SIEMENS

Aerospace

AeroComposit

AeroComposit introduces computer-aided composite products design and engineering with Fibersim

Product

Fibersim

Business challenges

Develop and produce composite wings for the MC-21 Russian short-mid-range airliner

Develop design and manufacturing competency for composite airframe components

Establish a design and manufacturing framework for making composite structural components

Reduce time to market

Keys to success

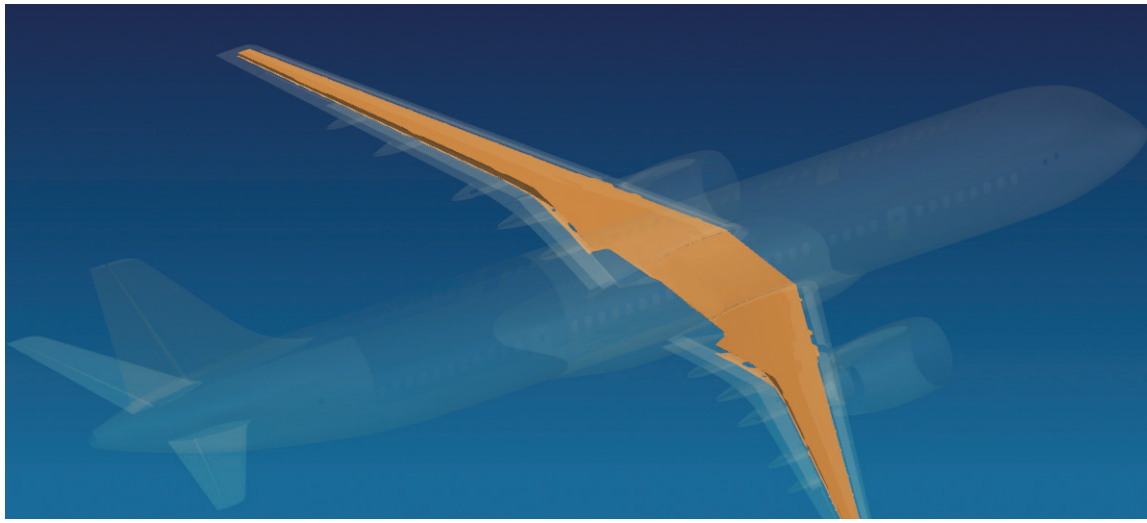
Implementation of Fibersim and mastering its comprehensive functionality

Eliminate paper drawings and switch to paperless engineering processes

Teamcenter serving as the end-to-end digital thread embracing every composite product development stage

Integrating Fibersim with available production equipment

Support from ITS and Siemens PLM Software



Aerospace manufacturer uses Siemens PLM Software technology to reduce time to market

