

TOWPREG: AN INNOVATIVE APPROACH TO CF CONVERTING



5° Forum dei Materiali Compositi

presso MiCo - Milano Congressi

12 - 13 Ottobre 2016

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BlackSun Partners

Società nata nel 2009, forte di un approfondito know-how tecnico e un'ampia rete di relazioni commerciali dei partners, allo scopo di fornire consulenza principalmente nel mondo dei compositi, privilegiando la filiera della fibra di carbonio. E' referente privilegiata di primarie aziende fornitrici di fibre, chimica, materiali, tecnologie e tutto quanto serva per la produzione di semilavorati, parti e prodotti finali nel settore compositi avanzati e protezione. Si occupa di Logistica integrata e di attività di M&A anche in settori collaterali al mondo dei compositi.



BlackSun Partners business offer

Located near Milano-Italy, BSP is working on three different levels:

Services

- ▶ Start-up and M&A
- ▶ Business consulting & development
- ▶ Manufacturer's representative

Engineering

- ▶ Process tailoring
- ▶ Process integration and automation
- ▶ Technical consulting and training

Logistics

- ▶ Supply chain management
- ▶ Logistic integration
- ▶ New suppliers and materials search

BlackSun Partners main cooperations

I principali partner industriali sono:



Intermediate and High Module and Strength carbon fibers



High Strenght Carbon fibers and derivates



Automation, robots and process integration for composites parts manufacturing

BlackSun Partners main cooperations



Composites repair materials and equipment



Non-destructive testing equipment for composites structures



Technologies for composites textiles manufacturing

Academic and technological cooperations



POLITECNICO
MILANO 1863

Italian Politecnico of Milano-Italy (included Lecco branch related to Composites Design)



CENTROCOT
Innovation experience

Centro Tessile Cotoniero Busto Arsizio-Italy (testing, research, technical support, experimentation, and training Center)



Center for Research and Technology, Aerospace cluster, Brindisi-Italy

BlackSun Partners is member of:



EuCIA (European Composites Industry Association)



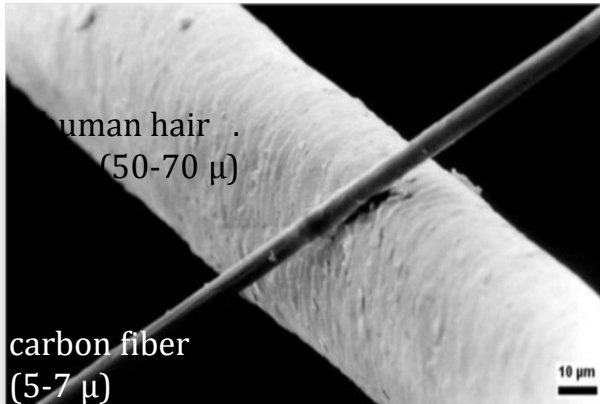
Assocompositi (Italian Composites Association)



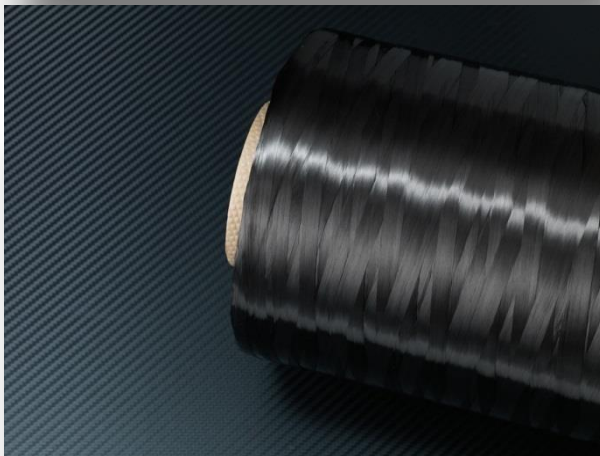
LOGISTICS: Supply Chain Management



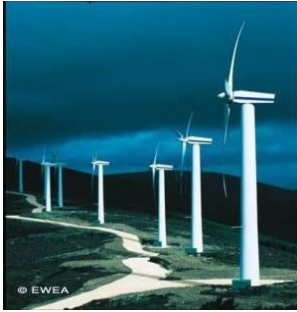
WHAT IS CARBON FIBER



- Carbon fibers are extremely fine fibers (typ. 5-7 μ in dia.) consisting mostly of carbon atoms
- HS Carbon fiber is **>95%** carbon
- Carbon fibers are produced in tows (yarns) ranging from 1.000 filaments (1k), to 3k, 6k, 12k, 24k, 50k, etc.
- Properties of Carbon Fiber: **high stiffness, high tensile strength, low weight, high chemical resistance, high temperature tolerance and low thermal expansion**



