COMPOSITE TAILORED MACHINES

Made in ITALY

ESEA COMPOSITES

-We know how-

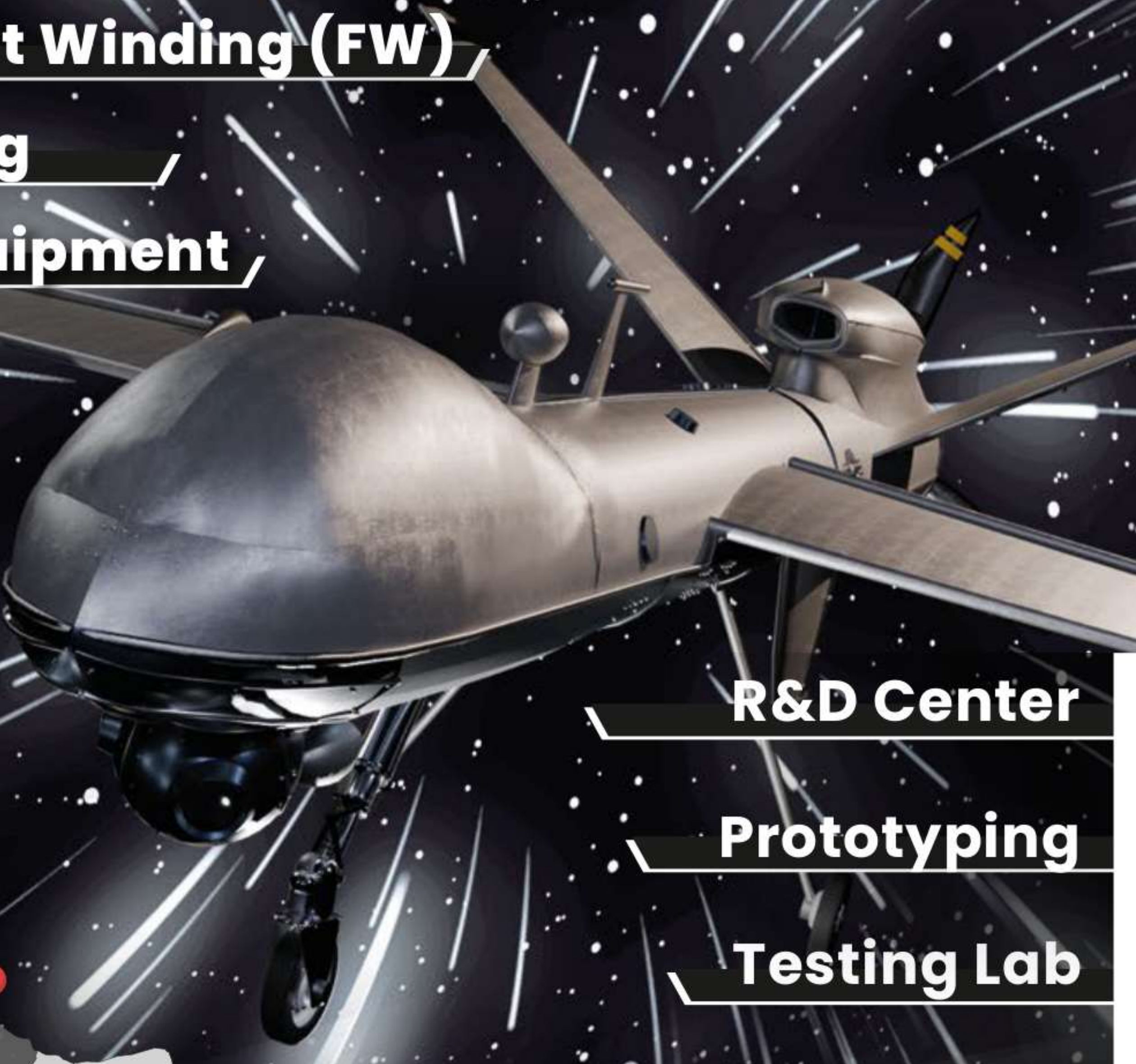
Fiber Placement (AFP)

Automated Tape Laying (ATL)

Filament Winding (FW)

Tow Preg

Test Equipment



R&D Center

Prototyping

Testing Lab

INTERNAL R&D LABORATORY

ESEA COMPOSITES

-We know how-

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ESEA COMPOSITES

—We know how—

Engineering the Future of Drone Mass Production

ESEA is your partner for developing smart factories and automated drone manufacturing processes, playing an active role in engineering the entire production line and testing advanced technologies within our in-house laboratory. Indeed, since its founding in 1980, more than 870 customized production and testing machines have been successfully validated in our lab and installed by ESEA's team.

ESEA positions itself as a global supplier in many countries all around the world, as for example in the USA, Japan, France, the United Kingdom, Germany, Sweden, China, India, Argentina, South Korea, and many more.

ESEA designs high-quality automated lines for mass production, including **Filament Winding (FW), Automated Fiber Placement (AFP)**, and integrated testing cells for lightweight aerostructures and composite airframes. ESEA Group is headquartered in Cepagatti (Pescara Italy), in a 15,000 square meter facility. It houses the mechanical, electrical, and software technical offices, as well as our specialized **R&D lab** for process validation, assembly, and service departments.

In addition, ESEA has a service unit that supports Clients during on-site commissioning and remote assistance, also through the innovation of augmented reality. The presence of 150 highly qualified members of its staff, combined with manufacturing skills and engineering leadership, plays a significant role in driving ESEA Group to success and will continue to do so for future achievements.

— We know how —

E.T.T.P. - Esea Technological Transfer Platform

Our R&D Laboratory is the heartbeat of ESEA, the place where innovation meets industrial precision. More than just a research hub, our lab is a key strategic asset for our partners, designed to bridge the gap between initial concept and large-scale drone manufacturing.

