Séminaire du laboratoire PIMM

Jeudi 7 avril 2022 à 13h30

Dr. Anaïs BARASINSKI

Université de Pau

présentera dans le cadre du séminaire ses travaux intitulés :

Surfaces & Interfaces and Some of Their Consequence in the Everyday Composites Forming Process Life

Composite materials today offer a unique opportunity for the development and evolution of parts. These multi-component materials, which can be defined "à la carte", can very easily be endowed with specific properties, multiple functionalities, or even gradient properties in a large number of fields (optical, electrical, etc.), offering an incredible ratio of mechanical performance to density and reaching records for resistance to temperature, chemical attack, or corrosive environments. These materials are used in many fields: sports and leisure, transport (aeronautics and space, land, naval, etc.), civil engineering (housing, structures (e.g. bridges, etc.), but also in repair (offshore, automotive), as well as in micro sectors (microelectronics, cosmetics, clothing, etc.). They also offer the possibility of combining various materials and compounds that are increasingly bio-based, and have the ability to be recycled.

However, one drawback today concerns their manufacturing. It remains difficult today to organize a customized, robust and reliable production while controlling costs. Moreover, it is difficult to control a production that concentrates in an unusual way very varied physics, at multiple scales, which can have dramatic impacts on the quality of the parts. In addition, at all scales of the product and at all stages of production, there is pervasive uncertainty about the quality of the material, the part and the process. All of these sources add up and fuel the difficulty of implementation. This is why most applications today remain in the high value-added or low volume areas, which keeps the cost very high.

To address these issues, it has been used to model a well-identified physics at each scale and manufacturing step, and then feed the models with well-defined measurements and calibration procedures. It is obvious that the development and control stages of composite parts production lines must be rethought and adapted. New benchmarks, quantities to be measured and controlled must be identified and monitored during production. The same applies to the usual specifications of components and semi-finished products.

Indeed, composite materials being composed of several materials, have a surface/volume ratio much more important than a traditional material that is considered in bulk, so the approaches in the thermal, mechanical, electromagnetic fields require to evolve and be adapted to correspond to these new materials, manufactured by new processes.

It is in this context that the developments presented were carried out: in order to better understand the processes, to propose a better identification of the preponderant physics, having a strong impact during the manufacturing of these materials, then to propose adapted numerical simulation tools, allowing to complete the understanding and to go towards the control and the optimization of the processes. "