

FiberSIM®

at Fischer Advanced Composite Components

FACC Reduces Detailed Design Time and Meets Development Deadlines for Boeing 787 Translating Sleeves with FiberSIM® Software



Austria-based Fischer Advanced Composite Components AG (FACC) is a leading company specializing in the development, design and manufacture of composite components and systems for civil aircraft. Shown are technicians laying up composite material on a tool used to create translating sleeves for the Boeing 787 Dreamliner.

Fischer Advanced Composite Components AG (FACC), located in Austria, is a leader in designing and manufacturing aircraft components and systems. It supplies products made of ultra-strong carbon fiber composite materials for modern civil aircraft, and was charged with designing and delivering advanced composite translating sleeves for the exciting, new Boeing 787 Dreamliner commercial airliner.

A translating sleeve is a key part of a cascade thrust-reverser system for today's modern jet engines. It is made up of a series of spaced blocker doors on the engine that enable all or part of the engine's thrust to be redirected out the sides of the cowling, providing increased braking for an aircraft after it touches down for landing. For the Boeing 787, these parts are manufactured with carbon-fiber composite materials for increased strength, noise dampening and part durability.

FACC faced a number of pressing challenges while creating these complex composite parts:

- Hitting deadlines was critical for the 787 program, so delivery times were very stringent.
- Technology demands and development requirements became very complex because FACC proposed to develop the new composite products using a completely novel manufacturing process.
- Collaboration across the entire development chain was critical to ensure that the parts were created with no errors the first time.

The company would, in essence, need to build a new kind of sleeve that would be optimized for maximum weight reduction and performance, while staying on budget and meeting all specifications and delivery dates—an extremely difficult task without VISTAGY's specialized engineering software.

FACC turns to FiberSIM® to Streamline Detailed Design as well as Manufacturing

Early in the design phase of the program, FACC achieved some initial success with 3D CAD tools and 2D drawings, but it proved to be time-consuming and tedious. FACC had traditionally defined and sequenced composite plies manually and created complex curves and flat patterns in 2D drawings. They soon realized that in order to achieve significant time-savings, the company needed to move to a completely model-based engineering process. The engineers had used VISTAGY's FiberSIM® specialized composites engineering software to create manufacturing data on other programs, and turned to this powerful tool again to help streamline conceptual and detailed design as well.

Using FiberSIM, FACC engineers began quickly defining the various zones of the composite sleeves very early in the design phases. They easily calculated complex curves, ply boundaries and transitions while simultaneously capturing all the critical non-geometric design detail needed to actually manufacture the parts. In just days, as opposed to weeks, FiberSIM's zone-based capabilities allowed the engineers to capture not only the surface geometry, but also automatically associate the critical non-geometric notes and annotations directly with the model. FACC utilized FiberSIM to electronically create and capture the complete design definition detail in one master model—including splices, drop-offs, offsets and chamfers, as well as all non-geometric detail—and automatically export it to XML in order to share the detail downstream with the manufacturing and quality groups.

FACC's Objectives:

- ▶ Move to an entirely 3D model-based design process
- ▶ Reduce design and manufacture cycles to meet strict delivery times while ensuring part quality
- ▶ Export design detail directly to manufacturing reports as well as downstream laser projection and automated deposition machines



Because the definition data was captured in common XML format, the information could be easily and efficiently shared with downstream engineers or exported to nesting and analysis software or automated deposition, tape laying and laser projection machines in order to reduce lay-up and tooling time. In fact, by using FiberSIM throughout the design and manufacturing processes, FACC reduced lay-up time by more than 15% and cut its delivery timeframe from years to months. For the first time ever, FACC could define detailed composite products as part of a reusable and shared model-based definition approach. As a result, all engineers could refer to the complete definition, make changes that were propagated across the development chain and collaborate in an unprecedented way to maintain original design intent on the final part.

