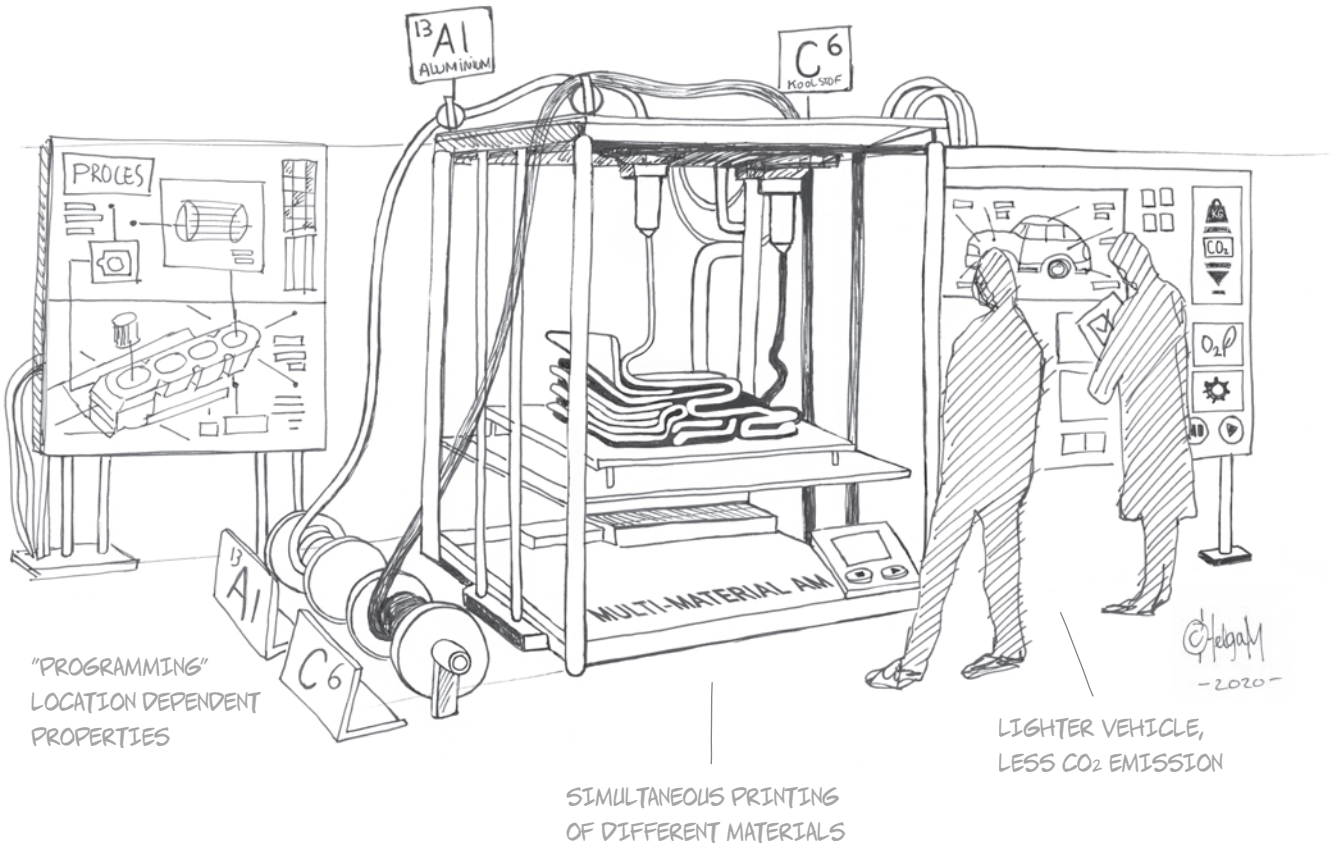
Holland High Tech

Global Challenges, Smart Solutions

Mobiliteit

Lightweight material design

Reducing transport system weight with Multi-Material AM



Although transportation is one of the greatest contributors to the advancement of modern-day society, it now faces the uneasy task of balancing its inevitable development and the associated economic benefits with the protection of health and the environment. Mobility being an important contributor to our CO_2 footprint, the Netherlands has expressed the ambition to have a sustainable mobility system and put forward the goal of 25 Mton CO_2 emission reduction by 2030. Reducing the weight of a transportation system will improve fuel efficiency and thus lower the CO_2 emission.

A new approach to component design and manufacturing

Independently of the energy source, the weight of a transportation system always has negative effects on system efficiency and eventually on the environment. Many of the components of transportation systems are *single material products* and are often overdesigned to meet a wide range of possible applications and conditions. Conventional manufacturing methods (casting, forging and machining from solid blocks) cannot produce locally tailored properties and are thus inefficient and wasteful.

Multi-Material AM as the holy grail

Additive manufacturing (AM) has already revolutionized the way we approach product design and manufacturing. The next paradigm shift is in Multi-Material AM, which allows for simultaneous printing of different materials with functional properties, thus enabling component design with “pre-programmed” site-specific properties. Combining light weight with optimal local properties is the holy grail of the transport sector. Reducing a car's weight by 100 kg triggers a reduction in CO2 emissions of 7.6 g/km. Only for the Netherlands, this means a reduction of 830.000 t CO2 per year!

Blending multidisciplinary expertise

To reach the challenging goal put forward in the project proposal, the involvement of companies from the relevant sectors as well as along the whole value-chain is required. In this project, multidisciplinary researchers and engineers from TU Delft, University of Twente and M2i together with GKN Fokker, Beamler and a broad 3D-printing and mobility consortium will develop weight reduction material design for energy efficient transport by “programming” location dependent properties in components, enabling the use of multiple materials to drastically cut weight and boost fuel efficiency. Blending expertise from component design, 3D-printing and material science, this project will devise an entirely new way of constructing smart components with full 3D functionality designed and built directly inside the materials.

Quick Facts

Project title	Enabling Energy and Environmental Transition through Multi Material Design and Additive Manufacturing (ENGAGE in AM)
Social theme	Mobility
Project partners	Delft University of Technology (TU Delft) - Mechanical, Maritime and Materials Engineering (3mE) University of Twente - Manufacturing Systems Materials innovation institute (M2i) GKN Fokker Beamler Additive Manufacturing

HiTMaT

The HiTMaT Call (Connecting High Tech pps in Maatschappelijke Thema’s) is an incentive programme of Top Sector HTSM to stimulate high tech innovation, highlight the importance of innovation in addressing social themes and missions, and inspire consortia to develop promising high tech solutions in pps research programmes.