Master's thesis Project proposal

Company name	**Automotive OEM** **with Laboratory for Processing of Advanced Composites (LPAC)**
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Project title or topic

"Coupled life cycle analysis, life cycle costing, and cost modelling of carbon fiber automotive structures"

Context and background

Full time masters thesis project

We are looking for an enthusiastic and motivated student, with a strong interest in sustainability strategies. This masters project will run a case study comparing candidate light-weighting materials for automotive structures typified by battery trays / body-in-white structures for conventional and electric vehicles including aluminium, steel, and alternate carbon fiber polymer composites. The case study will perform a system analysis including: i) life cycle analysis of the automotive battery tray / BIW component functional units, ii) technical cost modelling of the part manufacturing costs, and iii) life cycle costing of the applications including the use phase. LCA will examine multiple impact factors and data will be segmented into scope 1, 2, 3 emissions. We will examine the scenario of 2035 between: a) established technologies and supply chains available today, b) enabling technologies including green primary vs. secondary aluminium grades, green steel, bio-mass derived carbon fiber and bio-attributed snap cure resins, near net shape low waste automated composites manufacture, incorporation of post-industrial waste and end of life part waste (pyrolysis/solvolysis) between the two functional LCA units; with evolving IEA grid mix NetZero models (predictive LCA). Sensitivity analysis will be performed on the battery tray and BIW part mass (with and without vehicle mass decompounding), distance the vehicle travels, manufacturing volume, and end of life strategy (linear model versus circular economic approach with percentage re-use of materials). It is anticipated that high quality work will be published in a leading journal and also used as a case study in sustainability teaching at EPFL. The student(s) will have access to a previous similar case study and background data. Previous experience / courses in LCA or the sustainability minor would help accelerate progress. We are currently exploring options to collaborate with an automotive OEM during the project.