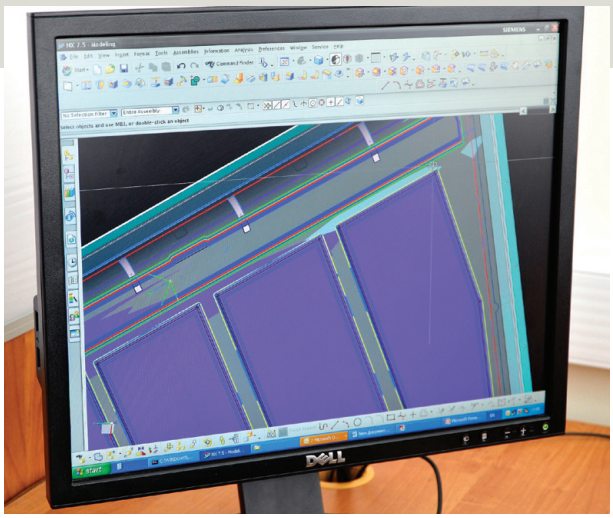
Mastering 21st century technologies

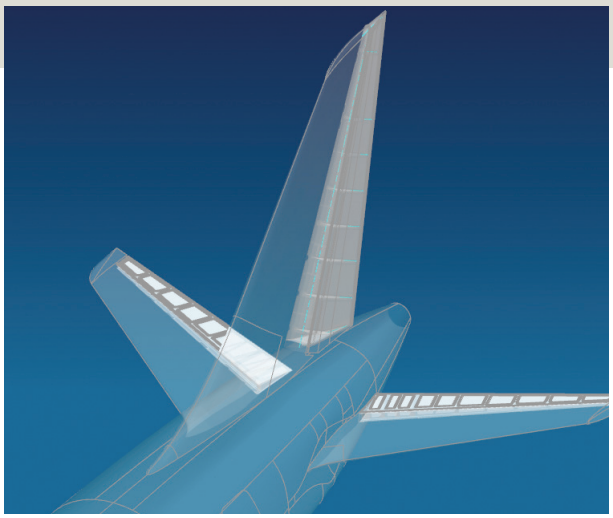
AeroComposit was established in 2008 as a center of competence for developing innovations and manufacturing polymer composite airframe components. Today AeroComposit's primary business is composite wing development for the new MC-21 Russian airliner, and composite component manufacturing for the new modifications of the SSJ100 airliner. Up to 40 percent of the MC-21 airliner's components are composite.

AeroComposit performs product development, composite component production planning, composite manufacturing, and post-sales support. The company provides complete product lifecycle support, from conceptual design to serial production launch. This approach improves the reliability and quality of the final product. To reduce time to market, the company needed appropriate software solutions at every product lifecycle stage, including product design and engineering.

Selecting Fibersim

AeroComposit evaluated several software tools for composite products development. A number of pilot projects were implemented in 2010 to aid in the software selection. Based on the pilot projects'





Results

Developed composite component production planning strategy

Reduced time from product ideation to composite manufacturing

Reduced number of design errors

Launched pilot production of composite components

Established a unified product development and manufacturing environment

Accelerated production cycles by removing intermediate operations

results, the company opted for the Fibersim™ portfolio of software for composites engineering from product lifecycle management (PLM) specialist Siemens PLM Software. Fibersim is a unified environment for design, data preprocessing for engineering analysis systems, and process planning for both manual and automated composite layup operations.

Several factors led to the selection of Fibersim, including comprehensive functionality, multi-platform features, a unified digital thread from design to manufacturing and compliance with the software standards of United Aircraft Corporation (UAC).

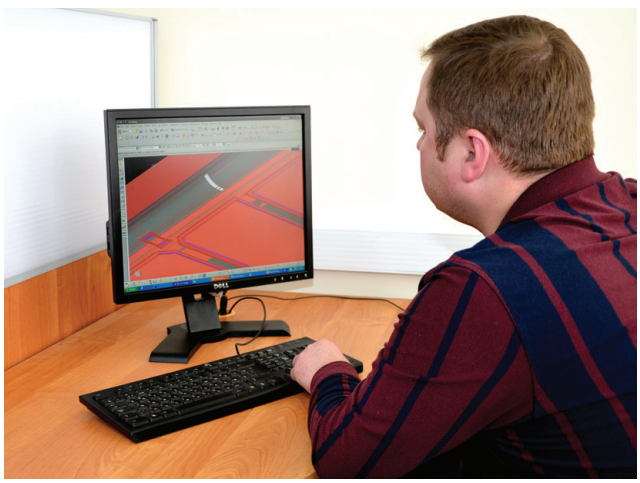
Partner support

Innovation Technologies and Solutions (ITS), Siemens PLM Software authorized partner for composite design and manufacturing solutions, participated in the Fibersim deployment at AeroComposit as early as the pilot project launch stage. ITS has been promoting Fibersim in Russia since 2009, and also is a channel partner for NX™ software, Teamcenter® software and the Tecnomatix® portfolio.

“As we launched the pilot project at the end of 2010, we invited ITS,” says Alexey Marusin, information technology (IT) director at AeroComposit. “Back then it was the only Russian partner of Vistagy, the developer of Fibersim. We welcomed Fibersim joining the Siemens PLM Software portfolio, since with this move our wishes for a single engineering software vendor came true.” UAC companies including AeroComposit use NX as their primary product development platform.

Step-by-step deployment

Under the Fibersim pilot deployment project in 2010, experts from ITS and Siemens PLM Software provided training to AeroComposit personnel. As the implementation moved from product design to production planning, AeroComposit’s engineers developed manufacturing information from the product definitions designed with Fibersim. The company experts received hands-on training with actual production components throughout the entire product development and engineering process, including for both manual and automated composite layup.



