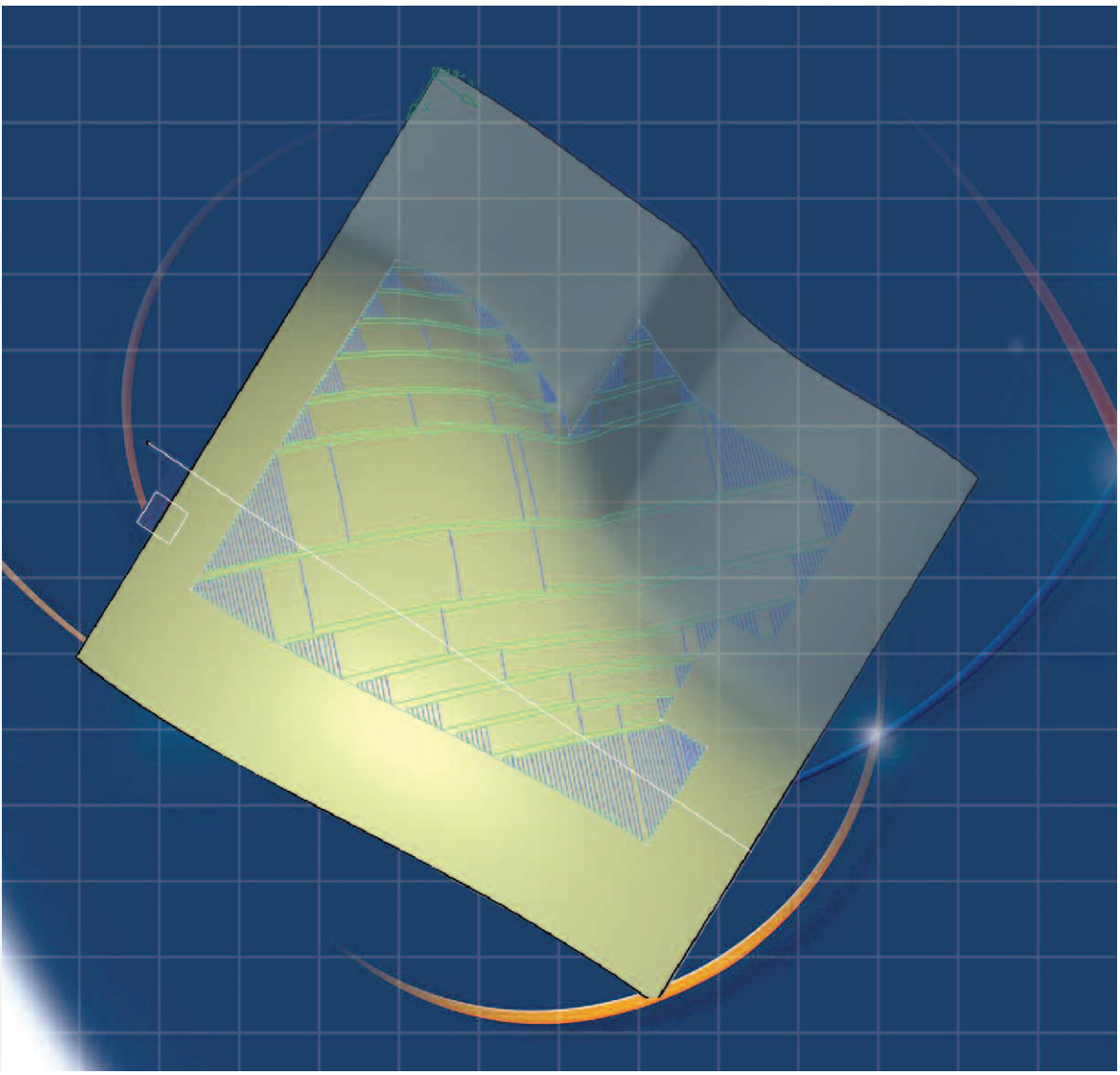
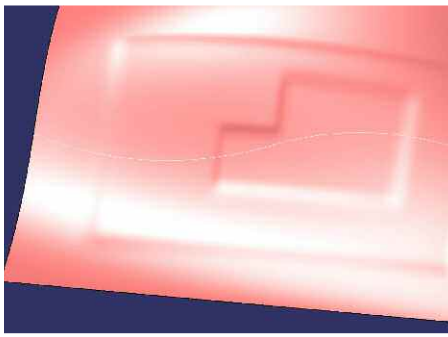
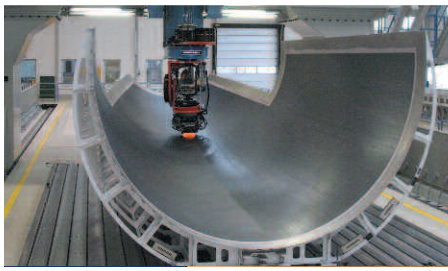
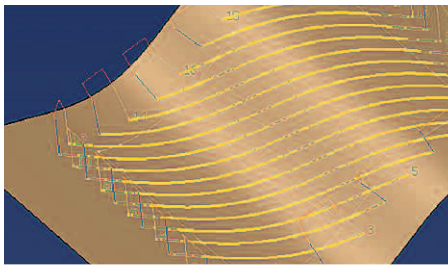
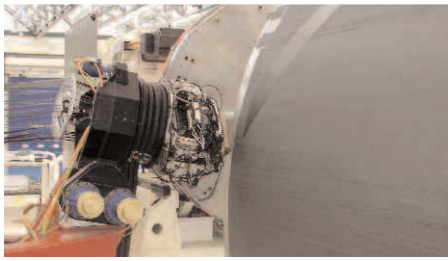
iCPS – Ingersoll Composite Programming System
The Integrated Suite for Composite Manufacturing