CARBON FIBER APPLICATIONS



Wind Turbine
Blades



Pressurized
Vessels



Civil Infrastructure



Marine



Aerospace



Automotive



Oil and Gas



Power Transmission



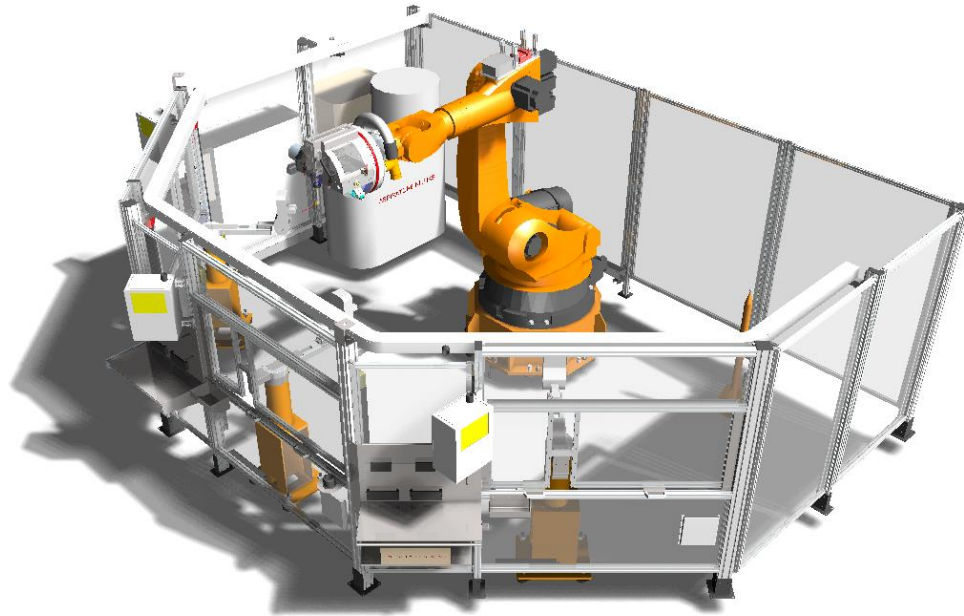
Sporting Goods



Defense

TOW PREG: A FURTHER STEP IN FILAMENT WINDING

A key feature for the success of filament winding and composite materials technology combinations is the improvement of the manufacturing process to reduce costs and to increase the overall quality.



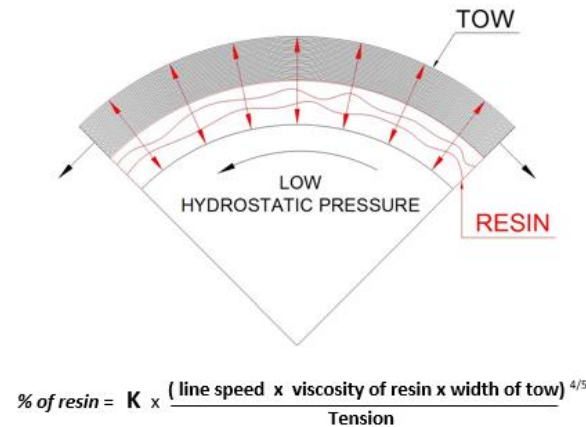
TOW PREG: A FURTHER STEP IN FILAMENT WINDING

One of the main manufacturing disadvantage to overcome, is the fiber impregnation method in open bath. The main drawback of the open bath is that a wide resin surface is affected by the exposition to air moisture. On top of that, the temperature variations in the resin bath and the change of viscosity of resin itself affect the impregnation quality and the final quality of the parts.



TOW PREG: A FURTHER STEP IN FILAMENT WINDING

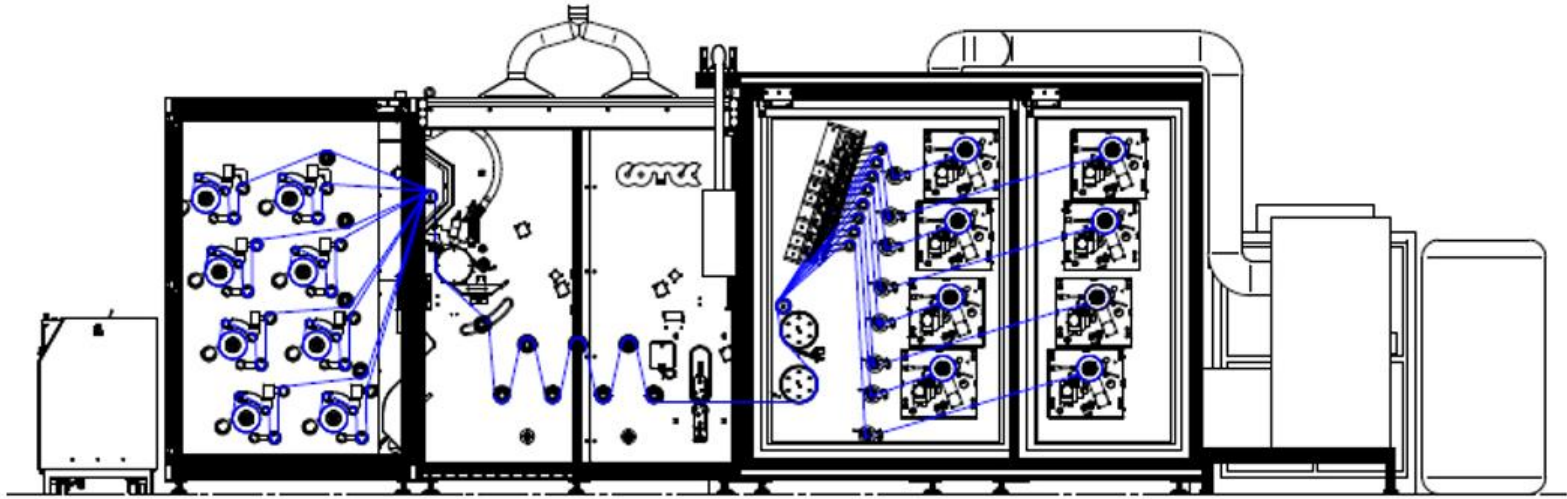
Moreover, in most cases, the parameters of the impregnation can not be adjusted while the fibers are being drawn in the impregnation bath.



Comec has developed an innovative impregnation low pressure process by applying a low hydrostatic pressure on the resin and wetting the fibers exploiting a capillary pressure effect.