By working side-by-side with our clients, we facilitate a complete Know-How Transfer, accelerating the development of automated production processes. Our laboratory serves as a Pilot Production center, where new components can be developed and initially manufactured on our state-of-the-art machines. This approach allows for the creation of full-scale prototypes and structural samples using ESEA's advanced Filament Winding, Automated Fiber Placement (AFP) and Automated Tape Laying technology, ensuring that every solution is fully qualified before the factory installation.

Additionally, our lab is equipped with a Tow Preg machine for the custom impregnation of fibers, a key technology for maximizing the structural integrity of drone airframes while reducing weight. This process ensures precise control of resin content, significantly improving the flight performance of the final products.

The greatest advantage of this model is the Immediate Start-Up: since the process is perfected and the operators are trained on the same technology in our lab, our clients can achieve Production from Day 1. Our team assists in defining the DNA of your Smart Factory, providing customized engineering solutions that minimize industrial risks and drastically reduce time-to-market.

-Tested in our Lab-

Reserch & development partners

CIRA Centro Italiano Ricerche Aerospaziali

UNIVERSITÀ DEGLI STUDI DI SALERNO

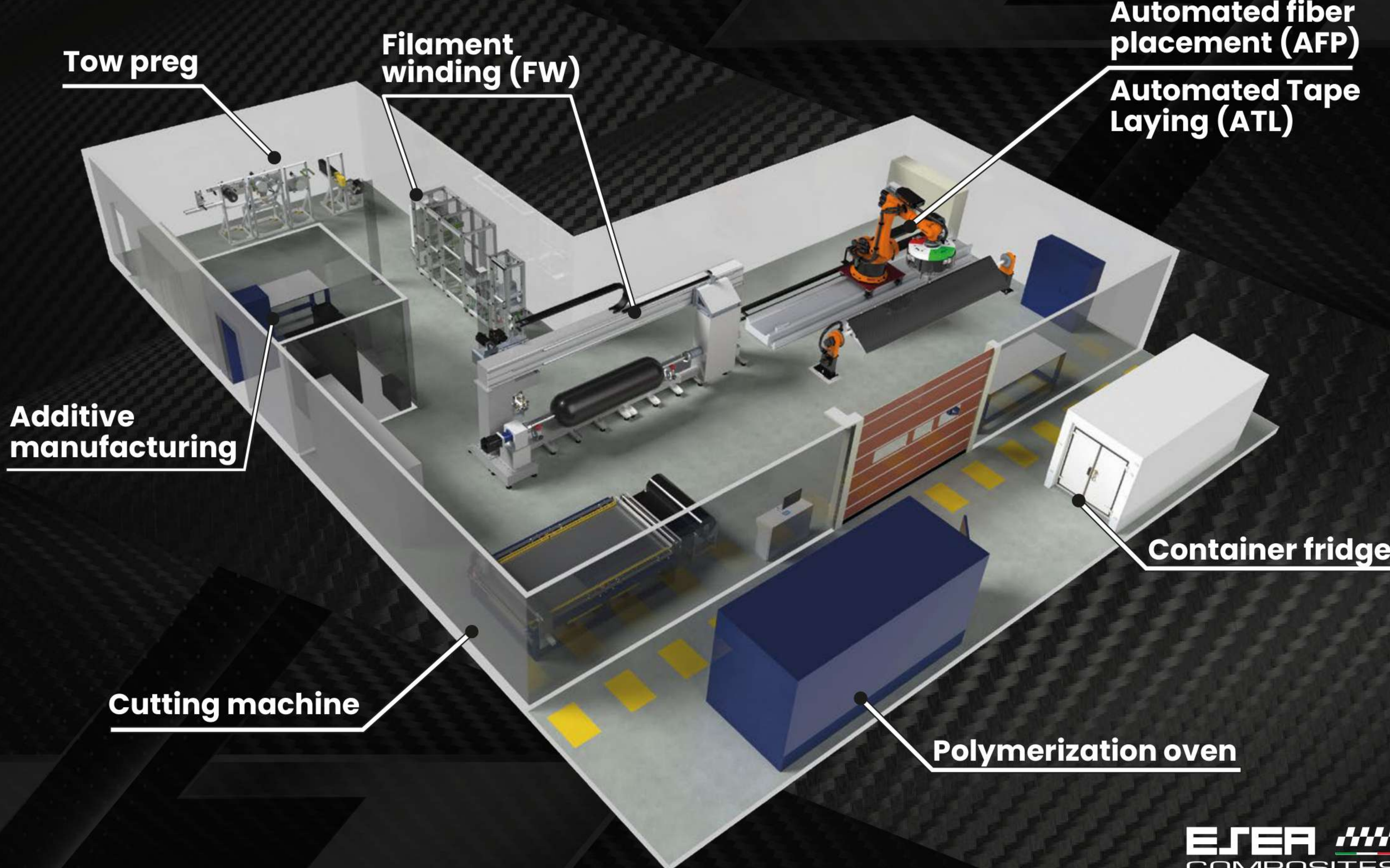
UNIVERSITÀ DEGLI STUDI DELL'AQUILA

TOR VERGATA UNIVERSITÀ DEGLI STUDI DI ROMA

SAPIENZA UNIVERSITÀ DI ROMA
Scuola ingenieria Aerospaziale

INTERNAL R&D LABORATORY

Layout



INTERNAL R&D LABORATORY

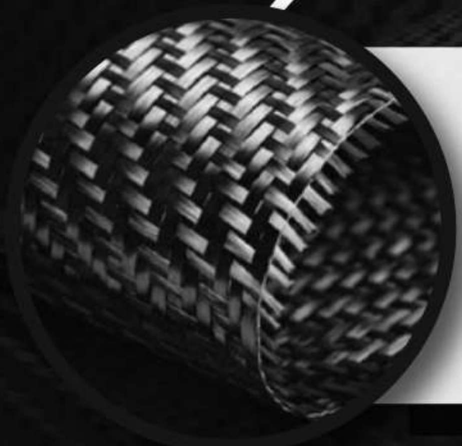
Manual process

3D Printing / CNC tool Machines

3D printing and **CNC tool machines** are used for the creation of complex molds and inserts from **thermoplastic materials, aluminum and steel.**

Hand Lay-up with dry or pre-impregnated fiber

This process consists of applying layers of resin and fabric, removing air bubbles between each layer, until the desired thickness is achieved.

