

Master thesis proposal

The conceptual composite car –environmental challenges and opportunities

Background:

The transport sector faces large challenges when it comes to decreasing its contribution to global warming and the dependence on fossil fuels. Vehicles need to find alternative sources of energy, as well as to decrease their energy use. This can be done by turning from vehicles with traditional internal combustion engines to electrical vehicles as well as by decreasing the mass of the car. The latter can be done by substituting conventional materials, such as steel, with lightweight materials, such as carbon fiber composites. One possibility to combine these two strategies would be to use structural batteries, where the energy is stored in the body of the car. These structural materials use the carbon fibers both as a reinforcement and as battery electrodes. Little is, however, known about the environmental impacts of these materials and how they would influence the overall life cycle impact of the vehicle. Also, there are methodological challenges in assessing the life cycle environmental impacts of such solutions as the same component fulfills several traditional functions in the car.

Project description:

The purpose of this project is to attempt to assess the environmental impact of an imagined conceptual composite car with structural batteries, and to benchmark that car to existing vehicles.

The tasks include:

- Rough conceptual design with regard to material types and weights
- Rough estimate of the life cycle environmental impact of the composite car with structural batteries
- Analysis of dominant phases, materials and design parameters to provide an understanding for environmental challenges and improvement opportunities
- Benchmarking against other vehicle solutions
- Identification of the main methodological issues in assessing technologies like this using LCA

The results will be a basis for future research on life cycle assessments of structural batteries and composite vehicles. The project will be conducted at Environmental Systems Analysis, Chalmers, during the spring 2021.

Qualifications

This project could be done by one or two students with a background in industrial ecology, mechanical engineering, product design, or similar, with interest in environmental assessment and/or technology development. Knowledge in basic LCA is needed by at least one of the students. Ideally, both students have taken a course on LCA.

Contact

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