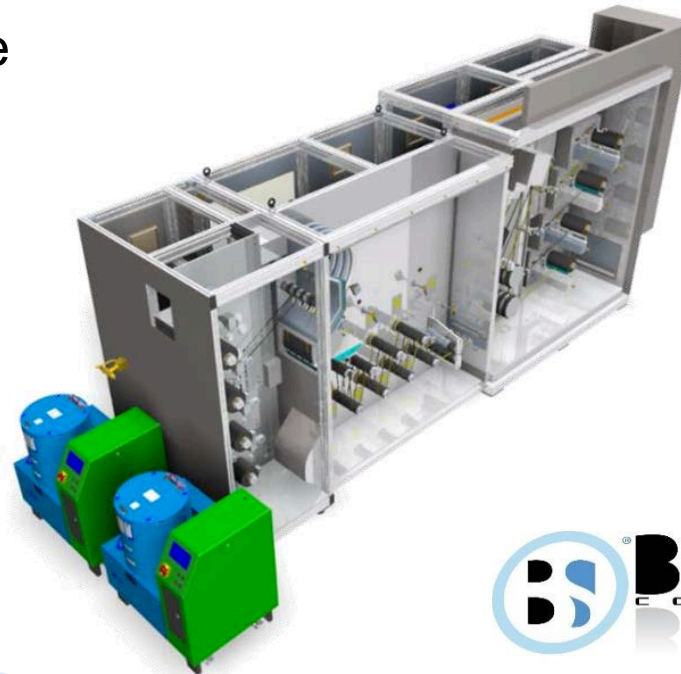
This patented process allows to avoid the resin backflow and the fibers' abrasion caused by the high compaction rate of the fibers.

CARBON FIBER TOWPREG LINE



High volumes Towpreg line

Mass production Towpreg line



COMEC INNOVATIVE srl



**CUSTOMIZED MACHINES AND
PROCESS INTEGRATION
FOR SMART COMPOSITE PRODUCTION**



Timeline



Affiliated
with UCIMU SISTEMI PER
PRODURRE



ISO 9001
design of special
machines



Composites manufacturing



Design of automatic assembly lines,
equipped with test stations



ATL application

1965

1973

1974

1982

1990

1997

2005

2012

2014



Conventional
lathes



NC lathes



First multiaxes CNC lathe
with servo motors and robot



Lamination process

Development of innovative
thermoplastic composite materials



Organization

Comec Innovative is an Italian SME (Small and Medium Enterprises) of 50 employees. Comec Innovative has a mechanical design department, an electrical design department, a software design department and an after sale service department.

Comec Innovative designs with the last versions of mechanic 3D CAD's and software tools for advanced analysis.

The after sale service has a large stock of spare parts to manage the critical maintenance activities, a department for "on-site services" and a department for comprehensive phone support.

Comec Innovative is able to equip its machines with telecontrol & teleservice for remote diagnostic.

Comec Innovative offers service agreements with specific SLA (Service Level Agreement).

Quality System

Comec Innovative Quality Management System is certificated ISO 9001:2008 regarding "design, manufacturing of special machine for automatic application, machine tools, industrial maintenance, retrofitting".

The certification is not just a slogan for us but a working method and a business system.



R&D partnerships

These are some of our R&D partnerships:

- **NOVOTECH** *ADVANCED TESTING*
- *(GROUND VIBRATION TEST - GVT, NOISE TEST AND LANDING GEAR DROP TEST)*
- **CETMA** *RESEARCH PARTNER*
- **THE UNIVERSITY OF MANCHESTER**
- **UNIVERSITA' POLITECNICA DELLE MARCHE**
- **ELANTAS** *CHEMICAL R&D CARBON FIBER DIVISION*

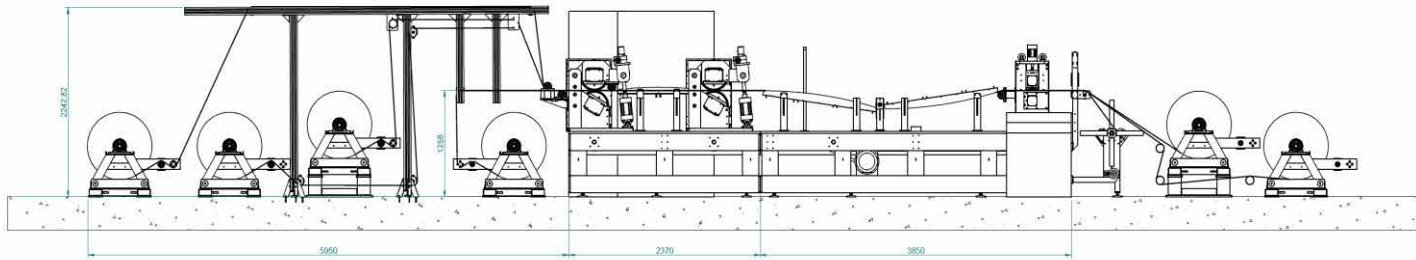
Integrator expertise

These are some of our expertise:

- **FANUC** *ROBOTICS*
- **KUKA** *ROBOTICS*
- **COGNEX** *VISION DEVICES*
- **SICK** *PROCESS CONTROL DEVICES*
- **ROBATECH** *GLUE SYSTEMS*
- **MITSUBISHI ELECTRIC**
- **SMC** *PNEUMATIC COMPONENTS*
- **SIEMENS**
- **NETZSCH** *PROCESS CONTROL DEVICES*
- **NEUGART** *HIGH PRECISION GEARBOX*