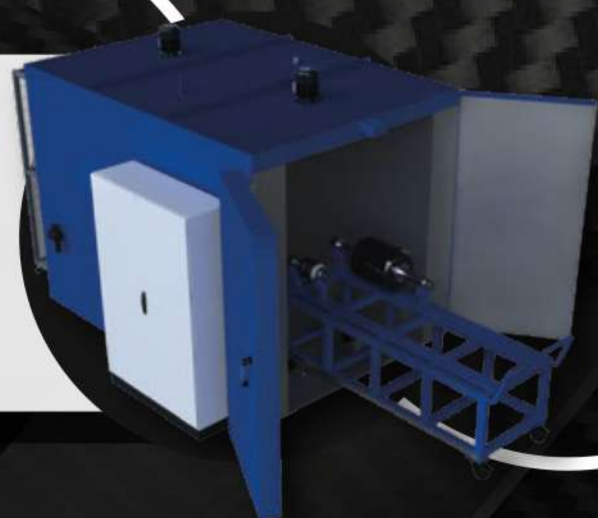


Preparation for polymerization

We are specialized in the curing cycles of composite materials up to **400°C**, with a full range of auxiliary materials to meet specific needs.

Vacuum infusion

The **Vacuum infusion process** consists of applying layers of **dry fiber** followed by the infusion of resin under vacuum



Polymerization in oven

The use of a high-temperature oven **(400°C)** allows the curing of composite parts with maximum performance.

Final Controls

At the end of the process, the composite parts can be tested through **non destructive testing (NDT)** such as:

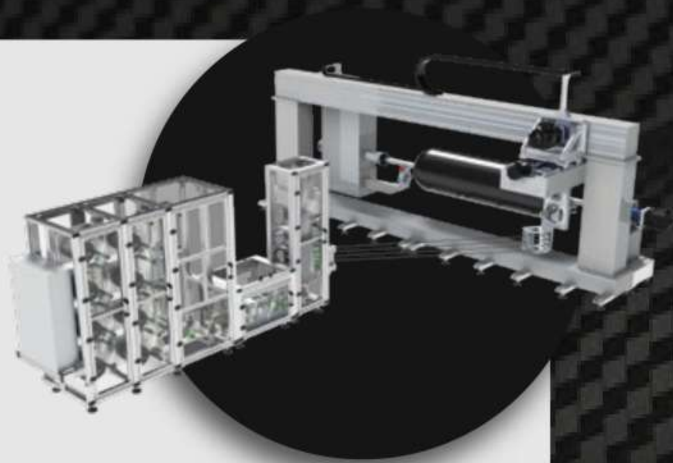
- Differential scanning calorimetry **(DSC)**
- Dynamic mechanical analysis **(DMA)**
- Thermomechanical analysis **(TMA)**
- Ultrasonic test

INTERNAL R&D LABORATORY

Automatic process

Filament winding (FW)

The Filament winding machine (FW) allows the production of pipes and **CPV (Composite pressure vessel)** tanks, with an external diameter up to 1 meter and a length up to 4 meters.



Automated fiber placement (AFP)

The **Automated fiber placement machine (AFP)** allows the lamination of complex parts, thanks to the presence of **6 axis robot** and **horizontal positioner.**

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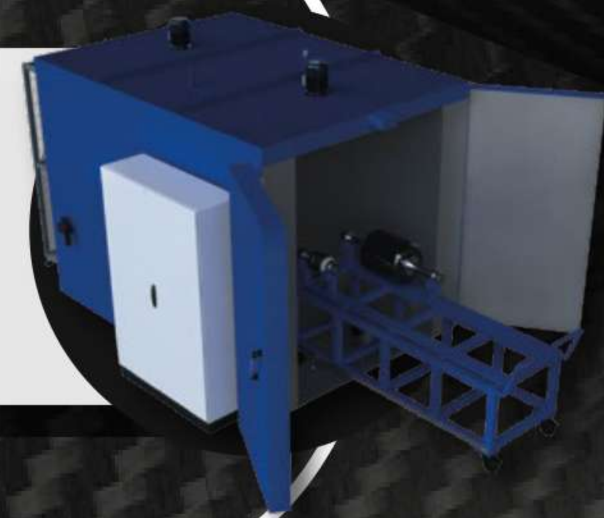

Burst test

The automatic **Burst test machine** allows the design validation of mechanical properties of CPV tanks, due the burst test using water at room temperature in bunker.