"It saves a lot of time, since product development is iterative. The designer tries to make an optimal design with several iterations, so an ongoing and fast collaboration with analysts is required."

Pavel Narmin
Senior Manufacturing Engineer
AeroComposit

As a result, the company became proficient in manufacturing data processing strategies for the available equipment (an automated cutter and a laser projection system for manual layup) and numerical control (NC) code development for automated layup machines. Since mastering the extensive functionality of Fibersim, AeroComposit has managed to significantly reduce development time and the number of errors. For example, Fibersim can control the layer sequence and number with a designed material definition. The designer simply selects the appropriate settings in a dialog box.

By the time the pilot project was completed in 2012, AeroComposit had purchased its first batch of software licenses covering the entire process chain. Afterwards the number of licenses grew, since more engineers began using Fibersim and there was a need for extra workstations and extended functionality.

The objective of the second deployment stage was pilot composite production at AeroComposit Labs. The process sustainability had to be verified before launching serial production. In addition, the software had to be integrated with the available manufacturing equipment. The second-stage results helped establish a feedback loop for the designers, and enable the team to gain more experience with Fibersim.

Currently, at the stage of pilot production, collaboration and online shared access to product data was organized from three sites: Moscow, Kazan and Ulyanovsk. The real results receipt from the production site has been tested. In the upcoming fourth stage, AeroComposit will launch serial production at its own manufacturing facilities.

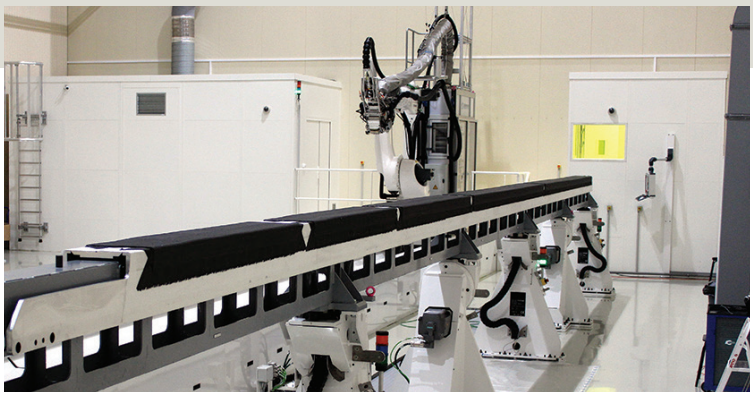
A digital thread from design to manufacturing

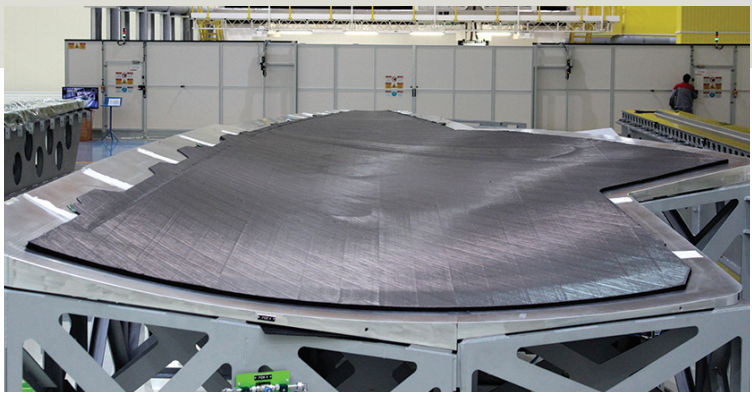
One of the key AeroComposit achievements is development of a production planning strategy for structural polymer composite components. The company develops design documentation and performs production planning using Fibersim. The software is used at the Moscow site and at the production sites in Kazan and Ulyanovsk, which are already making components identical to serial products.

AeroComposit is an integrated manufacturer, so an end-to-end digital thread is extremely important. To establish such a thread, all of the computer-aided design (CAD) applications have been integrated with Teamcenter project data management and collaboration tools. Since Fibersim is integrated into NX, the results are saved as NX models. "With a unified digital thread, information is transferred between stages as quickly as possible," explains Marusin. "Everyone uses Teamcenter, and the relevant information is available at virtually every lifecycle stage online."