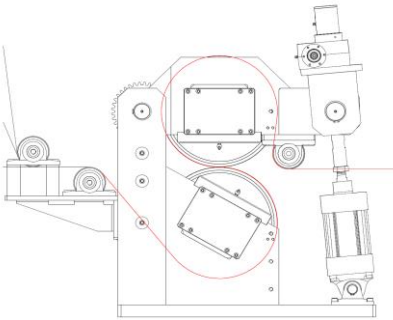


Pre-preg machine



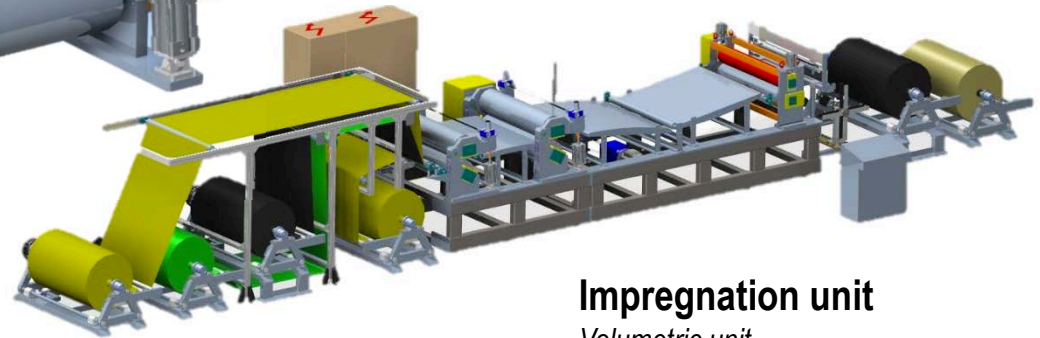
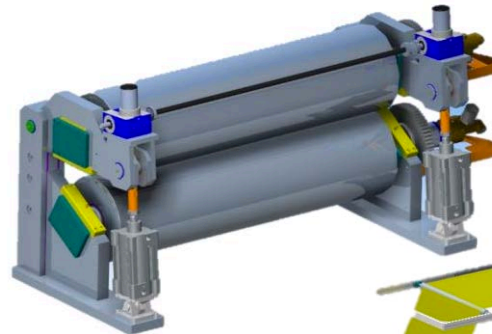
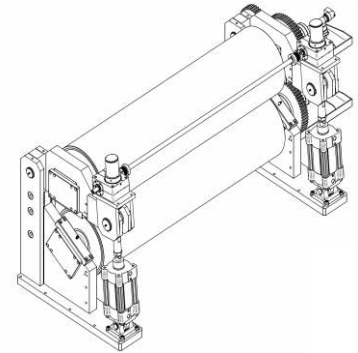
S wrap