Final Controls

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OUR MACHINES

COMPOSITE TAILORED MACHINES

EFESTO

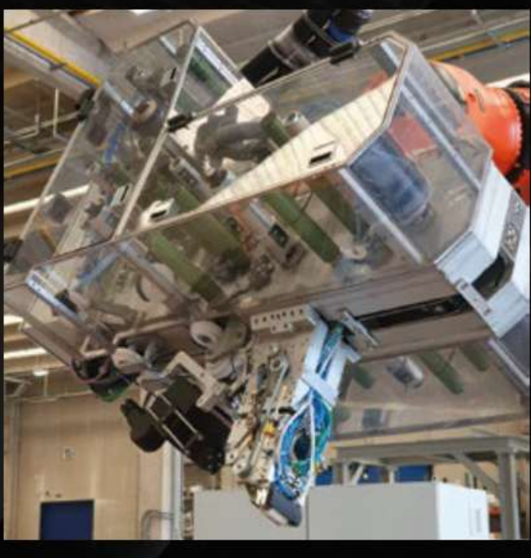
Automated Fiber Placement (AFP)

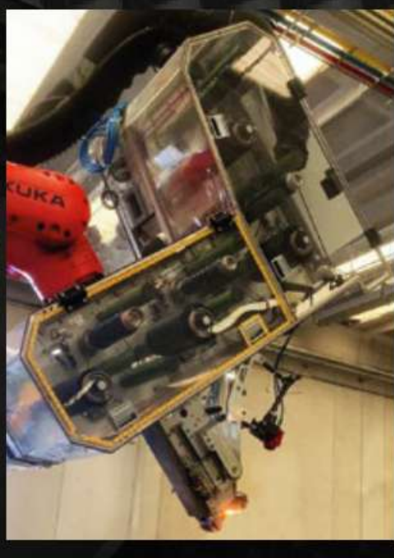
EFESTO stands out for high productivity and quality in advanced aerospace manufacturing. This innovative AFP machine features a modular design engineered to reduce footprint and tool dimensions, improving accessibility in deep molds and enabling the production of complex, tight-radius convex and concave structures with exceptional ease.

The intuitive programming software allows customized trajectories for advanced composite drone parts and airframes.

EFESTO redefines AFP technology through its compact and versatile architecture:

- Modular & Slim Tooling: Reduced dimensions for enhanced accessibility in complex molds.
- Multi-Material Capability: Use of slit tape or towpreg in different sizes.
- Material Flexibility: Compatible with thermoplastic and thermosetting materials.
- Rapid Set-up & Scalability: Fast reconfiguration for smart factory environments.
- High Deposition Precision: Accurate layup for lightweight, high-performance structures.
- Maximum Productivity: Designed to meet industrial mass production targets.





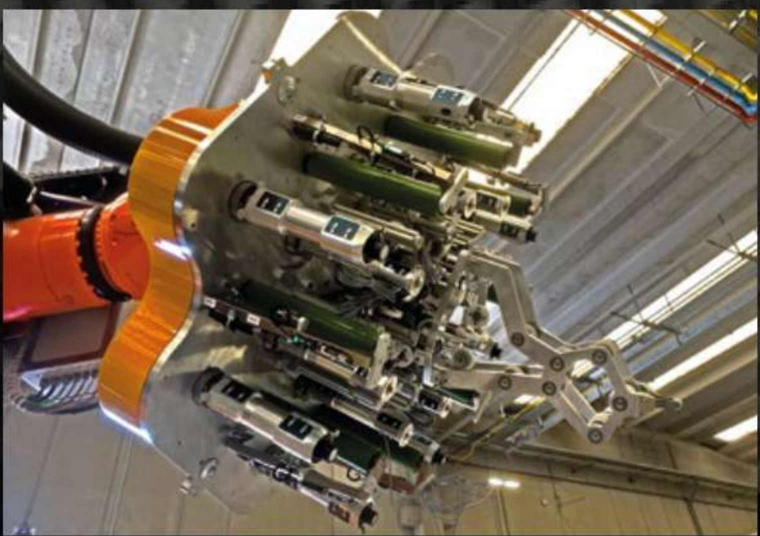
ATENA

Anisogrid Filament Winding (FW)

ATENA is used to manufacture complex shapes and high-quality parts.

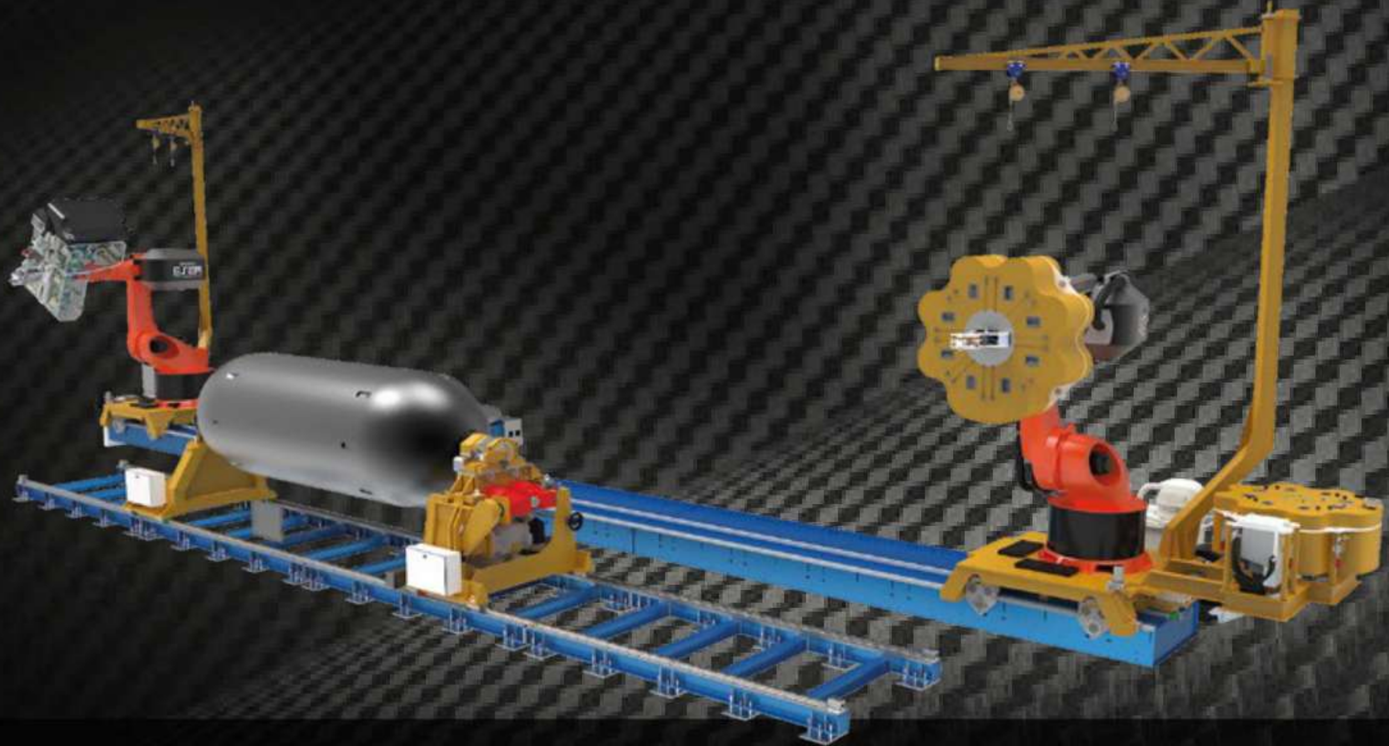
ESEA's robotic filament winding technology guarantees the minimum stress of the towpreg during the laying. **ATENA** is suitable for the production of anisogrid composite structures present in rockets.

