

Software for composites industry

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Abstract

Composite materials play a significant role not only in the automotive, aerospace, aviation and nautical industry, but their presence is also important in the production of furniture and sports equipment as well as in the energy industry. In this article described are solutions for computer aided design, computer aided manufacturing and computer aided inspection on example of Delcam's software for the industries that use composite materials.

KEYWORDS: CAD, CAM, CAI, composites

The development of materials engineering and higher requirements of modern technology along with bigger possibilities of using advanced manufacturing techniques lead to a gradual resignation of the use of traditional construction materials in favour of general usage of composite materials in contemporary constructions. Composite materials play a significant role not only in the automotive, aerospace, aviation and nautical industry, but their presence is also important in the production of furniture and sports equipment as well as in the energy industry. We are still observing the gradual development and extension of the material to many more new industries. Delcam's software meets the needs and satisfies the requirements of the industries that use composite materials. Applications developed by Delcam meet the requirements of unit manufacturing: the possibility of making instant modifications at any stage of production, servicing large size elements and new emerging technologies to name just a few. Delcam applications include among others:

- Delcam PowerSHAPE – CAD application (Computer Aided Design)
- Delcam PowerMILL – CAM application (Computer Aided Manufacturing)
- Delcam PowerINSPECT – CAI application (Computer Aided Inspection)

Design

Designing i.e. transferring constructors and designers ideas to a digital 3D model is the first step where Delcam's PowerSHAPE can be used. It is a CAD application that makes it possible to create complex geometries based on documentation by means of solid and surface modeling functionality. Delcam's PowerSHAPE also has many functions that enable to work with point clouds or STL model obtained from an existing

physical model by means of reverse engineering technology. Moreover Delcam's PowerSHAPE is a great tool for making analyses, verification and repair potential errors in geometry even before starting technological process. It also enables rapid section for the forming elements and making production tooling, including its ancillary technological components. The functions used to carry out unwrapped surface or 2D and 3D nesting fully satisfy the needs of design techniques and production preparation in the composites manufacturing.

Manufacturing

Delcam PowerMILL is another application used at following stages of the process. It makes it possible to use multiple advanced manufacturing techniques. This application is used both to generate technology necessary to comply with production tooling (molds) and to cut as well as trimm composite parts. Delcam PowerMILL allows for a quick calculation of complex 5-axis toolpaths with large size elements (fig. 1). The use of advanced simulation functions along with avoiding collision at the stage of toolpath calculation by eliminating the possibility of potential errors result in a reduction in execution time of the technological process and reduction of costs.



Fig. 1. Complex 5-axis milling of a large sized composite element

Considering more and more common practice of applying of robots in the production process of composite material structures Delcam prepared PowerMILL Robot Interface module which enables to control robot arms of all the leading manufacturers in any configuration, including the use of external axes (mobile units, rotary tables) (fig. 2). This application significantly increases the range of dimensions of machined molds, models and composite structures.

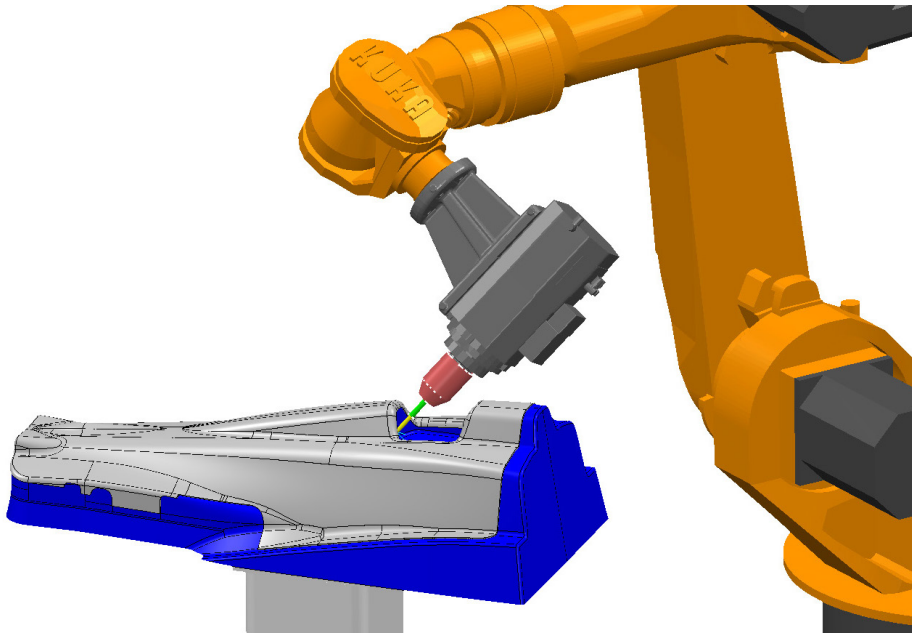


Fig. 2. Simulation of controlling robot arm in Delcam PowerMill

Inspection

Delcam PowerINSPECT allows for measurement and verification of the final product and its inspection based on a 3D model. This application works with all types of stationary measuring machines as well as mobile devices and machine tool probes (fig. 3), the use of which allows not only for measurement on the machine for inspection purposes, but also for detection the actual workplane position of the models having complex geometry.



Fig. 3. Scanning arm used for measuring composite element

Functionality possibilities of Delcam applications allow for their use in practically at every type and every stage of the composite structure production. Delcam applications are extremely flexible and may be used to design and develop production equipment, manufacturing, inspection and verification. The use of applications belonging to the Delcam environment brings measurable benefits in terms of time and material savings, as well as high-quality composite structures production.