Long Impregnation Surface



Calander

Control of pressure
Control of gap

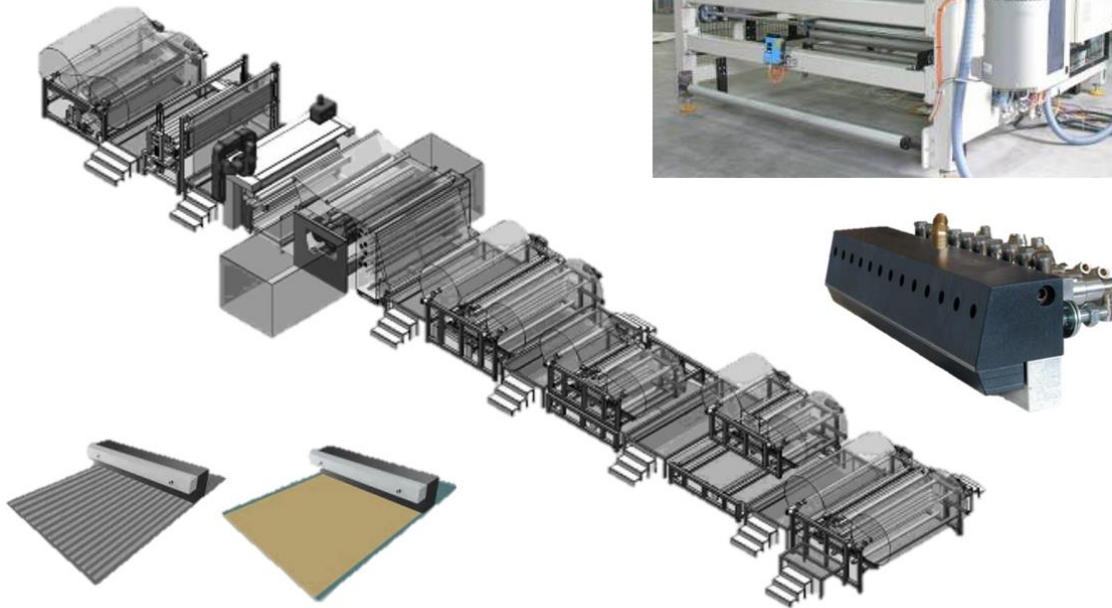


Impregnation unit

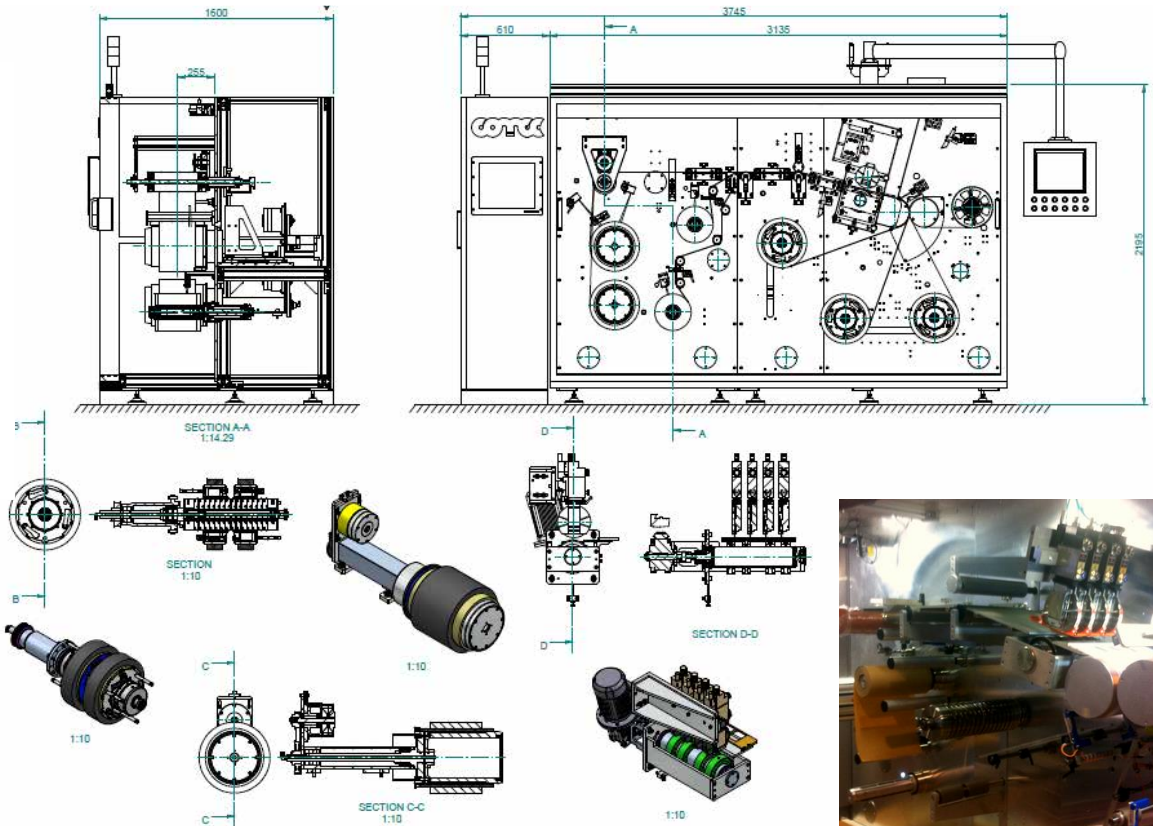
Volumetric unit

Lamination process

Lamination is the technique of manufacturing a material in multiple layers, so that the composite material achieves improved strength, stability, sound insulation, appearance or other properties from the use of differing materials.



Slit Tape Machine



Innovative JIGS

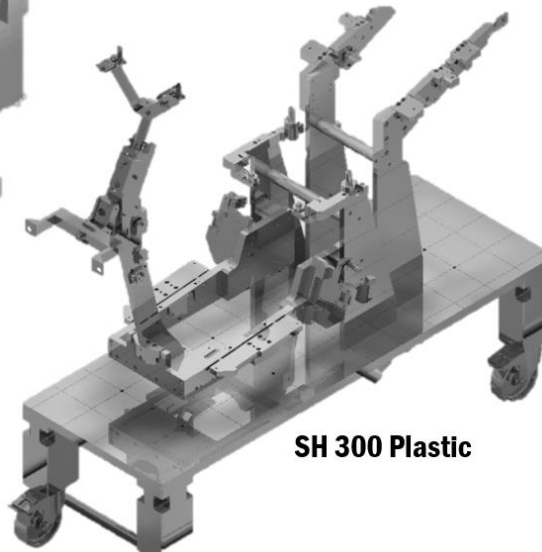
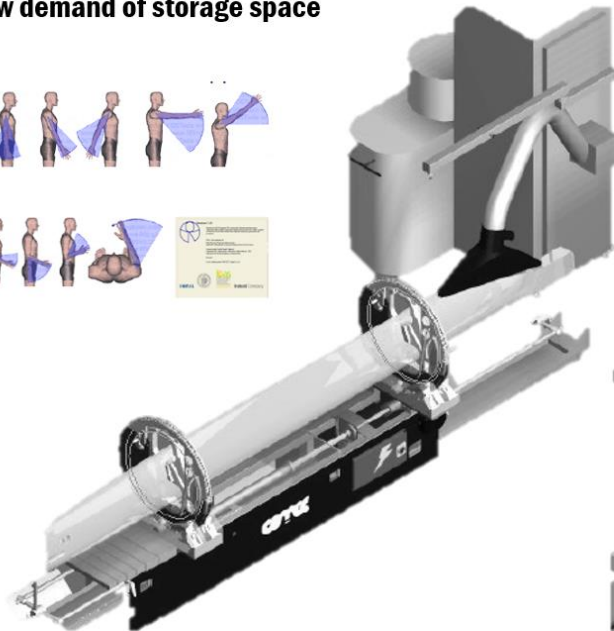
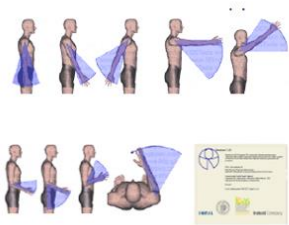
Modular construction