Anisogrid structures are shaped as cylindrical or conical shells and consist of a dense system of unidirectional composite helical, circumferential and axial ribs.



ARES

AFP - FW - Ultrasonic Cutting Machine



ARES is the ultimate multi-process platform, merging **AFP (EFESTO)**, **Filament Winding (ATENA)**, and Robotic Machining into a single cell. Engineered for drone mass production, it eliminates the need for multiple machines by integrating three core technologies:

- **AFP: High-precision layup** for complex geometries.
- **Filament Winding: High-speed production** of structural components.
- **Ultrasonic Cutting: Integrated knife** for clean trimming of honeycomb and pre-preg.

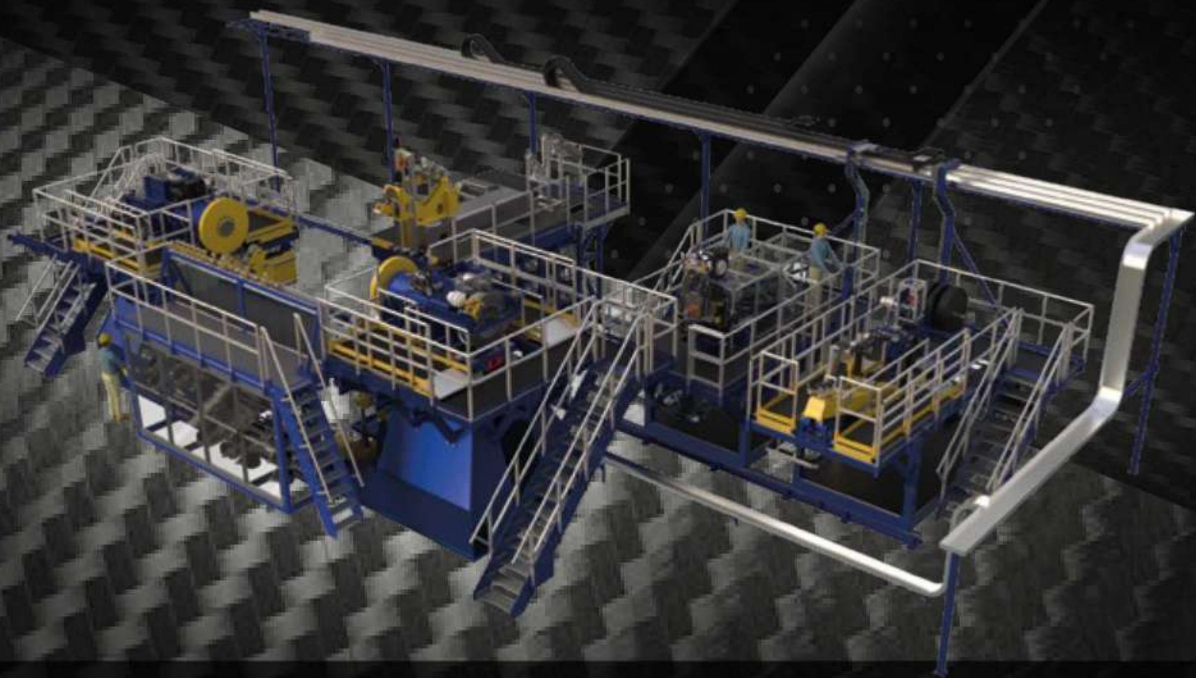
This fusion enables a seamless transition from layup to finishing in one workspace. Mounted on a high -precision linear axis, the system ensures maximum accessibility for large-scale drone parts.

ARES "One-Stop" Advantages:

- Zero-Transfer: Perfect accuracy by avoiding part relocation.
- Total Versatility: Handles both dry and pre-preg materials.
- All-in-One Finishing: Precise trimming immediately after layup.

ZEUS

Filament winding, Automated Tape Laying (ATL) and Tape winding machine



ZEUS is a high-performance cartesian multi- platform, engineered to manufacture complex composite structures for aerospace applications. Designed to integrate multiple technologies on a single system, **ZEUS ensures maximum efficiency and industrial precision.**

The platform's versatile capabilities include:

- **Filament Winding: High-capacity** system with up to 30 spools.
- **Tape Winding:** For specialized structural reinforcement.
- **Automated Tape Laying (ATL):** Supporting various UD tape bandwidths for optimized layup.

By combining these processes into a single integrated platform, ZEUS streamlines the entire manufacturing cycle, drastically reducing lead times and enhancing the structural performance of the final product.

This multi-technology integration provides the scalability and adaptability required for modern Smart Factories, allowing for rapid customization to meet the specific demands of the evolving drone industry.

