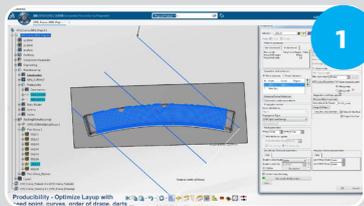


DELMI A FOR COMPOSITE MANUFACTURING

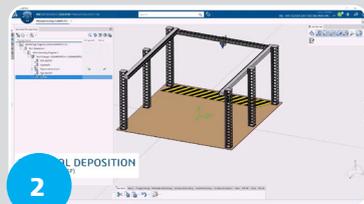
Connecting data, people, processes, and tools

The traditional composite manufacturing process involves multiple manual steps and is time-consuming, leading to production delays and increased costs. The lack of integration between different tools and systems used in the process leads to inconsistencies in data and communication gaps, further complicating the process. DELMI A for Composite Manufacturing addresses these issues by connecting data, people, processes, and tools. It offers a suite of tools that streamline the entire process, from design and material specification to production and finishing. Fully integrable with CatFiber (CORIOLIS) and TorFiber/TorLay (MTORRES), the solution also provides simulation and validation capabilities, allowing manufacturers to optimize their production processes, reducing production costs and increasing product quality.



1 PRODUCT DEFINITION

- Design parts and plies in CATIA
- Specify complete composite raw material & product definition including strength and stiffness
- Numeric analysis of the quantity of material consumption per ply
- Produce composite outputs for downstream manufacturing processes including laser projector programming
- Verify producibility of parts



2 MOLD PRODUCTION

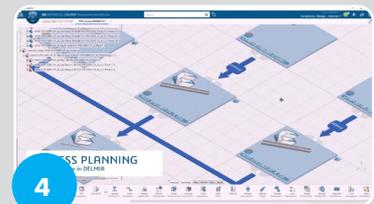
Material Deposition to create the mold in DELMI A

- Use additive manufacturing solution to reduce production cost
- Choose from multiple 3D printing techniques including extrusion-based, such as FGF
- Validate processes before printing to reduce print time and material usage
- Re-use company know-how for process definition



3 FACTORY LAYOUT & FLOW SIMULATION

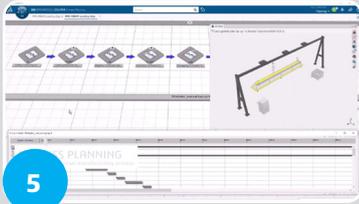
- Create different factory layouts with stations specifically for automatic & manual composite manufacturing such as plies cutting, plies placement, bagging/debagging, autoclave, non-destructive testing (NDT), and final machining
- Perform discrete event simulation to identify manufacturing bottlenecks and to validate factory layouts



4 MANUFACTURING BILL OF MATERIALS (MBOM) CREATION

Part Fabrication: Manufacturing Engineer prepares the MBOM for the composite part in DELMI A

- Create MBOM structure automatically, taking into account the calculated material consumption for each ply
- Define plies layup sequence

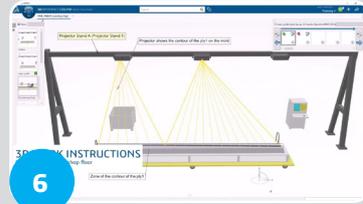


5

PROCESS PLANNING

Create manual fabrication process for composite part in DELMIA

- Link the manufacturing plan with MBOM
- Define all the process steps & operations and define the product flow between these steps
- Assign parts and estimated times to each process step
- Define & manage capable resources for each operation directly from factory layout or catalogues

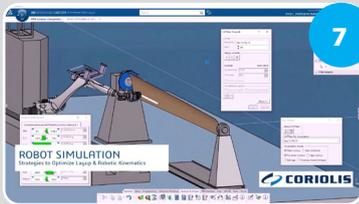


6

3D WORK INSTRUCTIONS

Create 3D work instructions in DELMIA for operators on the shop floor

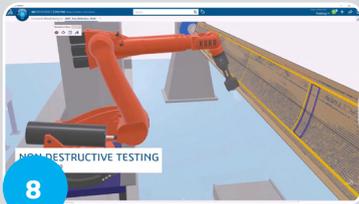
- Create 2D work instructions with information from the ply book
- Create 3D views to generate 3D work instructions for the workers on the shop floor
- Use views to capture details of individual work instructions for each manufacturing step/operation



7

AUTOMATED PROCESS (AFP & ATL)

- CatFiber (CORIOLIS) and TorFiber/TorLay (MTORRES) automatic composite manufacturing solutions
- Full integration of both partner solutions in the 3DEXPERIENCE platform
- Generate automatic tapes
- Define robot/NC machine parameters
- Global robot/NC machine path planning with collision detection
- Validation of robot programs & NC codes based on 3D simulations

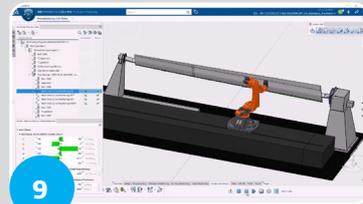


8

NON-DESTRUCTIVE TESTING

Create a simulation of the NDT process and generate a robotic program for ultrasonic testing in DELMIA

- Define robot parameters
- Define surface trajectories
- Define tool parameters (TCP, cone, etc.)
- Create trajectory path
- Create & validate robot programs
- Export robot programs from the platform and import them onto robots on the shop floor



9

FINAL MACHINING PROCESS

Deburring and finishing of the product in DELMIA

- Define multi-axis finishing operations
- Define tool parameters for deburring
- Plan (sinusoid) paths to minimize the wear of tools
- Create robot programs based on 3D simulations

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