Base plate with customized grid of zero point clamping systems

Standardized reusable base and columns

Automatic spread of vacuum from the base to the vacuum plates

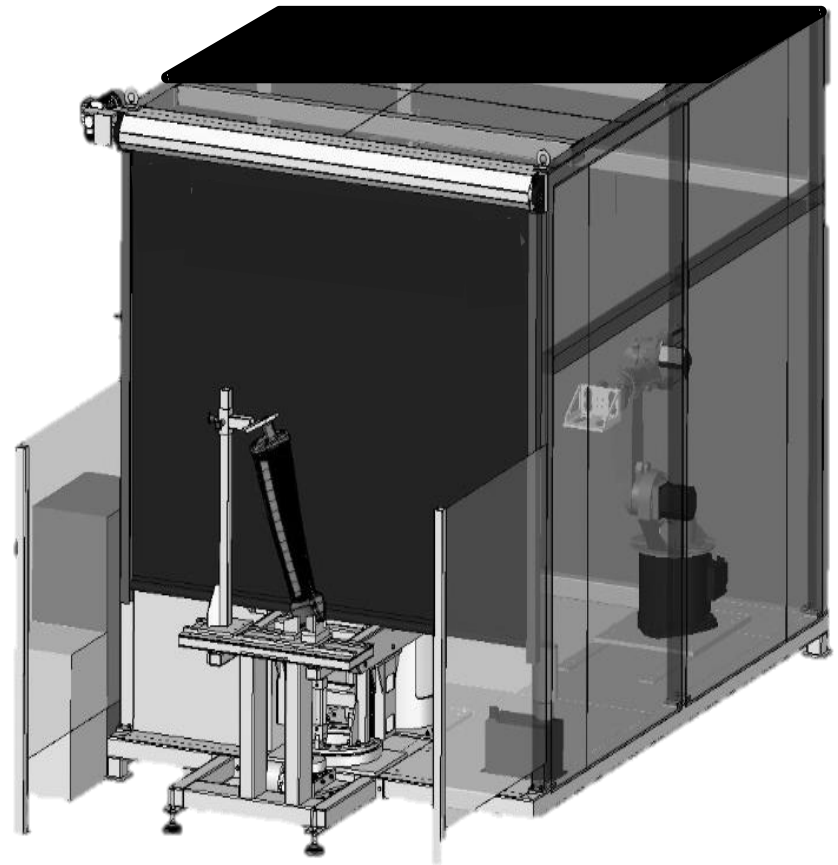
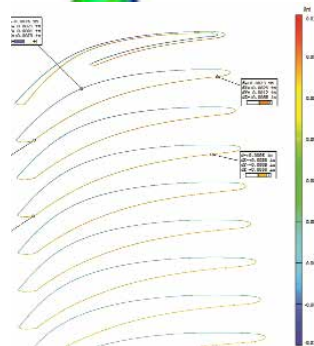
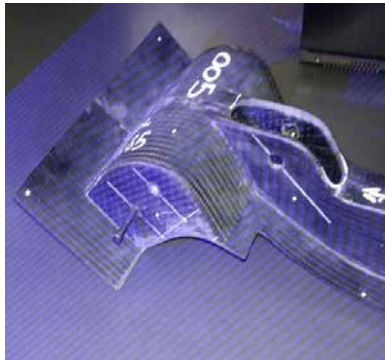
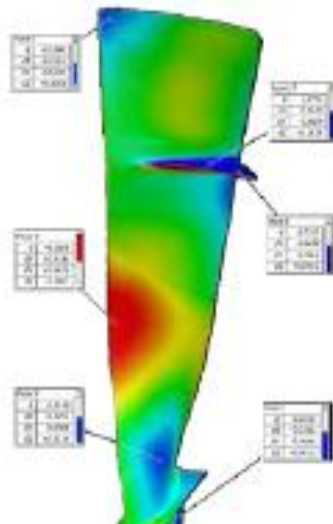
Low demand of storage space



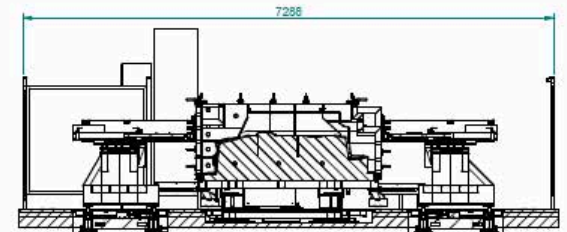
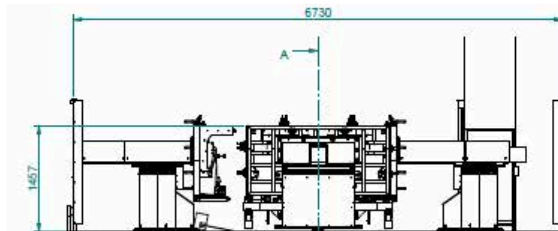
SH 300 Plastic



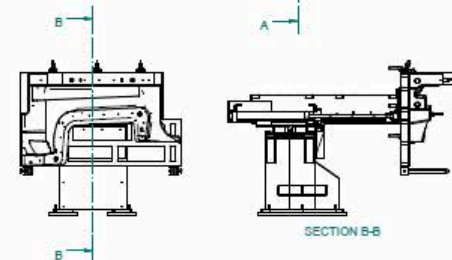
3D Coordinate High Accuracy Measuring Technique



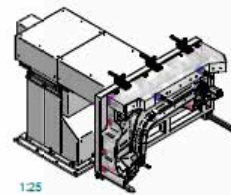
RTM Press



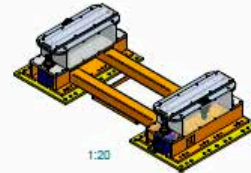
SECTION A-A



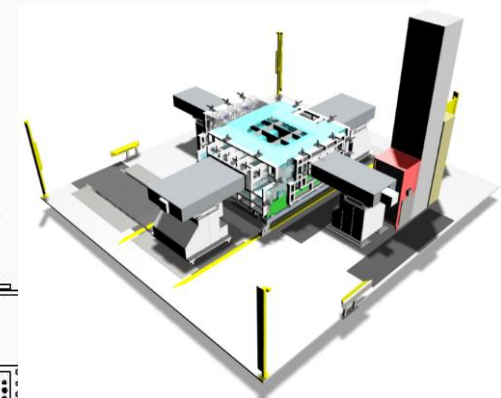
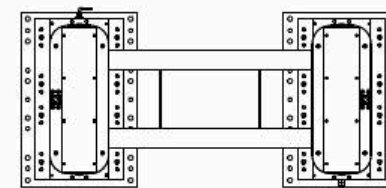
SECTION B-B



