Total Solution for Carbon Fiber Manufacturing
MTORRES has developed over the years the widest range of systems to automate, with the highest flexibility and productivity, the composite components manufacturing process. Ranging from Automatic Tape Laying and Fiber Placement Systems for Lamination, Ultrasonic Cutting, Routing and Drilling with Flexible Tooling, Machines for net trimming, Ultrasonic Inspection for non-destructive test to Automated Assembly Jigs, MTORRES provides the most comprehensive, productive and well-proven range of solutions. MTORRES strong Engineering and Project Management capabilities ensures the capacity to define, manage and successfully implement complex integrated projects providing Turn Key global solutions to our customers. That powerful engineering capacity allows the development of a number of customized special projects, as well as an array of sophisticated and advanced software solutions, for easy programming of Lamination Equipment, Spring Back Compensation for composite machining applications, HMI, Postprocessors, etc. Our products cover all types of composite materials, Carbon Fiber, Glass Fiber, Prepreg and Dry Materials, Unidirectional, Fabric, Thermoplastic, Thermoset, as well as processes such as Lamination, Resin Infusion, out of Autoclave processes, Ultrasonic Cutting, Routing and Drilling, NDT and Assembly. Sectors of activity range from Aerospace, Naval, Renewable Energy to Transportation.
TORRESFIBERLAYUP

Automatic Fiber Placement Machine

The TORRESFIBERLAYUP is a machine designed to provide the highest productivity when it comes to fabricate high contour carbon fiber aircraft components, although a 2D for high speed flat lamination, providing huge scrap material savings is also available.

Its unique tow cutting and adding system at full speed design concept allows the machine to cut, add and lay down consistently and accurately at 60 mpm (2,500 IPM), ensuring the highest productivity fiber placement solution available in the market.

OPTIONS
- Automatic splicer
- Automatic miss add/miss cut
- Ultrasonic cutting system
- Wireless pendant
- Automatic polyethylene disposal

Applications include manufacturing of flat, mild curvature as well as high contour carbon fiber components.

The TORRESFIBERLAYUP has been specially designed for extremely high speed and high productivity fully automatic process to fabricate high contour carbon fiber parts.
The TORRESLAYUP is an 11 axes Gantry CNC tape laye
machine specially designed for high speed tape laying of
compound contoured aircraft structural components.

Furthermore, there is one unique and remarkable option for flat components only, which lays down simultaneously 4x150 mm (4x6") tapes, providing the productivity of a 600 mm (24") wide band keeping the scrap within the 150 mm (6") wide tape levels.

Additionally, the TORRESLAYUP is the only available tape layer machine in the market that has proven to lay down successfully the Cooper Mesh as well as Glass Fiber material.

Optionally, an Ultrasonic Cutting system built in the head, may cut the solid laminate after laying to formats avoiding the need of a dedicated machine for this purposes.

A highly sophisticated simulation software package, TORLAY, allows the programmer to simulate and analyse and modify every tape, ply, layer and part associated parameter properly, before a MTORRES supplied postprocessor generates the CNC program. In addition, a Part History software package is provided, to keep control of production relevant events.

TORRESLAYUP can be built in various sizes to meet customer requirements.
The well proven sturdy and, torsion free gantry concept enables the machine to provide the maximum acceleration-deceleration at the highest feed rates.

A high frequency spindle provides appropriate spindle revolutions for optimal cutting and maximum feed rates.

TORRESMILL® Gantry or Column milling machines are built in various sizes to meet customer requirements and specifications.

TORRESMILL® 5-axes Gantry/Column Routing and Drilling Machine With Flexible Tooling System

An in house developed unique software to offset the effect of spring back on Composite components is optionally available. This software takes a number of part measuring readings, compares the theoretical vs real part shape and corrects the CNC program accordingly.

By integrating the TORRESTOOL® with the TORRESMILL® 5 axes High Speed Milling Machine, the system provides the highest degree of flexibility and reduces changes over time from one work piece configuration to another to less than 2 minutes. All supports rods with vacuum cups move simultaneously in the X/Y/Z axes and are automatically locked in their final positions.

The TORRESMILL® can also be delivered with a conventional T slotted table for hard tooling set up.

A Vertical TORRESMILL® can also be provided eventually working integrated with a head Stock/Tail Stock system for mandrel rotation on a fully interpolated manner with the TORRESMILL®.

TORRESMILL® 5-axes gantry DNC-CNC high speed milling machine series has been specially designed for high speed milling and drilling of aircraft Carbon Fiber structural components. The integration with the TORRESTOOL® provides the maximum flexibility.
The lightweight, sturdy torsion free gantry concept enables the machine to provide maximum acceleration-deceleration at the highest feed rates.