POSEIDONE
Tow Preg

POSEIDONE is able to process different thermosetting resin systems with high viscosity, to produce high quality tow preg, at a maximum speed of 200 m/min (3,3 m/s).

ESEA's impregnation technology guarantees a constant resin content with deviation of less than ± 0,4%.

POSEIDONE is a modular machine, which can also be tailored to guarantee different production rates (from 1 to 8 spools).

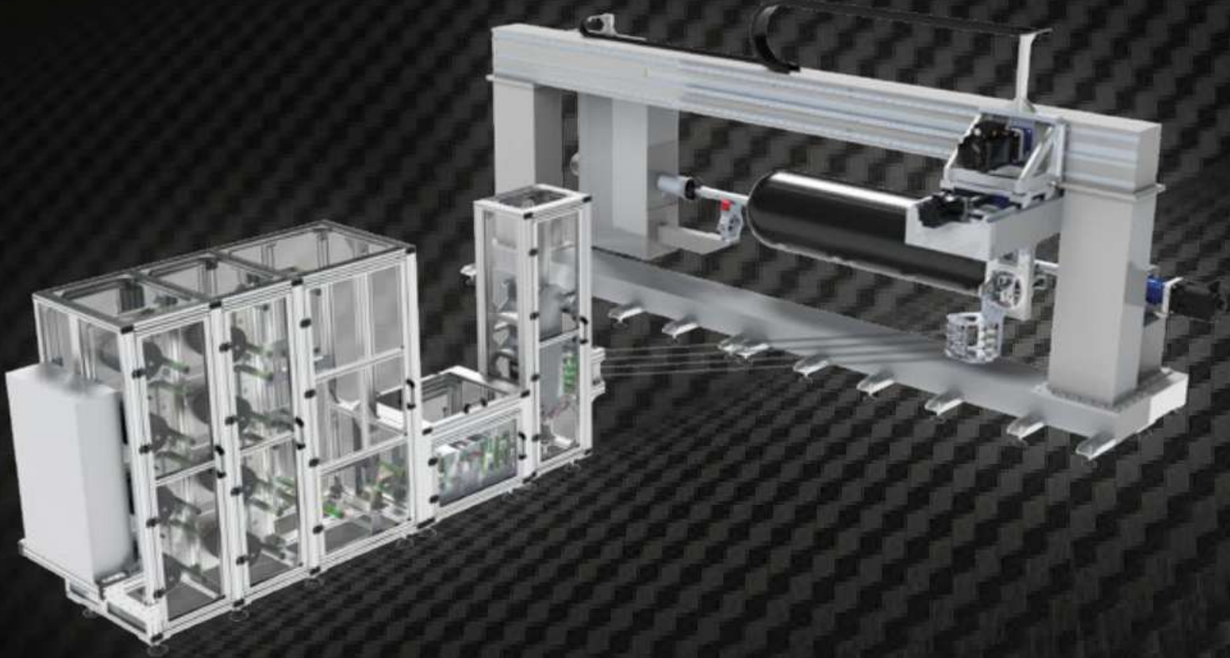
ERMES

Tow Preg - Lab Scale

ERMES is made available to universities, research centers, and companies to drive innovation with novel resin systems, in order to produce tow preg.

ERMES ensures high-quality tow preg through advanced impregnation technology that achieves uniform resin distribution, due to an integrated reverse roll system.