125



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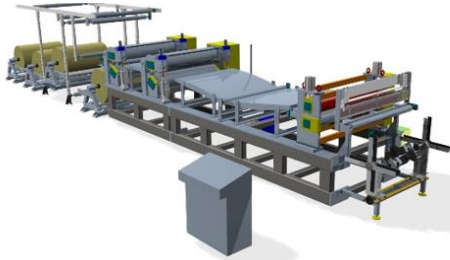


Composite Applications



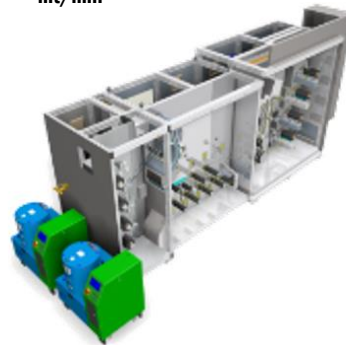
PRE-PREG TAPE MACHINE

- Clean Room
- Hot-melt technology
- Tow, U-D Tape, Fabric Carbon and Natural Fibre
- Width 1400 mm
- Moisture / temperature control
- Independent delivery systems



PRE-PREG TOW FOR HIGH SPEED FW

- Clean Room
- Moisture / temperature control
- Independent delivery systems
- Impregnation speed from 5 to 130 mt/min



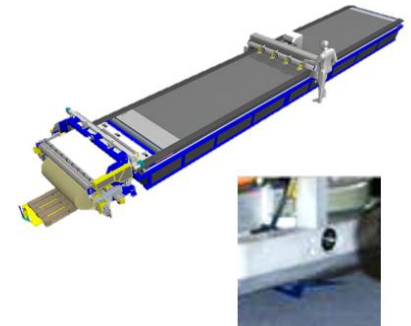
SLIT TAPE MACHINE

- Clean Room
- Qualitative inspection with vision device and Eddy Cus CF technology
- Different kinds of materials and width



PRE-PREG CUTTING MACHINE

- Clean Room
- Ultrasonic Cutting 20KHz
- Working Capacity 10m x 2m
- Material Thickness 20 mm

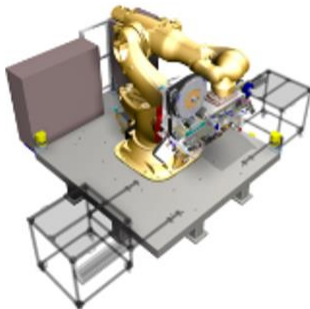


Composite Applications



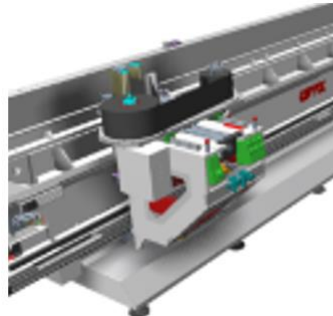
**AUTOMATIC TAPE
LAYER ROBOT**

- Clean Room
- Advanced control of automatic deposition
- Complex surface
- Kuka Robot Accuracy 0,3 mm



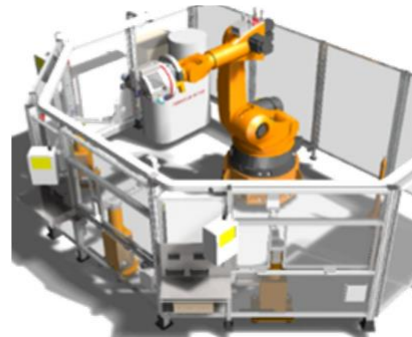
ATP LINEAR SYSTEM

- Clean Room
- Compacting Load 400 Kg
- Mechanical cutter



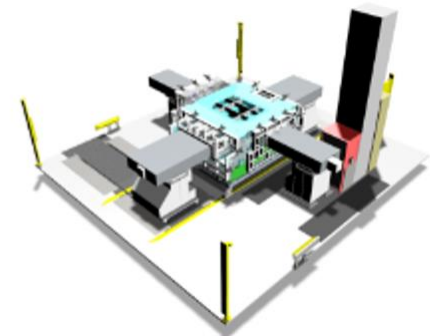
**FILAMENT WINDING
ROBOT**

- Clean Room
- Complex geometries
- Dynamic control shoot
- Impregnation resins control



RTM SYSTEM

- Hydraulic Drive
- Max Applied Load 20 KN
- Synchronized motion
- Volumetric pump



Composite Applications



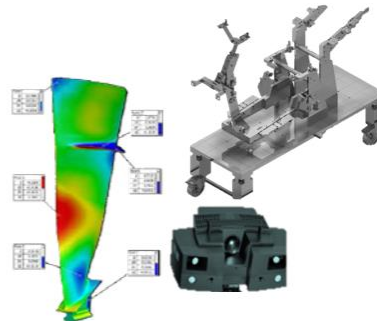
COMPACTING PRESS

- Clean Room
- Mechanical Drive
- Applied Load 160 ton
- Dynamic Position Control



JIGS AND MEASURE TECHNOLOGY

- Modular system
- High precision with zero point
- 3D measure robot



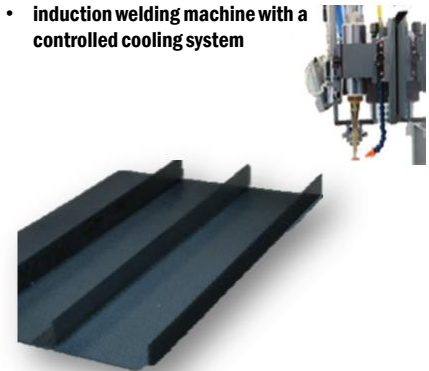
HANDLING SYSTEM FOR CARBON FIBER COMPONENTS

- Automatic handling system for composite parts and raw materials
- Scada software



INNOVATIVE INDUCTION WELDING FOR THERMOSETTING CF

- Innovative continuous
- induction welding machine with a controlled cooling system



Automotive application

Rotary Synchronous assembly



The system is designed for the automatic assembly and on-line testing 100% of electrical connectors.