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iCPS

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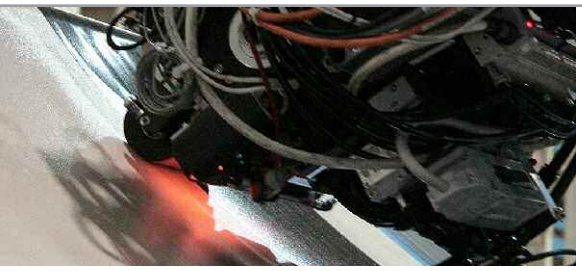
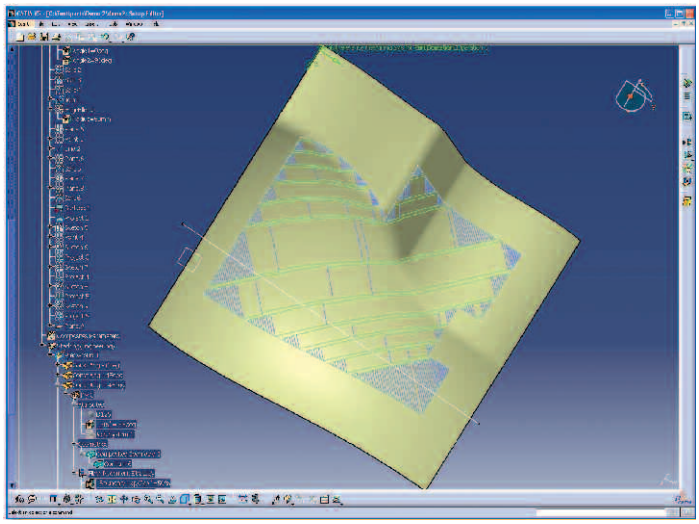


iCPS – CAAV5 Software Partner



iCPS (Ingersoll Composite Programming System), is a complete solution for the design, manufacturing and analysis of a composite part

iCPS/Designer

Helps engineers optimize the layup of composite parts

- Layup method strategy definition
- Continuous surface definition
- Surface updating