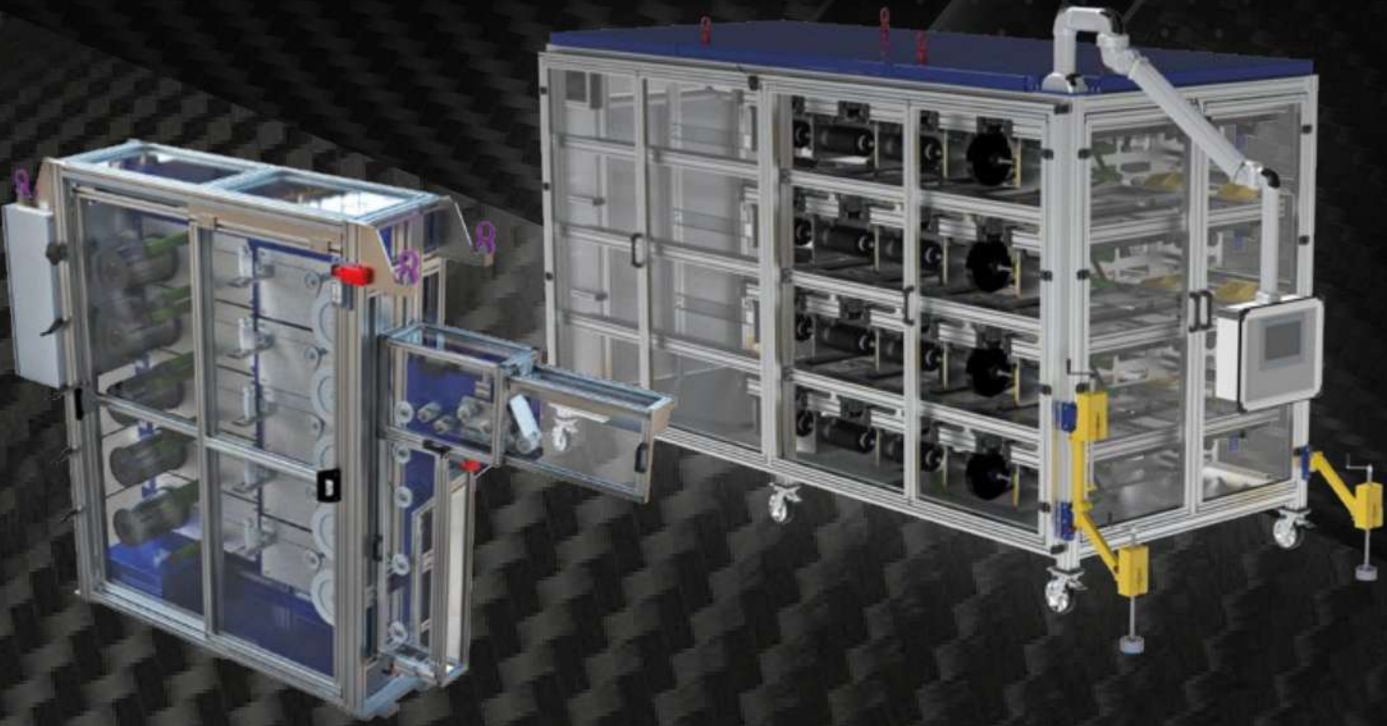
APOLLO
Filament winding



APOLLO is designed for the manufacturing of CPV tank, with a creel of 8-spool system, it combines wet winding and tow preg winding in one machine.
Optimized for the production of tanks of various sizes and shapes, **APOLLO** allows accurate control of winding angle and fiber tension, ensuring uniform laying.

Equipped with 5 axes and an advanced deposition end-effector, **APOLLO** guarantees high-quality lay-up and minimizes surface or structural defects.
The intuitive interface enables real-time monitoring and adjustment of winding parameters, ensuring reliability and operator safety throughout production.

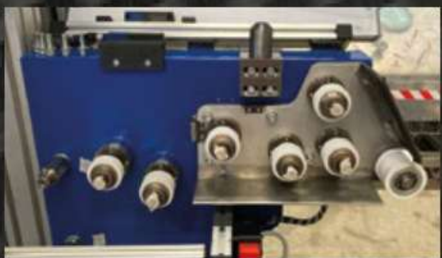
CRONO
Delivery System



CRONO is a standalone creel for the integration in existing machines.

Suitable for unwinding of Tow-preg, dry fiber, different materials as carbon fibers, aramid fibers, glass fibers (on cores), optical fibers, and monofilaments.
Soft unwinding process with S-Wrap.

Additionally, **CRONO** is equipped with an extraction system for dust containment, ensuring a safe and clean environment.



DEMETRA
Burst Test Machine

DEMETRA is designed for carrying out **"Burst test" activities on composite pressure vessels (CPV)** using water.

The equipment is easily transportable and can be used for CPV tanks up to 1000 liters, as it can also pressurize the vessels up to 2500 bar.

APPLICATIONS:

- Burst testing of composite pressure vessels
- Qualification and homologation of composite pressure vessels

EOLO
Noodle Former

The ESEA Noodle Former is a specialized high-speed system designed to produce precision Radius Fillers (Noodles) from 305 mm wide unidirectional plies. Essential for ensuring the structural integrity of complex airframes, this machine automates the creation of the "critical core" required for high-performance composite joints.

Engineered for the demands of drone mass production, it combines multi-shape versatility with record-breaking cycle times:

- Multi-Design Versatility: Integrated tooling to produce multiple custom noodle designs on a single machine, allowing for rapid reconfiguration between different aerostructure projects.
- Large-Scale Capability: Optimized for parts up to 13 meters in length (customizable for different lengths), covering the needs of even the largest drone wing and fuselage sections.
- Industrial Throughput: Capable of producing a finished part in just 2.5 minutes, ensuring the production line maintains peak efficiency without bottlenecks.
- Precision Sectioning: Guarantees a consistent cross-section, providing the exact geometry required for perfect structural bonding and optimized weight control.

By transforming a traditionally complex manual task into an automated, high-speed process, the Noodle Former ensures that the "DNA" of your aerostructure is flawless and ready for flight.

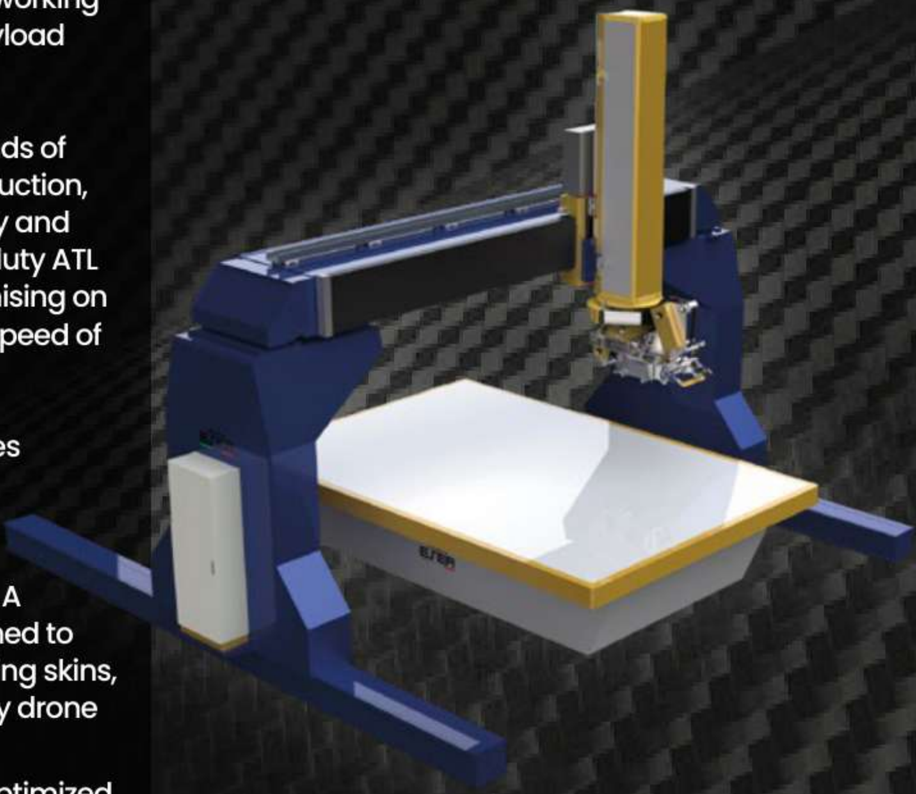
ADE

Cartesian Automated Tape Laying (ATL)

ESEA Cartesian ATL platform is engineered to redefine the boundaries of automated layup, combining an extra-large working envelope with an unmatched payload capacity.