"Our Western partners had expected that it would take us seven years to get any tangible results. We obtained these results in just three years."

Alexey Marusin
IT Director
AeroComposit





This strategy has led to an almost paperless processes. Some companies struggle with computer-aided systems deployment because obsolete, paper-based strategies are still in place. Such situations cause information gaps and it is often the case for composite design processes. Fibersim fills the gap, because it accommodates both the paper-based strategy as well as the new digital strategy. Since AeroComposit is a new company with no paper-based legacy, it decided to perform all the design and engineering tasks digitally using the IT systems available.

The digital process, which saves time and reduces errors, is extremely important because errors may lead to delays and defects that are very expensive due to the cost of the product components. The intuitive user interface in Fibersim also helps reduce the number of possible errors. The designer checks the proposed composite layer distribution with the integrated layer and cross-section visualization tools. Early in the design stage, the finished product is rendered so any possible errors can be eliminated.

Fibersim also helps in checking the product manufacturability as well as the number and sequence of layers in the design stage. These tools evaluate fabric producibility and layup options so that changes can be made as early as possible. Other functions help with the development of standard parts. For example, aircraft slats and flaps are very different; they have diverse geometry and structural strength features. Still, their layups can be standardized to make the designer's work easier.

Product design efforts at AeroComposit have been reduced through the 3D modeling implementation and by the integration between CAD and structural analysis tools. Since Fibersim operates within the unified product development framework, the designer can specify certain manufacturing processes such as the composite layup sequence, and then exchange the layup with the structural strength analysis systems. "It saves a lot of time, since product development is iterative. The designer tries to make an optimal design with several iterations, so an ongoing and fast collaboration with analysts is required," says Pavel Narmin, senior manufacturing engineer at AeroComposit.

Fibersim has also contributed to shorter production cycles. For example, Fibersim has helped eliminate several intermediate development stages used in conventional approaches to launch production and manufacture products. The software creates data that can be directly transferred to AeroComposit machines, including fabric cutters and laser projectors. All cutting and layup information is made available to the manufacturing engineer with a simple mouse-click in Fibersim. There is no need for additional software tools because Fibersim already supports a broad range of production equipment due to Siemens PLM Software's close cooperation with equipment manufacturers.

Faster time-to-market is the crowning achievement made possible with the software's advanced capabilities and benefits. "Our Western partners had expected that it would take us seven years to get any tangible results," says Marusin. "We

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Alexey Marusin
IT Director
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Solutions/Services

Fibersim
www.siemens.com/plm/fibersim

Customer's primary business

AeroComposit develops and manufactures composite wings for the Russian MC-21 jetliner. The company performs product development, analysis, production planning, composite manufacturing, and post-sales support. The headquarters and the Composite Technologies Labs are in Moscow. The company has two production sites in Kazan and Ulyanovsk. AeroComposit is a United Aircraft Corporation company.
www.aerocomposit.ru

Customer location

Moscow
Russia

Partner

Innovation Technologies and Solutions
www.inteso.ru

obtained these results in just three years." Marusin emphasizes that the partnership with ITS has helped a lot. ITS provided support and training at the initial project stage. The support by Siemens PLM Software has also been considerable. During the project implementation, the experts from ITS and Siemens PLM Software solved many issues related to the adaptation of the software to Russian national standards, and compatibility with the equipment available at AeroComposit. A number of the customer requests have been promptly addressed in the subsequent releases of Fibersim, enhancing the product functionality. As AeroComposit has gained significant hands-on experience, the processes and the software are still being fine-tuned. The company has requested new functions to support unique manufacturing equipment and processes. For example, the one-of-a-kind manufacturing equipment in Ulyanovsk needs support for dry carbon automated fiber placement (AFP). For the Kazan production site where prepreg (pre-impregnated) carbon fabric cutting is performed with automated cutting machines and the layup process is manual, there is a need for a nesting and cutting optimization feature. Narmin believes that as soon as these capabilities are implemented, Fibersim will become a perfect solution for manual and automated polymer composite layup processes.

AeroComposit plans to expand its use of Siemens PLM Software solutions. "We have gained our first experience with the MC-21 project, and will transfer it to other programs focused on reducing product development and production planning time," says Marusin. "For this reason we may need extra software."

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