



COMPOSITES:
ADVANCED MANUFACTURING SKILLS
AND PLATFORMS TAILORED TO YOUR NEEDS

FIRST HIGHER EDUCATION AND RESEARCH TECHNOLOGICAL INSTITUTE IN FRANCE

SUPPORTING INNOVATION AND ECONOMIC DEVELOPMENT

IMT has research teams and technological platforms across France, that are closely involved in R&D with enterprises, from SMEs to corporate multinationals such as Airbus and many others. We mobilise expert skills and capacities to address various types of composites (either polymers, organic or metal-based composites) and various additive manufacturing approaches, from modelling to simulation to material characterisation (mechanical, thermal, recyclability,...). We focus on addressing optimisation, durability, and functionality.

Our capabilities embrace the whole product life cycle:

Design- Compounding/Processing/Manufacturing -
Assembly - Testing - Monitoring - Recycling.



**A RANGE OF PLATFORMS
AVAILABLE FOR PARTNERSHIPS**

LASCALA AND POPCOM PLATFORMS AT IMT LILLE DOUAI

Located in Douai, LASCALA (Large SCALE plAstics & composites 3D printing) and POPCOM (Composites advanced manufacturing) platforms regroup 70 experts and 5000 m² of facilities dedicated to polymer and composites processing. The research activity focuses on advanced manufacturing of composites (e.g. fibre placement, liquid composite moulding, thermo-compression, injection-overmoulding) and polymer additive manufacturing, so as to address the R&D requirements of various sectors (automotive, aerospace, railway, energy, medical, EEE ...). Our approach balances technological/experimental development and modelling/simulation. In particular, based on the expertise gained on thermoplastic additive manufacturing (FDM/FFF and Freeforming processes), IMT Lille Douai has developed the LASCALA platform with unprecedented features: feeding by standard pellets, flexibility (thermoplastics, chopped fibre-reinforced plastics and structural composites with continuous fibres), manufacturing of large components (up to 5 m x 2 m x 1 m).

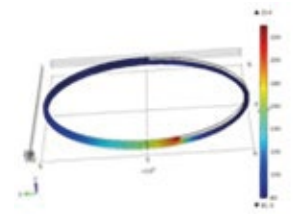


Figure 1
Simulation and modelling of polymers fused deposition (droplets or filaments)



Figure 2
Arburg Freeformer

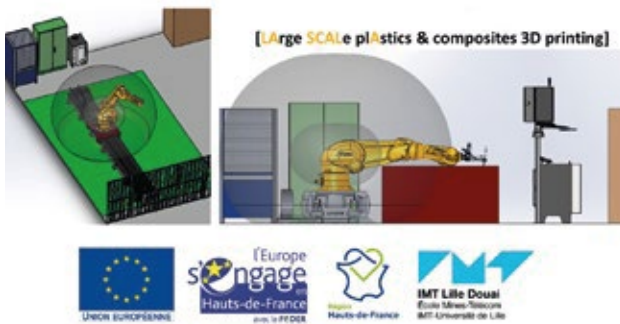


Figure 3
The POPCOM platform

EDYCO: DYNAMIC MANUFACTURING OF COMPOSITES AT IMT MINES ALBI

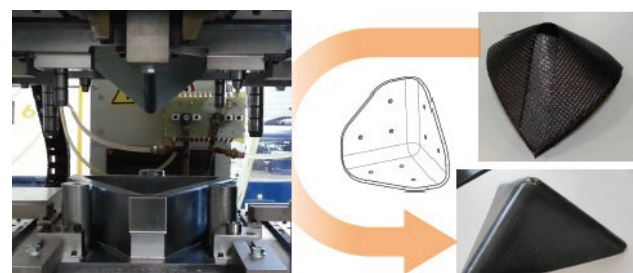


Figure 4
Corner Fitting manufacturing

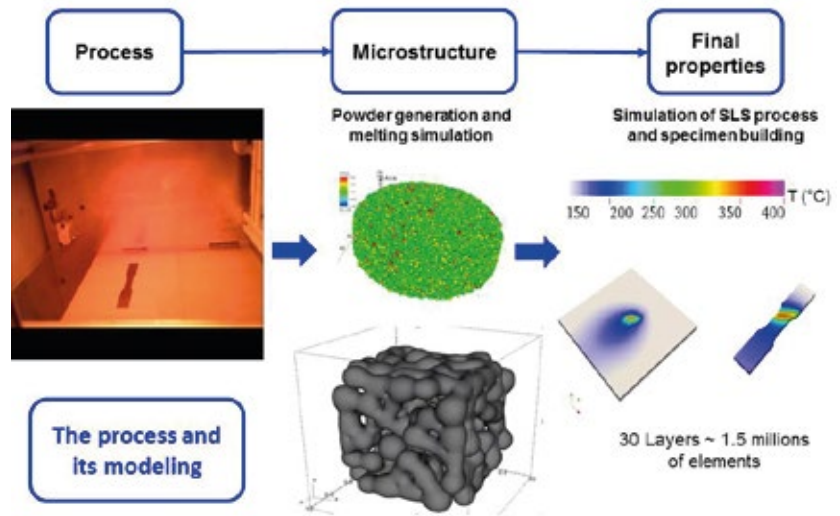
Located within the MIMAUSA Platform dedicated to R&I on advanced materials for aeronautics and transport applications, the EdyCo pilot equipment enables investigation of fast thermocompression processes applied to thermoplastic and thermoset composite manufacturing. A wide range of materials and semi-products may be addressed, such as natural flax fibre thermoplastics, thermostable powdered or comingled C/PEEK and comingled reclaimed carbon fiber Polyamide mats (rCF/PA6).