The TORRESPANEX can be built in 2D or 3D configurations. An ultrasonic cutting system provides the appropriate high frequency vibration capabilities for optimal cutting conditions and maximum feed rates.

The well proven modular machine system is the basis for each individual application.

The machine may also include a vacuum table to support the component to be cut or a conveyor for easy part loading/unloading can be provided. Nesting software is optionally available to optimize the material usage.

TORRESPANEX Gantry cutting machines are built in various sizes to meet customer requirements and specifications.

The TORRESPANEX 6-axes Gantry CNC high speed ultrasonic cutting Machine has been specially designed for High Speed Cutting of aircraft uncured composite structural components.
The well proven lightweight, sturdy and, torsion free gantry or column concept enables the machine to provide the maximum acceleration-deceleration at the highest feed rates, delivering the most demanding accuracy.

A high frequency spindle provides appropriate spindle revolutions for optimal drilling and countersinking at maximum feed rates.

TORRESDRILL Gantry or column Drilling Machines are built in various sizes to meet customer requirements and can be built for milling purposes too.

A unique pressure foot design provides an efficient and highly accurate solution for countersinking Composite components as well as to drill and countersink a stack of different materials (Al, Carbon Fiber, Ti, etc.).

A in house developed unique software to offset the effect of spring back on Composite components is optionally available. This software takes a number of part measuring readings, compares the theoretical vs real part shape and corrects the CNC program accordingly.

By integrating the TORRESTOOL® with the TORRESDRILL, the system provides the highest degree of flexibility. All supports rods with vacuum cups or clamping devices move simultaneously in the X/Y/Z axes and are automatically locked in their final positions.

The TORRESDRILL Automatic Drilling and Countersinking Machine specially designed for high speed drilling and countersinking Carbon Fiber components, as well as stacks of different materials.
The TORRESTOOL® is a modular concept consisting on a number of carriages that move on the X-axis direction, with a number of supports per carriage, that move on the Y and on the Z axes under a computer program instructions. Each support rod has a self-adjusting 45º tilting capability vacuum holding cup on the top. In certain applications a part clamping device is set up on top of the rod instead.

The TORRESTOOL® is controlled from a PC where all part programs are downloaded from, into the MTORRES developed multiaxes control system to trigger the TORRESTOOL® repositioning process.

All supports rods move simultaneously in X, Y, Z axes and are automatically locked in their final position. All motions are servo driven and NC controlled. Ground guide ways, rack and pinion and ball crews systems are used to drive the axes.

By integrating the TORRESTOOL® with the TORRESMILL®, or TORRESDRIL, or TORRESLASER®, the system provides the highest degree of flexibility on their milling, drilling or laser cutting operations, reducing change over time from one part configuration to next to a maximum of two minutes. All supports rods with vacuum cups or clamping devices move simultaneously in the X/Y/Z axes and are automatically locked in their final positions.

TORRESTOOL® Universal Holding Fixtures are available in different design configurations, horizontal, vertical, round, 3 Axis, single axis, etc, and in any required size to be integrated with other MTORRES machines.

The TORRESTOOL® has a sophisticated built in executive software package (HMI) to allow an extremely easy machine operation, as well as its maintenance, providing self-diagnosis routines etc.

Applications are machining, assembly, laser scribing, etc.
The TORRESSONIC is a set of accurate, stiff and reliable mechanisms, control electronics and software subsystems, working together to make an advanced ultrasonic unit to scan a part capturing data according to a defined strategy.

TORRESSONIC system are always customized and built on any architecture to fulfil specific customer requirements.

MTORRES integrates commercially available high added value inspection systems (end effectors, electronics, data acquisition and evaluation software) built by someone else into the TORRESSONIC solution, which can use conventional NDI Technologies, Pulse-Echo and Thru-Transmission, either via water jet or immersion, either single channel or multichannel, as well as Multichannel Phased Array Technology.

TORRESSONIC provides a frame in which several ultrasonic scanning applications can be implemented, from water-jet thru-transmission equipment to pulse-echo and phased-array systems, for large aircraft structural parts Non Destructive Inspection.
Flexible Drilling Head [FDH]

5 Axis Crawling Drilling and Riveting Machine

The FDH is a 5 interpolated axis drilling machine with modular design for easy system customization.

Its principle is to ‘walk’ over the aircraft fuselage, holding on place by means of a set of vacuum cups. Once the FDH ‘walks’ to position, gets locked with the vacuum cups and is ready to perform the drilling/riveting operation.

