GKN Aerospace reduces manufacturing engineering time 50% with DS PLM Solution for Composites

GKN Aerospace sought to eliminate the time-consuming process of troubleshooting composite lay-ups on the shop floor. By adopting CATIA, ENOVIA, DELMIA (including Intercim) and 3DVIA, plus software from Dassault Systèmes' CAA Partners Simulayt and Magestic Systems, GKN reduced manufacturing engineering time approximately 50% and greatly improved collaboration throughout the extended enterprise.

GKN Aerospace is a major Tier 1 aircraft parts supplier specializing in complex composite and metal parts and aircraft assemblies. The company is acclaimed for its technological leadership on projects that include developing the first major composite wing spar, the first all-composite fan containment case, and the first all-electric ice protection system.

PROCESS INTEGRATED FROM DESIGN TO FABRICATION

Like all pioneers in composites manufacturing, GKN used the traditional "paper-doll" approach to composites design, which involves cutting and re-cutting the initial design on the shop floor until the flat pattern conforms to the lay-up tool's surfaces. Various applications have been developed over the years to simulate producibility, but data normally must be translated from system to system, adding time to the process, impeding communications and introducing the potential for errors.

To meet the demands of its complex composite design and build programs, GKN Aerospace recognized the need to introduce more sophisticated methods and design tools to eliminate these challenges. GKN Aerospace has subsequently developed a leading-edge process that integrates CATIA, ENOVIA, DELMIA including Intercim and 3DVIA Product Lifecycle Management (PLM) solutions from Dassault Systèmes (DS) with third-party software from DS CAA Partners Simulayt and Magestic Systems. This integration process is now used throughout the design and fabrication of GKN-designed parts.

A380 wing spar manufacture

Our integrated DS PLM solution helps our people stay connected throughout the entire process, regardless of location, while ensuring that downstream processes match the correct released engineering.

Tonya Cole
NC Programmer, GKN Aerospace

PLIES WORK THE FIRST TIME

GKN engineers use CATIA Composites Design (CPD) to organize the ply buildup by creating sequence charts, material tables and lay-up books. Then they use producibility algorithms, either in CPD or using Simulayt's Advanced Fiber Modeler (AFM) for complex shapes, to assess possible fiber deformations in plies. If the potential for deformation is identified, the design can be corrected with the addition of splices at the design stage. Ply darts also are added where required, before the design goes to the shop floor for cutting and lay-up. "Since we began simulating producibility up front, we have seen very few cases where the results were not as anticipated by the NC programmers," said Tonya Cole, NC programmer on the project.

As a part is designed in CATIA, the in-process data is managed in ENOVIA, where it can be accessed by design and manufacturing team members regardless of their location, as well as by the customer for electronic signoff. Once producibility is verified and the part is approved, CNC programs are generated directly from CATIA data.

"Maintaining all of the data in ENOVIA makes it easy to collaborate with designers that are hundreds of miles away," Cole said. "When Design Engineering calls me, we both pull up the latest revision of the part from ENOVIA. When we make a change during the manufacturing process, everything downstream updates in CPD to stay in synch."

GKN Aerospace is implementing DELMIA Assembly work instructions to automatically define manufacturing processes, generate shop floor work instructions directly from the design data, and reconcile the engineering bill of material (EBOM) to the manufacturing bill of material (MBOM). DELMIA will be used to create visualizations of the work instructions for workers on the shop floor, making processes clearer and avoiding misunderstandings. GKN also plans to use DELMIA to simulate other operations, such as moving parts through the aisles of the shop to verify they will fit.

3DVIA Composer enhances CATIA data with exploded views, annotations, callouts, and other notes that add rich, interactive 3D information to the work instructions, replacing words and increasing understanding. Velocity, from Intercim, electronically delivers the planning and work instructions to the shop floor, monitors information, and generates activity and quality reports to tightly connect the physical world of Manufacturing Execution Systems (MES) with the virtual world of PLM.

The original CATIA geometry is used by TruNEST, software from Magestic Systems, to nest the plies, which maximizes material efficiencies during the ply-cutting process. Magestic Systems' TruLASERView software then uses CATIA data to program laser projectors that project ply boundaries onto the mold. These programs work as functions inside CPD and pull data directly from the CATIA tree. "With nothing to translate or input, there is no need to revalidate the CAD data," Cole said.

A380 inner spar operators

IMPROVED VISUALIZATION CUTS TIME

Leveraging DS PLM, GKN Aerospace reduced manufacturing engineering time approximately 50%, to an average of four hours per part, and greatly improved collaboration throughout the extended enterprise. "With CATIA, plus Simulayt and Magestic Systems working inside CATIA, the ability to evaluate producibility on the computer rather than on the shop floor positions us at the leading edge of composites design and fabrication," Cole concluded. "Our integrated DS PLM solution helps our people stay connected throughout the entire process, regardless of location, while ensuring that downstream processes match the correct released engineering."

For more information:
www.gknaerospace.com