iCPS/NC Programmer and Analysis

Automates the manufacturing process of composite parts

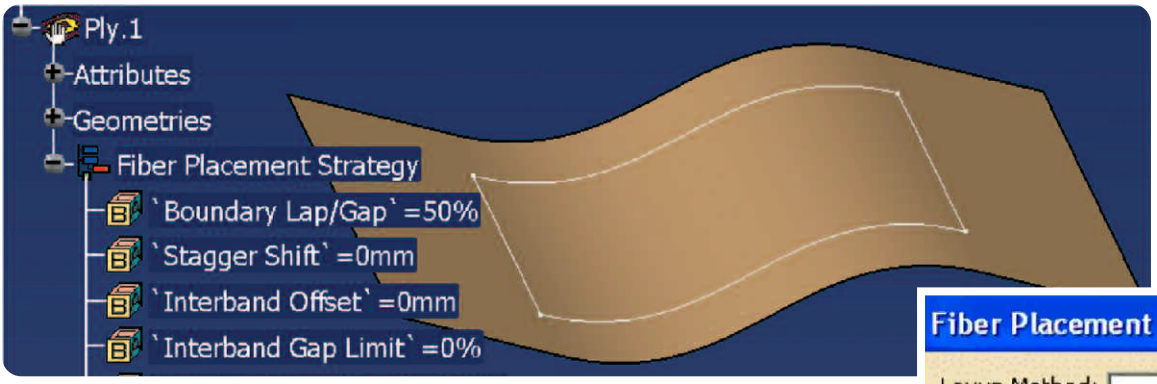
- Analysis of the manufacturability of a part
- Ply generation
- Fiber paths deviation and curvature analysis
- Link with analysis to automate the update of the FEA model
- Definition of automated fiber placement operation
- NC data generation

References: 5-10 Customers

- **iCPS/Designer and iCPS/NC**
  - Airbus
  - Lockheed
  - Boeing
- **Target Markets:**
  - Aerospace, Defense and Automotive
  - Design and Manufacturing Depts.
- **Proven Customer Benefits:**
  - One platform to design, manufacture and analyze a composite part
  - Optimum fiber path design through the use of continuous geometry description

iCPS Advantages:

- One native Catia V5 platform to design, manufacture and analyze a composite part.
- No interface needed.
- Optimum Fiber path design through the use of native continuous CAD geometry.
- No Lay-up discontinuity due to the possibility to incorporate Surface Topology and Manufacturing constraints during the design of the Laying Surface support to guarantee a free JERK machine motion.
- Generate intermediate Surfaces to ensure smooth machine transitions across varying ply thickness distributions.
- Allows the NC Programmer to locally control Process parameters.
- Take advantage of the possibility to customize machine off-part motions in order to minimize parasite time
- Preview Head Motion to avoid collisions
- Model Roller deformation and feasibility for any Surface curvature distribution.
- Direct Link with FEA solver such as Nastran and Abaqus to automatically update bulk data file to reflect what will be the manufactured part.

