TOOL4LIFE

A European project for developing materials and process (3D printing) for tooling production, to improve sustainability and wider applications for the composites of tomorrow

Michele Morbarigazzi – JEC Forum Italy – 11/06/2025

Tool4Life
A Life Project

Project location: Varano dè Melegari (Parma, Italy)

Duration: Start: 01/08/22 - End: 31/07/25

Beneficiaries:

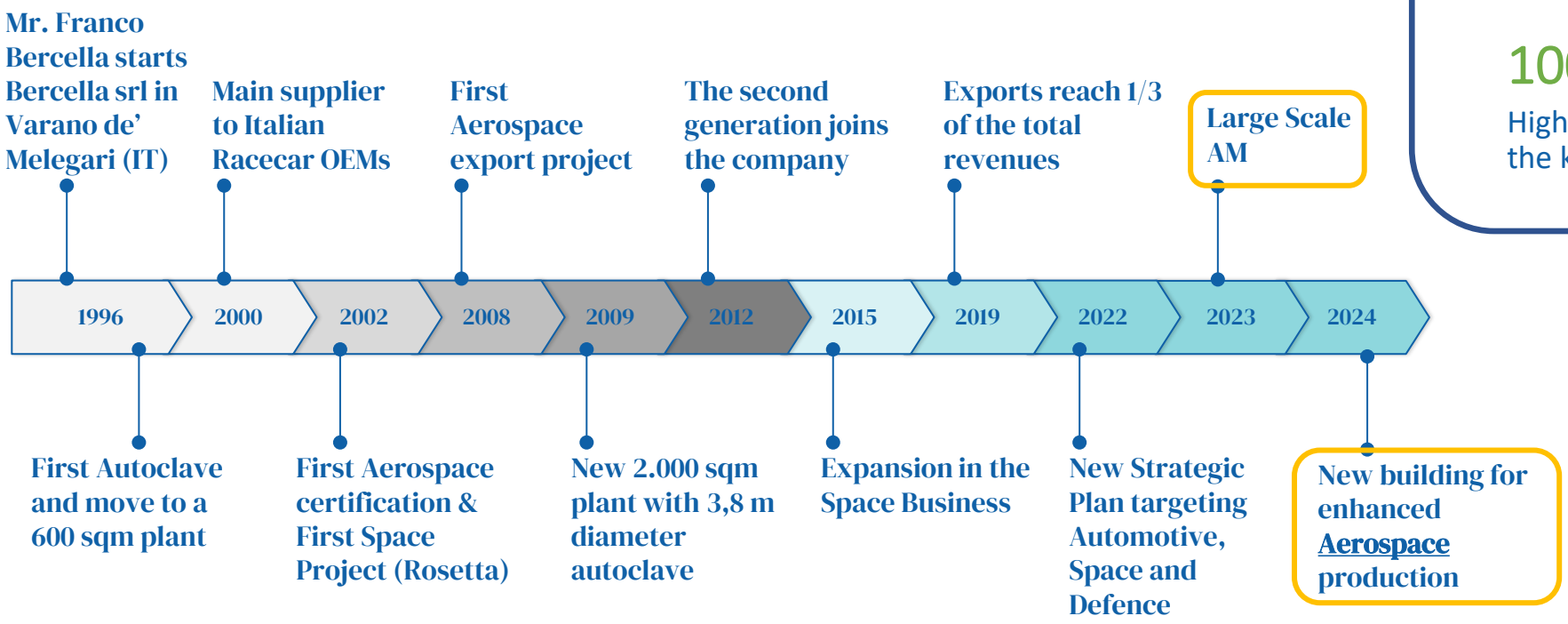
- BERCELLA SRL (Coordinating Beneficiary)
- RINA CONSULTING SPA
- CENTRE SCIENTIFIQUE & TECHNIQUE DEL'INDUSTRIE TEXTILE BELGE ASBL
- MARBO ITALIA SRL

BERCELLA at a glance

€11+ Million
2023 Revenues, up 27% from 2022

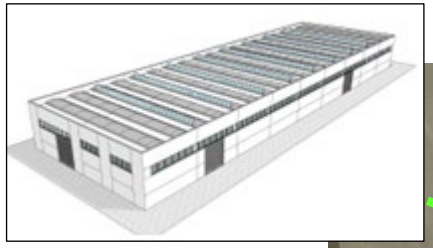
11.500+
Parts produced in 2023

100+ Employees
Highly specialized resources, the key to our success.