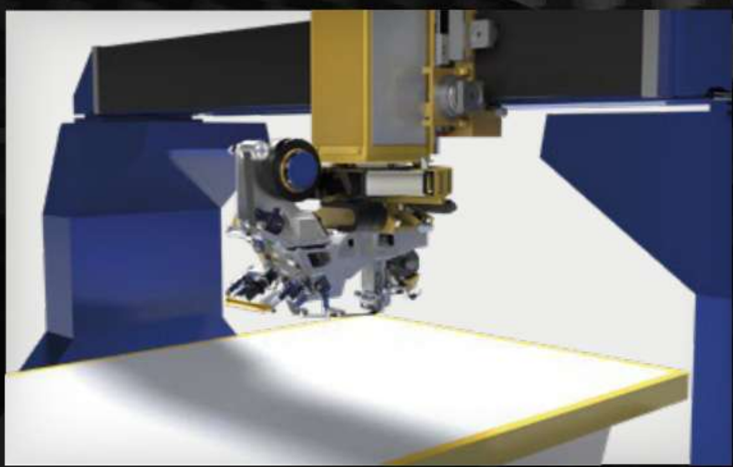
Designed for the intensive demands of drone & aerostructure mass production, this machine provides the stability and power needed to handle heavy-duty ATL deposition tool, without compromising on micron-level precision and high speed of laying.

The Cartesian architecture ensures maximum rigidity, making it the ideal solution for:



- Maximized Working Capacity: A massive 3D workspace designed to accommodate large-scale wing skins, fuselage sections, and primary drone aerostructures.
- Increased Payload Support: Optimized for high-performance deposition heads, allowing for the integration of multiple sensors and high-volume material spools.
- Superior Dynamic Stability: The robust frame minimizes vibrations, ensuring consistent compaction force even at high speeds and over large surfaces.
- Scalable Architecture: A modular design that can be customized in length and width to fit the specific footprint of your Smart Factory.

By combining heavy-duty payload capability with the agility of advanced software, Cartesian ATL transforms raw UD tape into structural masterpieces with industrial-grade efficiency.



PERSEFONE

FW + ATL pre-cut UD Tape sheets

ESEA integrated hybrid platform, combining high-speed Tow-Preg Filament Winding **(FW)** with precision Automated Tape Laying **(ATL)** of pre-cut tape sheet.

This dual-technology system is engineered for industries demanding maximum structural integrity and weight optimization.

Core Technologies

- Advanced Tow-Preg Winding: Utilizing pre-impregnated fibers to ensure a consistent resin-to-fiber ratio, zero waste, and superior laminate quality compared to traditional wet winding.
- Precision ATL Reinforcement: Automated deposition of pre-cut Unidirectional (UD) Tape sheets. This allows for strategic, localized structural reinforcement in high-stress areas that winding alone cannot reach.

NEMESI

Precision UD Tape Slitting Machine

To ensure total control over the supply chain, ESEA offers a high-precision Slitting Machine. This system is designed to transform wide UD (Unidirectional) tape into high-quality slit tape, optimized for Automated Fiber Placement (AFP), ATL and specialized layup processes.

By integrating this technology, manufacturers can produce their own calibrated tapes, ensuring:

- Customized Widths: Precision cutting of UD materials into narrow slit tapes with tight tolerances.
- Material Optimization: Minimizing waste and tailoring the material specifically for drone & aerostructures.
- Supply Chain Independence: Reducing lead times by processing raw materials directly within the facility.
- Production Readiness: for immediate use in EFESTO (AFP) or ARES cells.

AUGMENTED REALITY

ESEA integrates cutting-edge technologies to be able to offer our Customers a first-class remote maintenance and assistance service.

Thanks to **Augmented Reality (AR)**, operators can receive direct and complete on-field, keeping their hands free to carry out tasks in complete safety.

AR technology allows the operator to view instructions and maintenance data, directly on their smartglasses, making operations more efficient and reducing downtime.

With remote assistance the problem-solving process has been drastically simplified, allowing our customers to communicate directly with our experts through an interactive channel.
This means greater productivity, less operational downtime and higher quality support.

ARTIFICIAL INTELLIGENCE (AI)

By collecting and analyzing Big Data from our machines (process parameters, sensor signals and quality measurements), we implement AI models that learn the "normal" production signature and detect even small drifts in real time.

When deviations appear—e.g., fiber tension, temperature, resin distribution or deposition accuracy—the system suggests corrective actions and can automatically fine-tune setpoints to keep the process within specification.

This closed-loop approach improves repeatability, reduces scrap and downtime, and strengthens traceability: each part is linked to its digital production record, enabling faster root-cause analysis and continuous improvement across future runs.

ESEA COMPOSITES

-We know how-

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National and European projects

Ministero dell'ambiente e della Sicurezza Energetica

In collaboration with: ROMA TRE UNIVERSITÀ DEGLI STUDI

Ministero delle imprese e del made in ITALY

PROGETTO
SIDRO

SIDRO project aimed at the development of "Innovative technologies for the storage and transport of hydrogen"

PROGETTO
LAMBDA

The **LAMBDA-M project** emerges as a significant innovation in the aerospace sector, aiming to create a large self-deploying reflector.

PROGETTO
AUTOCOMP

Innovative solutions for compression, moulding, induction welding for thermosetting and thermoplastic composite materials.

GRUPPO ESEA SINCE 1980

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