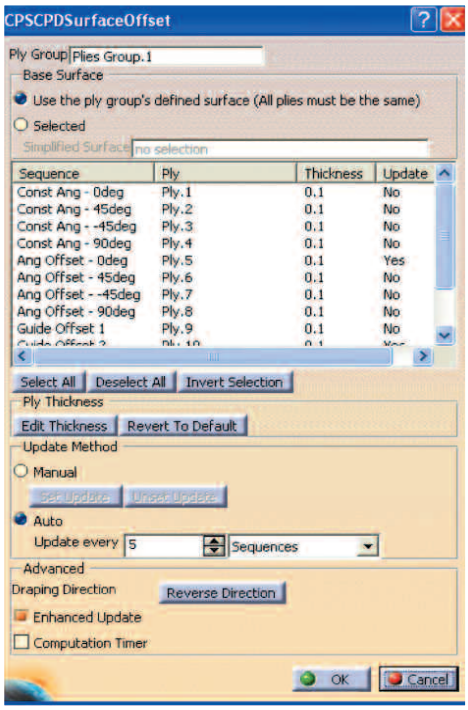


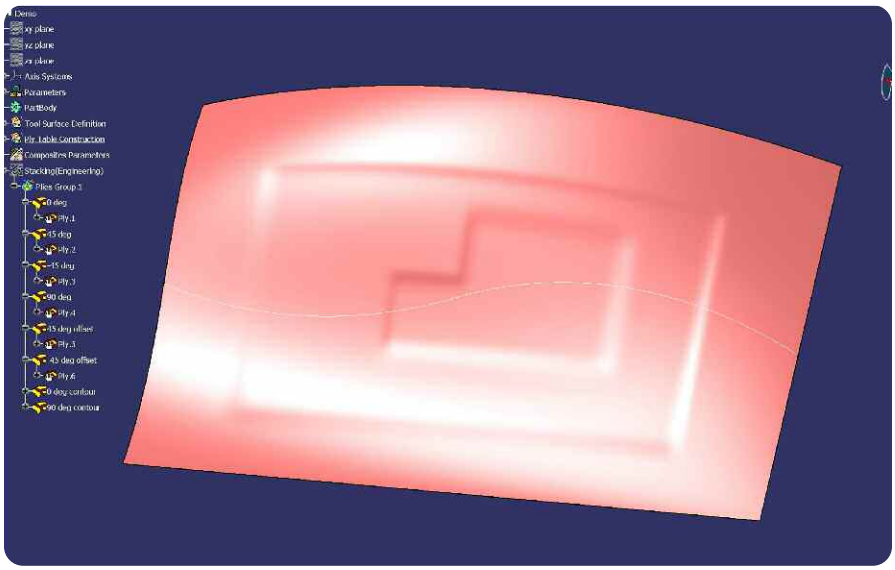
Your Fiber Placement Strategy

- **Allows the designer to specify the fiber placement layup strategy**
- **Different layup strategies available**
  - Constant Angle
  - Angle Offset
  - Guide Offset
  - Tailor Fiber Path
  - Manual

Surface Offset:

Generate intermediate Surfaces to ensure smooth machine transitions across varying ply thickness distributions.





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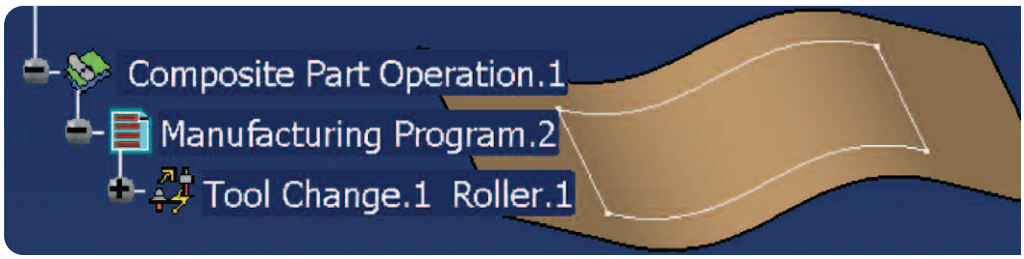
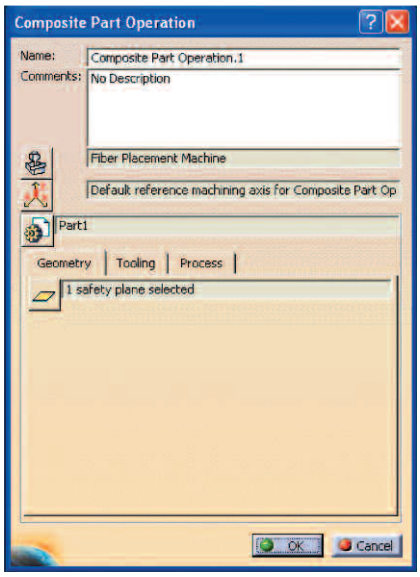


