From automation to optimisation: unlocking the full potential of AFP for sustainable aerospace structures

Samuel Requile, head of the composites department at Coriolis Composites, explains how intelligent use of AFP can lower the environmental footprint of composite parts.

As aerospace continues its push toward lighter, more efficient, and climate-resilient structures, composite manufacturing must evolve beyond simple automation. Automated fibre placement (AFP) is widely adopted for its precision and repeatability, yet it is often deployed as a direct substitute for hand layup, mimicking legacy stacking sequences and quasi-isotropic designs. This 'black metal' mindset, where automation merely replicates manual practice, limits the real potential of AFP.

At Coriolis Composites, we advocate for a shift toward Intelligent AFP: an approach that leverages AFP's unique capabilities to steer fibres along the real load paths, adapt placement to geometry and optimising both structural performance and material efficiency, without compromising performance. To illustrate this evolution, we developed a series of demonstrator parts, from traditional hand layup to AFP-based, topologically optimised structures, highlighting how each step increases the functional use of material and reduces waste.

This transition is not purely about engineering; it's also a matter of sustainability. By placing only what's needed, where it's needed, Intelligent AFP enables a reduction in raw material consumption (up to 30%), lower part mass (20-30%), and decreased energy use during processing. Less overdesign means fewer plies, shorter deposition paths, reduced machine energy consumption, and ultimately a lower CO_2 footprint per part. In short, every optimisation step reduces environmental impact.

The key enabler of this transformation is CATFIBER V2, our new design-to-manufacturing software embedded in CATIA V5 or 3DEXPERIENCE platform. CATFIBER V2 bridges the gap between designers and manufacturing engineers through full integration of DFM in designers' environment and MPS in the machine programmers' environment:

- **DFM (Design for Manufacturing) logic:** guiding designers to create AFP-compatible layups from day one.
- **MPS (Manufacturing Process Simulation):** enabling early validation of deposition strategies, minimising trial-and-error on the shop floor.

This digital continuity ensures that what is designed is also manufacturable, and that what is manufactured has been designed to be efficient.

By optimising every layer of the composite layup, both virtually and physically, AFP becomes more than an automation tool. It becomes a sustainability enabler. This approach leads to lighter structures, fewer production iterations, and reduced waste, essential factors for lowering the environmental footprint of future aerospace programmes.

As we look to the next generation of composite design, it's clear that sustainability cannot be an afterthought. It must be embedded in the design logic itself, driven by performance, enabled by smart software, and realised through process-aware manufacturing like AFP. Using the full potential of AFP is not just a mindset, it's a method, combining simulation, software, and advanced machine capability. It transforms AFP from a high-end tape layer into a strategic tool for sustainable innovation in aerospace.

At Coriolis Composites, we are committed to unlocking the full potential of AFP, not only to make parts faster, but to make them smarter, lighter, and cleaner. We believe this is not just possible, it's necessary.

Further information

Coriolis Composites: www.coriolis-composites.com