the life cycle results into technical targets that can be measured and monitored.

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Will you continue to apply the life cycle perspective?

- We've got a clear plan on how to introduce the life cycle approach into the production process and other decision-making processes that we face, such as in our choice of materials and in particular resource-critical materials. Some of our next steps are to improve our tools and obtain more data on battery recycling. We are also seeking to understand the environmental impact associated with more and more electronics and thus the use of rare earth metals that we see increasing in our cars.

What tips would you give to others who want to launch or further develop their own efforts to reduce the climate and/or environmental impact in their organisation?

- First of all you need to find out internally what stage the company is at today and what environmental impacts it currently has, and then work step-by-step towards what you want to achieve. I also think it's important for the management to decide that this is important and for the life cycle approach to become part of the organisation as a whole.

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This article is part of the project entitled: Good examples – Inspiration for energy efficiency through the entire value chain, which was carried out with funding from the Swedish Energy Agency. You can find out about additional examples of applied life cycle thinking, read more about Volvo Cars' work on climate change or learn more about the life cycle perspective via these links:

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