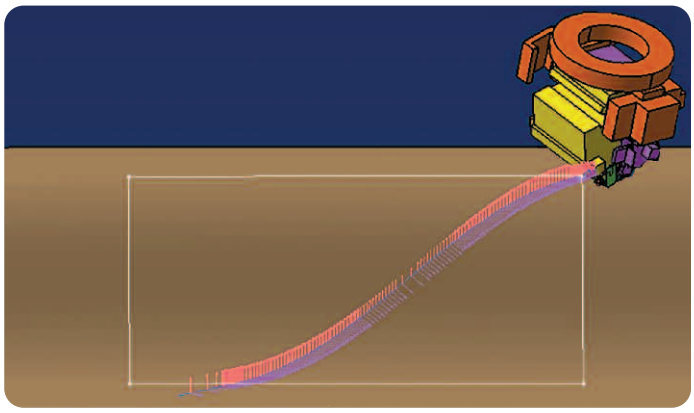


Composite Part Definition

Define the machine set-up for a particular process of a part

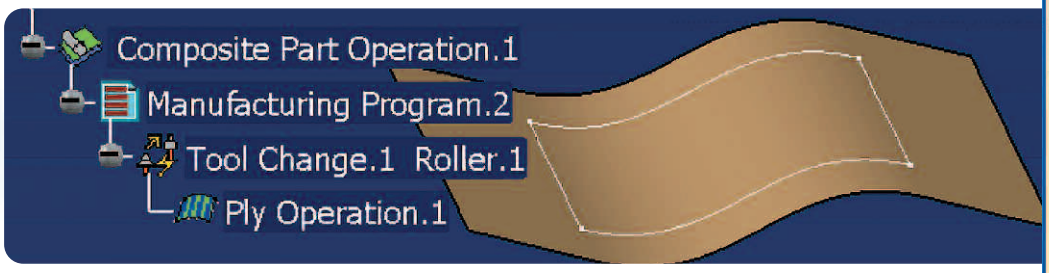
Tool Path Review

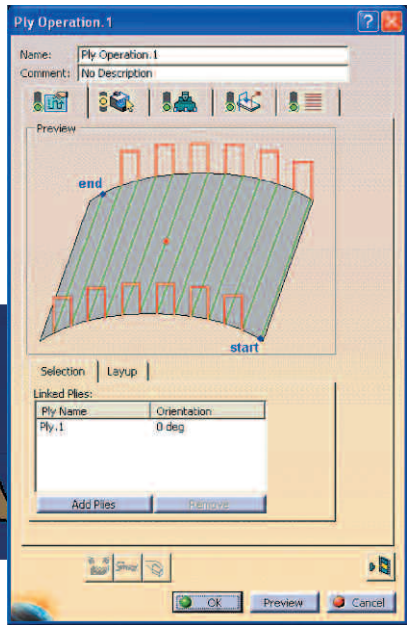
- **Preview Head Motion**
- **Collision Avoidance**



Ply Operation Definition

- **Define the manufacturing operations**
- **Define global process parameters (Compaction heater, tension, etc.**