Simplifying Critical Reporting on Manufacturing Data with FiberSIM

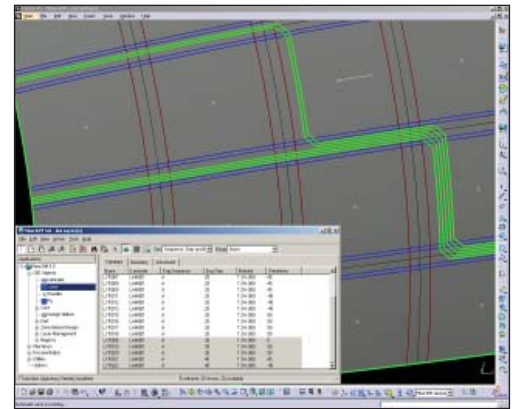
It was also extremely important for FACC to create manufacturing documents and reports relating to materials being used on the sleeves. Before using FiberSIM, FACC manually compiled data using hard copy lists, spreadsheets and tables. Reports were created as spreadsheets and ply books made up of hundreds of 2D hand drawings were used to outline each ply. Annotations and engineering notes were written on these drawings, which were hand-delivered to the manufacturing floor.

Now, with FiberSIM, the detailed design data—everything from ply orientation, material type, transitions, sealants and ply sequences could be automatically exported directly to downstream manufacturing reports and documentation. At the push of a button, the reports could be populated with thousands of pieces of data, saving weeks of manual research and compilation time. In addition, because of the flexibility of FiberSIM's architecture and support for third party applications, stress and aerodynamic data from analysis tools could be shared within the model and then exported to stress reports. This was

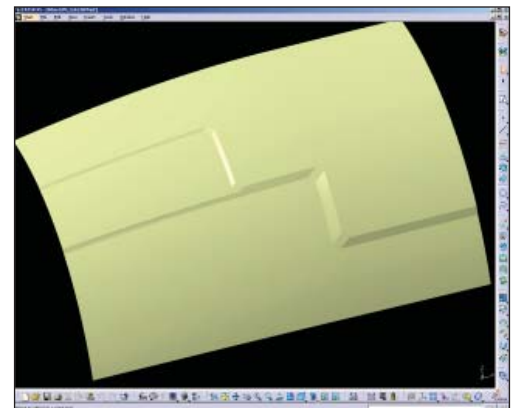
an important step for FACC in streamlining their entire end-to-end development process and using a model-based definition approach as the sole communication medium between design, manufacturing, analysis and quality.

Successful Delivery of Composite Parts

With FiberSIM, FACC delivered its translating sleeves on time as part of its commitment to the 787 program. Combined savings in design, tooling and reporting time reduced the development cycle by months. VISTAGY became a trusted strategic partner for FACC, and the company relied on VISTAGY's more than 15 years of aircraft development expertise to meet its deadlines and deliver these innovative composite parts on time. By utilizing FiberSIM to create a completely model-based definition and integrate the design, manufacturing and reporting phases of development, FACC gained a competitive advantage while contributing to the future success of the Boeing 787 program.



Shown is a sample aircraft panel (not an actual FACC model) during a CAD modeling session. Engineers can define a chamfer constraint within FiberSIM to accommodate specific manufacturing processes, such as automatic tape deposition or fiber placement. FiberSIM then automatically creates the corresponding layer boundaries shown in green, eliminating what used to be a painstaking and error-prone process for defining plies.



Shown here is the offset surface based on the sample design above. A surface of three different thicknesses is shown. This is useful for creating a tooling surface for manufacturing.

FiberSIM® Delivers Results

- ▶ **Reduced Development Time**
Design, ply lay-up and tooling times were reduced by more than 15%
- ▶ **Automated Documentation and Reporting**
Eliminated paper and 2D drawings while automatically creating bills of material and detailed parts and materials reports
- ▶ **Accurately Export Downstream Data**
Detailed design data was exported directly to manufacturing machines without losing data or original design intent
- ▶ **Improved Development Process Flow**
Streamlined internal development processes to win additional aerospace projects
- ▶ **Enhanced Product Development**
Met all customer delivery deadlines while increasing number of cycles to further refine product designs—reducing weight, improving durability and ensuring part quality



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