SIEMENS

Fibersim

Fischer Advanced Composite Components

Leading aerospace supplier meets deadlines for Boeing 787 translating sleeves with Fibersim

Industry

Aircraft and airframe

Business challenges

Hit stringent delivery deadlines

Leverage full value of new design and manufacturing processes

Collaborate across the entire development chain

Keys to success

Move to an entirely 3D model-based design process

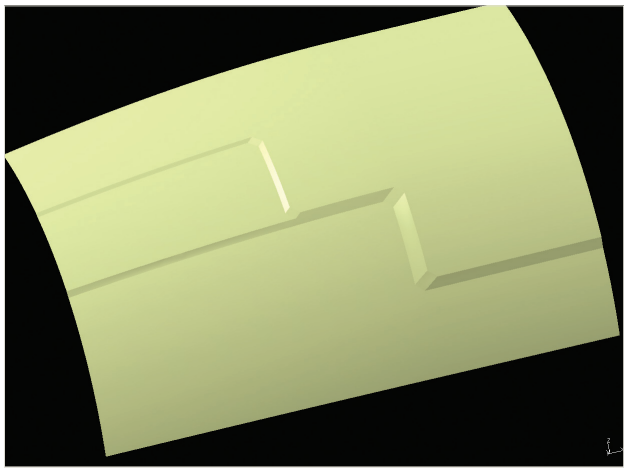
Reduce design and manufacturing cycles to meet strict delivery times while ensuring part quality

Export design detail directly to manufacturing reports as well as downstream laser projection and automated deposition machines

Fischer Advanced Composite Components reduces product development time by more than 15 percent

Fischer Advanced Composite Components AG (FACC), located in Austria, is a leader in the design and manufacturing of 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 new Boeing 787 Dreamliner commercial airliner.

A translating sleeve is a key part of a cascade thrust-reverser system for today's 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.



Shown 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.

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.

Results

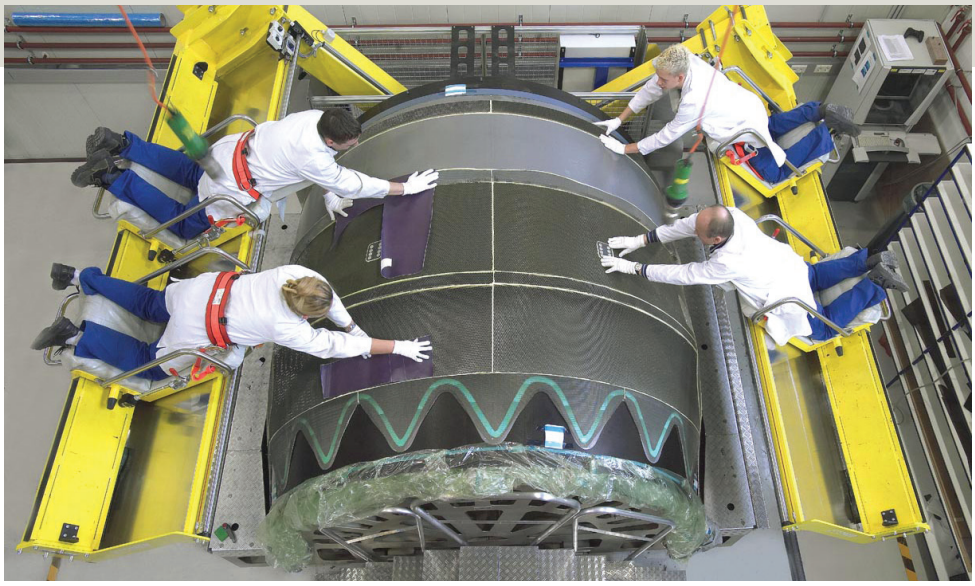
Reduced design, ply layup and tooling times by more than 15 percent

Eliminated paper and 2D drawings while automatically creating bills of material and detailed parts and materials reports

Exported detailed design data directly to manufacturing machines without losing data or original design intent

Streamlined internal development processes to win additional aerospace projects

Met all customer delivery deadlines while increasing number of cycles to further refine product designs, thus reducing weight, improving durability and ensuring part quality



Technicians laying up composite material on a tool used to create translating sleeves for the Boeing 787 Dreamliner.

Ultimately, the company needed 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. This would have been an extremely difficult task without Siemens PLM Software's Fibersim™ portfolio.

Streamlining detailed design and manufacturing

Early in the design phase of the program, FACC achieved some initial success with 3D computer-aided design (CAD) tools and 2D drawings, but that 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. The company soon realized that to achieve significant time-savings, it would need to move to a completely model-based engineering process. The engineers had used Fibersim to create manufacturing data on other programs, and turned again to this powerful tool to help streamline conceptual and detailed design as well.

Using Fibersim, FACC engineers began quickly defining the various zones of the composite sleeves early in the design process. They easily calculated complex curves, ply boundaries and transitions while simultaneously capturing all the critical non-geometric design detail needed to manufacture the parts. In just days, as opposed to weeks, the zone-based capabilities of Fibersim allowed engineers to capture not only the surface geometry, but also to automatically associate the critical non-geometric notes and annotations directly with the model. FACC used 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.

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 layup and tooling time. In fact, by using Fibersim throughout the design and manufacturing processes, FACC reduced layup time by more than 15 percent and cut its delivery timeframe from years to months. For the first time ever, FACC could define detailed composite products as part of a re-usable and shared model-based defini-

Solutions/Services

Fibersim
www.siemens.com/plm/fibersim

Customer's primary business

FACC is a leading company in the development, design and manufacture of composite components and systems for civil aircraft and helicopters. It offers a wide range of products, from aerostructures to fuselage, wings and empennage, engine and engine nacelle components and complete aircraft cabins. The two divisions, Structures and Interiors, occupy top positions in their respective markets.
www.facc.at/en

Customer location

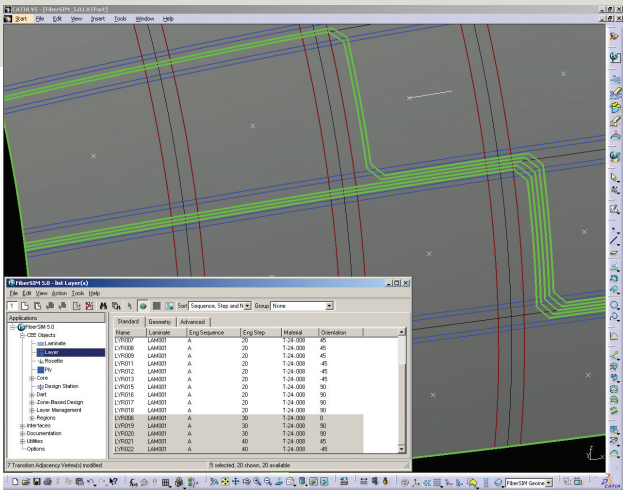
Ried im Innkreis
Austria

tion 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 reporting on manufacturing data

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 that 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, such as 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 the architecture and support for third-party applications of Fibersim, 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.



Pictured is an example of an aircraft panel 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 corresponding layer boundaries (shown in green), eliminating what used to be as painstaking and error-prone process for defining plies.

Successful delivery of composite parts

With Fibersim, FACC delivered its translating sleeves on-time as part of its commitment to the Boeing 787 program. Combined savings in design, tooling and reporting time reduced the development cycle by months. Siemens PLM Software became a trusted strategic partner for FACC, and the company relied on its more than 15 years of aircraft development expertise to meet its deadlines and deliver these innovative composite parts on-time. By using 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.

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