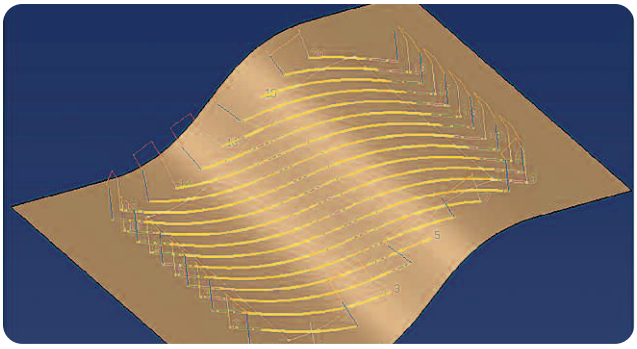


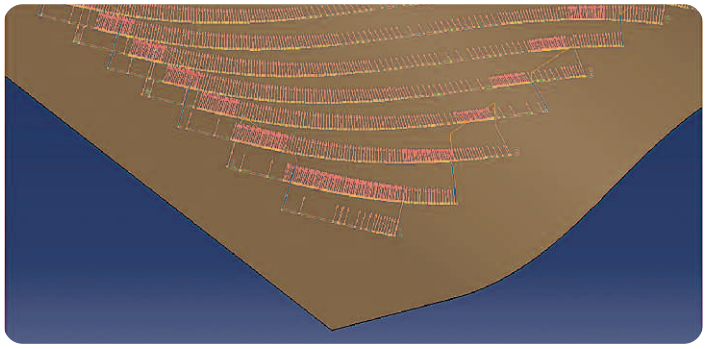


Tool Path Analysis

Allows the NC Programmer to analyze:

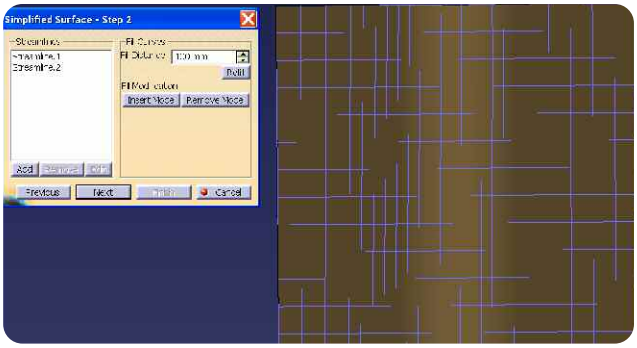
- Off Part Motion
- Laying Motion
- Fiber Path Discontinuity
- Trimming
- Ply Comparison
- Angle Deviation
- In plane Curvature (Steering)





Surface Simplification

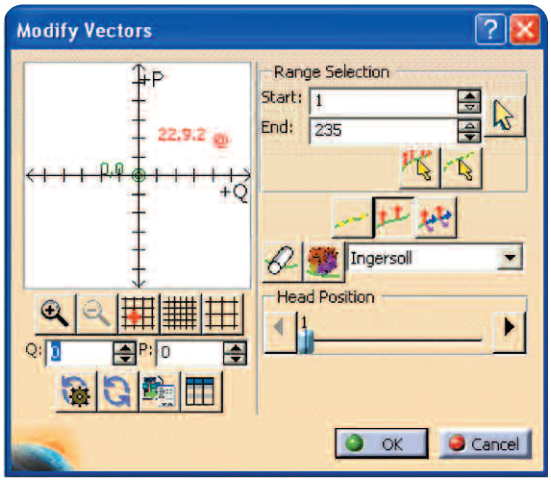
- **Creates a continuous parametric surface definition**
- **Possibility to incorporate topology and manufacturing constraints**



Tool Path Customization

Allows the NC Programmer to customize:

- Vectors Orientation
- Course Customization
  - Laying Order
  - Remove
  - Reverse
  - Break
- Adjust ply process information



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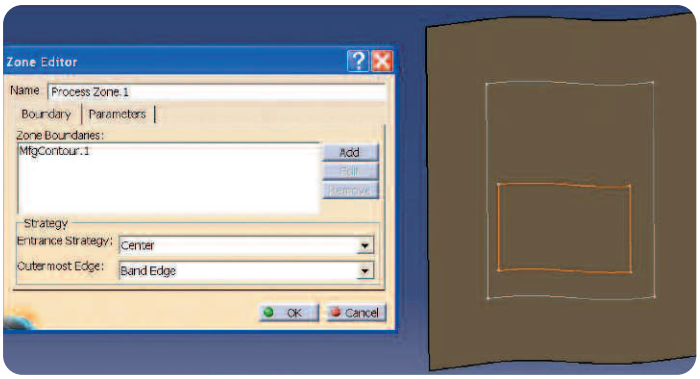
Process Zone