Figure 5
rCF/PA6 (reclaimed carbon fiber Polyamide part)

SHAPING-MICROSTRUCTURE-CHARACTERISATION CHAINING APPLIED TO ADDITIVE MANUFACTURING AT MINES PARIS TECH

MINES ParisTech provides technological solutions to better control the microstructure and warping of structural components, warping that is inherent to additive manufacturing. Expertise in Fused Deposition Modelling (FDM) and Selective Laser Sintering (SLS) relies on a deep understanding of fusion and solidification of the polymer. We couple this expertise with digital models to predict the development of porosities during the solidification phase, and, at the macroscopic level, to simulate residual distortions that result from the applied thermal process.



DIGITAL AND PHYSICAL ENVIRONMENT FOR MULTI-SCALE MULTI-PHYSICS ANALYSIS OF INFUSION-BASED PROCESSES FOR (BIO-)COMPOSITES AT MINES SAINT-ETIENNE

Mines Saint-Etienne has continuously built, over the past years, a digital and physical modelling environment for simulating infusion-based processes for (bio-)composites, from micro-structures to full structures. Mostly, our numerical capabilities and deep understanding of the many scales and multi-physics involved in fluid-fibrous media interactions have taken advantage of a close strategic academic-industry partnership with Hexcel, a leader in advanced composites. Hexcel & Mines-Saint-Etienne have mobilised a team of highly skilled scientists and engineers, complemented by a €2.2 million funding, within the framework of a major €9 million undertaking.

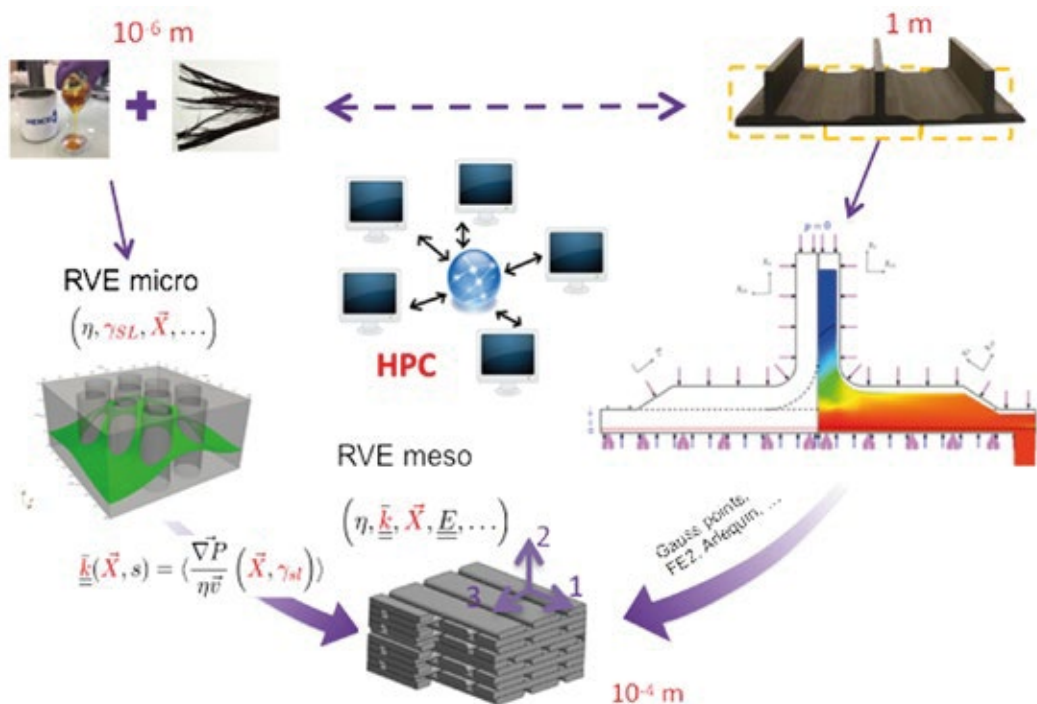


Figure 6
Multi-scale approach of the infusion processing of composite parts

COLD SPRAY AND POLYMER MATRIX COMPOSITES AT MINES PARIS TECH

This platform provides access to a low-pressure cold spray system and to a medium/high pressure cold spray system which allow in-depth studies of cold spray on polymers and polymer matrix composites.

Based on these systems, and on various scientific skills in the fields of characterisation, simulation, or design, quite a range of functional materials can be developed and prototyped.



Figure 7
Picture by TWI Ltd, Great Abington, UK

A POLYMERS AND COMPOSITES PLATFORM AT IMT MINES ALÈS

IMT Mines Alès platform is dedicated to additive manufacturing based on polymers, mixed polymers or composites. This platform allows to address R&D based on FFF, SLS or hybrid manufacturing, and encompasses the full cycle, from modelling and simulation to process optimisation to material characterisation. Quite a range of systems is available, in both modelling and design, AM, and characterisation, with demonstrated results in various industrial sectors (medical appliances, aerospace, architecture ...).



Figure 8
Segula composite corset



Figure 9
Biobased cups colored by micro-algae

CONTACT
jec@imt.fr



Institut Mines-Télécom
37-39 rue Dareau
75014 Paris, France
www.imt.fr