The system consists of:

- 1 precision rotary table with 8 positions
- 8 manipulation stations
- 16 axis
- 2 vibrating units
- 1 vision system for testing

The manipulations of the components are made through specific mechanical modules, managed by the same synchronous transmission that moves the rotary table.

Cycle time: 50 pcs / min.

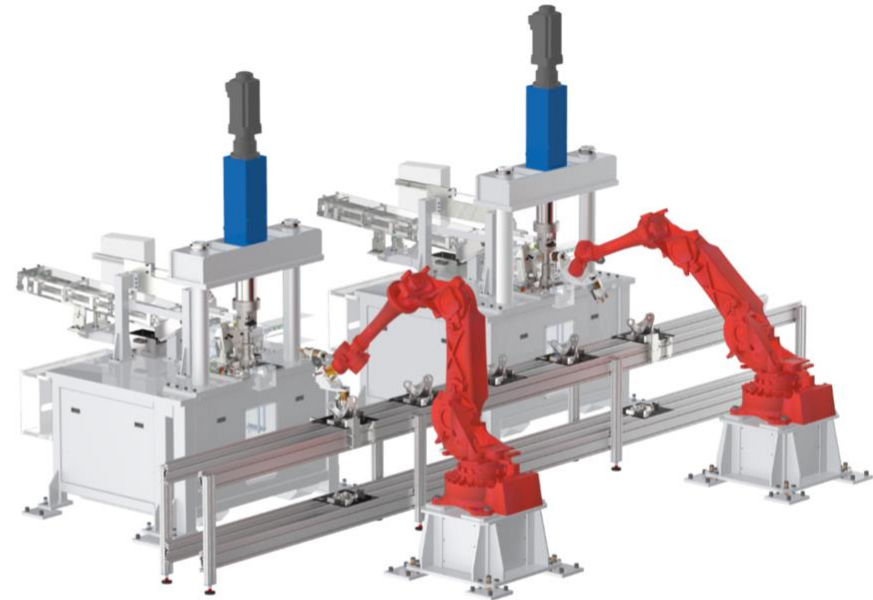
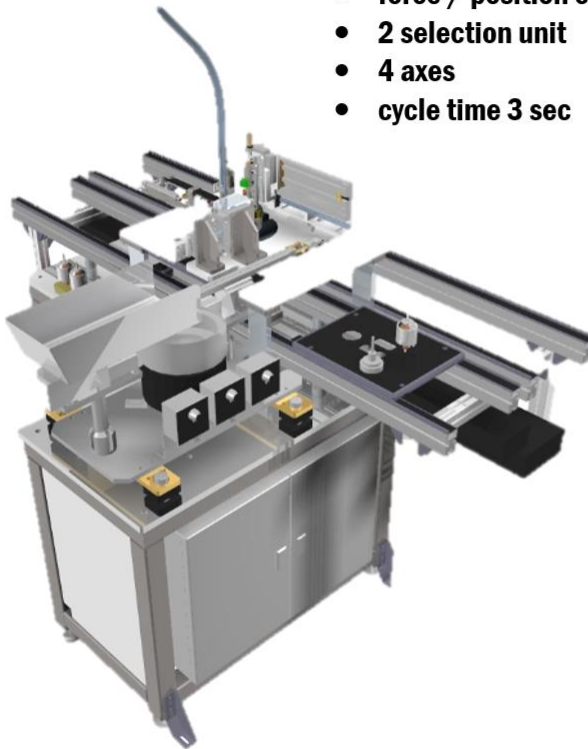


Automotive application

Example of stations of total assembly and testing lines

Automatic assembly seeger and washer:

- force / position control DIGIFORCE
- 2 selection unit
- 4 axes
- cycle time 3 sec



Assembly line suspension Maserati:

- Force/ position control
- 2 robot
- cycle time 5 sec

Advanced Applications



**AUTOMATIC THERMAL
PROTECTION PAINTING
OF ROCKET**

- Clean room
- ATEX
- Volumetric control
- Dinamic Position Control



**AUTOMATIC DEPOSITION
THERMAL PROTECTIVE
TAPE OF ROCKET**

- Clean room
- Speed control
- Temperature control
- Compaction press control



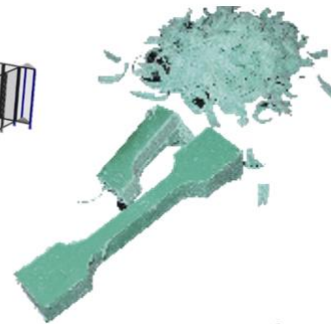
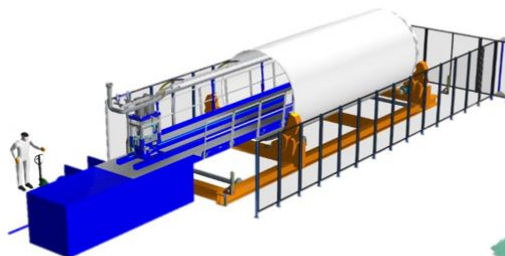
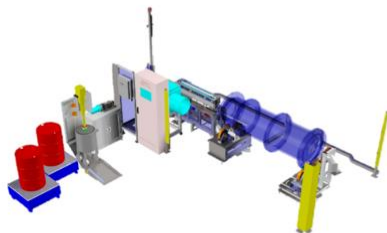
**ROCKET SOLID
PROPELLENT CUTTING
MACHINE**

- Clean room
- ATEX
- High precision
- Automatic load/unload system



**LAMINATION
MACHINE**

- Continuous production from raw material to packaging of the final products
- High speed / automatic change of raw materials



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