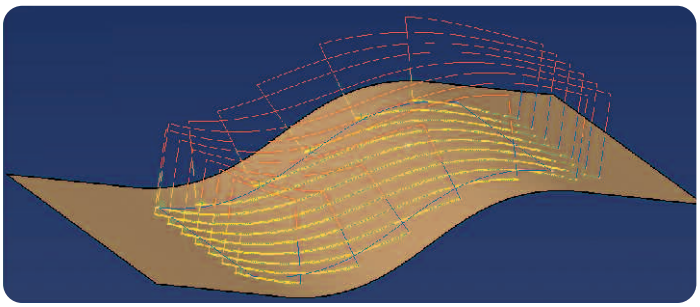
- **Allows the NC Programmer to locally control process parameters such as:**
  - Compaction Force
  - Compaction Temperature
  - Tow Tension
  - Feedrate
  - Dynamic Pinch Control

- **Better Layup quality on honeycomb, foam, fiber glass and otherwise difficult surface contouring.**



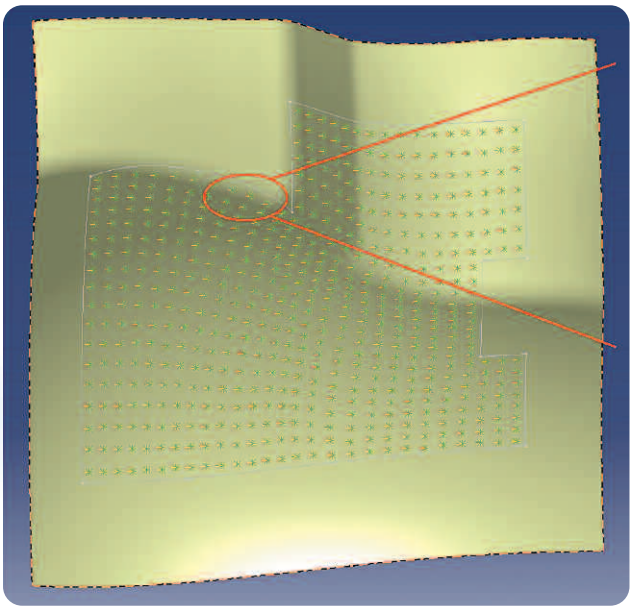
Advanced Off Part Motion

- **Allows the NC Programmer to optimize the machine motion between courses**
- **Improve cycle time**

