

Environmental Assessment of New Thermoplastic Composite Manufacturing Techniques for Transport Applications

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Candidate profile: master students at last year of studies in Materials Science and Engineering or Mechanical Engineering, willing to learn and put into practice the tools of Life Cycle Assessment, and to move to Windisch (Aargau) for a period at PSI and FHNW.

Duration: 4-6 months (1-2 at PSI, 1-2 at FHNW, 2-3 at EPFL)

Nowadays, the increasing need of energy and international requirements for environmental sustainability are pushing the transportation industry and the scientific community to find new strategies to improve vehicle fuel efficiency. One of the most effective way to reduce fuel consumption and subsequent carbon emissions is through light weighting: using strong but light materials to reduce the overall weight of cars.

Long fiber polymer matrix composites are ideal candidates to replace steel in vehicle structural applications, thanks to their combination of low density, resistance to corrosion and chemicals, mechanical properties, manufacturing versatility, and styling flexibility. There are a wide range of manufacturing routes to produce composite components, which depend on the nature of the matrix material, thermoset or thermoplastic. Thermoplastic composites (TPC) are more promising than thermoset composites, due to their higher toughness, recyclability, and workability, but are not yet widely used, due to cost and end-of-life issues.

Researchers and developers are investigating new manufacturing concepts in order to make long-fiber TPCs more attractive to mass-production industries. This must be accompanied by a comprehensive examination of all the aspects involved, in particular the environmental impact of the whole product throughout its life cycle (raw materials, manufacturing, transportation, use phase, recycling).

In this project, the environmental impact of two novel manufacturing processes, based on Resin Transfer Moulding (LTC-EPFL) and Injection Moulding (IKT-FHNW) for TPC components for transport application will be assessed. The study will be focused on real vehicular parts for public transport, and different scenarios will be compared. The student will spend an initial period at PSI, where she/he will be introduced to Life Cycle Assessment (LCA) tools. At FHNW (Brugg) and EPFL, he/she will perform the data collection, both through in-lab measurements and benchmark research, and will define manufacturing strategies.

The project is set in the framework of the Swiss Competence Centre for Energy Research (SCCER) – Mobility, within the Capacity Areas A3 and B2. For further details visit the web-page www.sccer-mobility.ch or feel free to contact us.

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