After drilling/riveting at the current area, the FDH walks one more step, by releasing the vacuum at half of the cups and moving them one step ahead, where it will lock them on place again getting ready for the next drilling/riveting operation.

The FDH does not need any additional guiding system mechanically engaged to the Aircraft to walk on its fuselage, irrespective of its position, even upside down.

FDH is a 5 axes autonomous platform that carries the necessary end-effectors for drilling and countersinking.

The robot optimal design ensures the best drilling and countersinking positioning accuracy and a high speed performance at the lowest weight.

A portable electric cabinet is provided, connected to the FDH by means of a minimum hosing/wiring harness.

A MTORRES developed control system allows the FDH to work without needing a conventional CNC system.

Applications are drilling and riveting circumferential, longitudinal and conical joints.

A 5 minutes set up on place by 2 operators is enough to be ready to start.
MOTORRES is in a unique position to apply at other industrial sectors using composites. Its extremely wide knowledge and experience on composite manufacturing systems at the Aerospace Industry.

From that standpoint, Composite solutions for boat and wind mill blades manufacturing processes have been successfully implemented in the past. As a result, a number of Racing Boats and Wind Mill Blades have been built at MOTORRES facilities in recent years. Additional industrial sectors, either using or about to start using composite materials (automotive, construction, etc.) are also in advanced conversations as potential users of the MOTORRES technology.

Our Aerospace Industry well known solutions can be applied, have been applied and will be applied to other products manufacturing processes at other industries.

Not only in the case of prepreg material processes but Resin Infusion, Dry Material lamination, Thermoplastics lamination, etc. are areas in which MOTORRES is currently involved on a number of development projects to implement new solutions, as well as to modify and adapt existing solutions, on an industrial manner.

In addition to composite components fabrication other stages of the process can be accomplished as well. Current MOTORRES technology, experience and powerful engineering capabilities allows us to address a comprehensive process solution, from the lamination equipment to components cutting, machining, inspecting, as well as assembling processes.

Summarizing, a total composite manufacturing solution can be provided out of a single source. Automation of those processes are key to reduce cost and increase productivity, quality, exchangeability and consistency and MOTORRES solutions are perfect to fulfill those goals.

Special Projects on Composites
Software

1. Automatic Tape Layer Programming Software Torlay
TORLAY is a CATIA V5 fully integrated application developed by MTORRES to allow the creation of CNC part programs for the TORRESLAYUP in an easy and user friendly manner. It allows the programmer to use all the initial designs that they have in CATIA V5 without any loss of information due to CAD format translations.

The programmer enters a number of parameters into the system to generate the tape trajectory using base surfaces, ply contours and laying orientations. It facilitates to the user the definition of machine and material constraints (minimum length, allowed cutting angles, minimum tape with, etc.) to easily obtain a executable CNC program.

Other laying parameters such as scrap area, flow area, clear surface, laying feed rates, etc. can also be determined from the TORLAY application.

TORLAY displays what the ply will look like based on the parameters that the programmer entered for him/her to depurate the ply by modifying those parameters. TORLAY includes a built in Post-processor to generate the CNC program.

Again, the system displays the ply on the screen for the programmer to analyze and eventually modify some of the parameters entered to obtain a fully satisfactory and machine doable ply.

The integrated software allows the creation of machine executable files directly from the DELMIA V5 environment.

4. HMI
HMI applications are developed to create user friendly packages to allow the operator to run complex NC manufacturing processes on an easy and errors free mode.

MTORRES HMIs are customized for each application to minimize the operator training requirements and time and still allowing an efficient and safe way to run the machine.

2. Automatic Fiber Placement Programming Software Torfiber
As in the Tape Layer Machine, TORFIBER is a CATIA V5 fully integrated application developed by MTORRES to allow the creation of CNC part programs for the TORRESFIBERLAYUP in an easy and user friendly manner. It allows the programmer to use all the initial part designs that they have in CATIA V5 without any loss of information due to CAD format translations.

TORFIBER application generates all the laying process information in the CATPROCESS document, in DELMIA environment. It also post-processes the information in the CATPROCESS document to generate CNC file.

MTORRES has developed over the years unique and specific solutions for Machine simulation, integrated in DELMIA V5, particularly for our Composite Manufacturing equipment. Our simulation soft reads CAD models and NC programs executing them on a virtual machine detecting collisions etc. for program correction.

3. Simulation
MTORRES has developed unique and specific solutions for Machine simulation, integrated in DELMIA V5, particularly for our Composite Manufacturing equipment. Our simulation soft reads CAD models and NC programs executing them on a virtual machine detecting collisions etc. for program correction.
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MTORRES TOTAL SOLUTION FOR CARBON FIBER MANUFACTURING