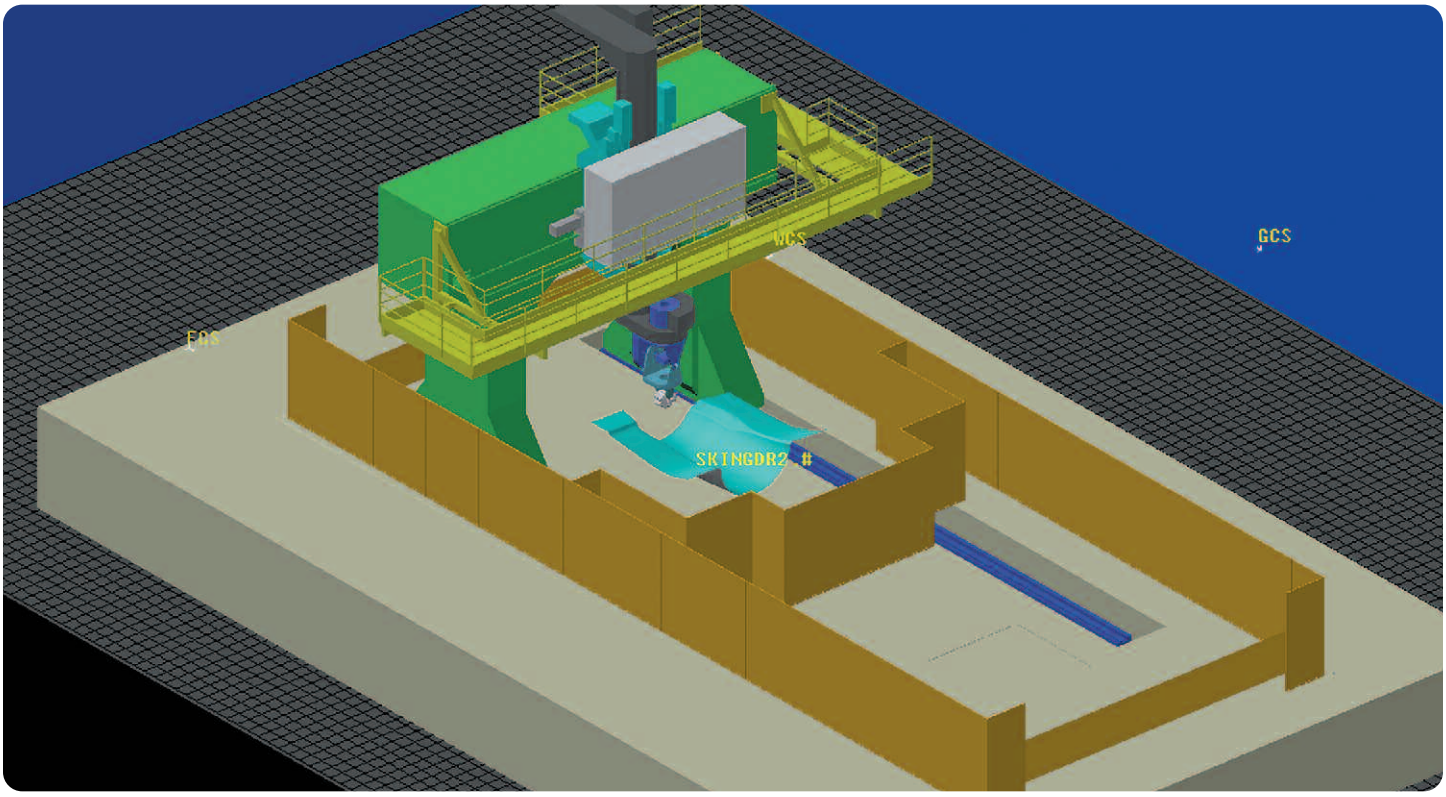


FEA Link

Compare theoretical and manufactured fiber angles

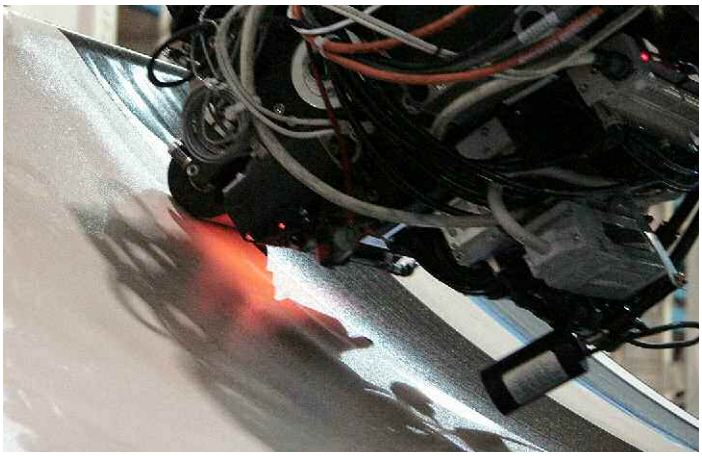


Complete Process Simulation



iCPS Programming

- **Composite part definition**
- **Ply operation definition**
- **Compaction modeling**
- **Ply computation**
- **Tool path analysis**
- **Tool path customization**
- **Off part motion customization**
- **FEA link**



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Ingersoll Machine Tools, Inc.

707 Fulton Ave. • Rockford, IL 61103 USA • Tel 815-987-6000 • Fax 815-987-6725
info@ingersoll.com • www.ingersoll.com

European Headquarters and Service

Via Attilio Franchi, 20 • 25127 Brescia, Italy • Tel +39 030 3706268 • Fax +39 030 3706302

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