A strategic location

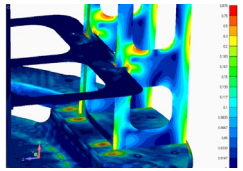
Bercella is in the Heart of the Italian Motor Valley, where the next technologies for Composites are developed.



The mission

"Our mission is to create a lighter, safer and more sustainable world through the development and application of innovative processes for the transformation of Composites".

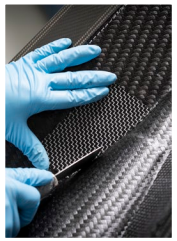
End-to-end product development



Design

In-house **Design Office** with 12+ expert Engineers working on Parts and Tools Engineering.

Long-lasting **partnership** with external companies for specific activities such as Dynamic Simulation, Electromagnetic or Thermal design, etc…

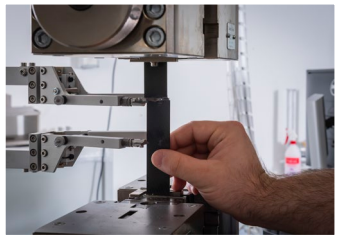


Production

In-house availability of all the needed processes: Layup, **CNC Machining** and Painting.

Backup suppliers for every process to ensure a complete redundancy and risk mitigation.

Continuous investment in training and up-to-date equipments.



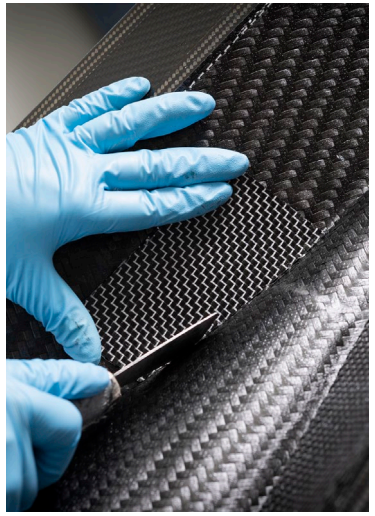
Testing

Materials and Process **traceability** is guaranteed for 100% of the parts and they are guaranteed for 10 years after delivery.

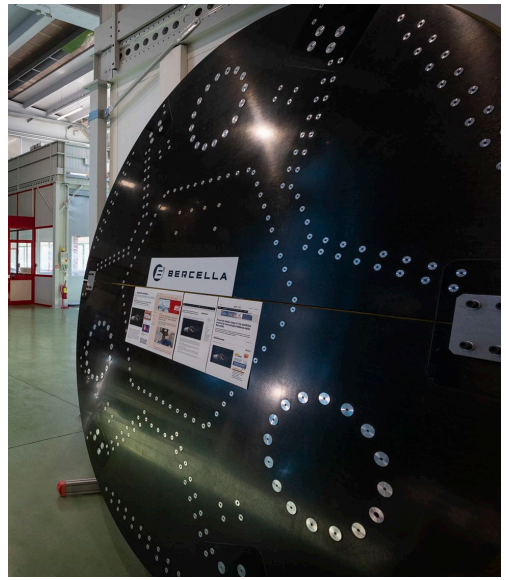
In the **internal Material Testing Laboratory**, incoming inspection and acceptance testing can be quickly implemented.

Prepreg Layup + Autoclave curing

- 25+ years of experience in layup of Composites Prepreg
- 3 Clean Rooms including an ISO7 Certified Clean Room
- 3x CNC Plies Cutting machines



Multiple **Autoclaves** (6) available for large size production and risk mitigation



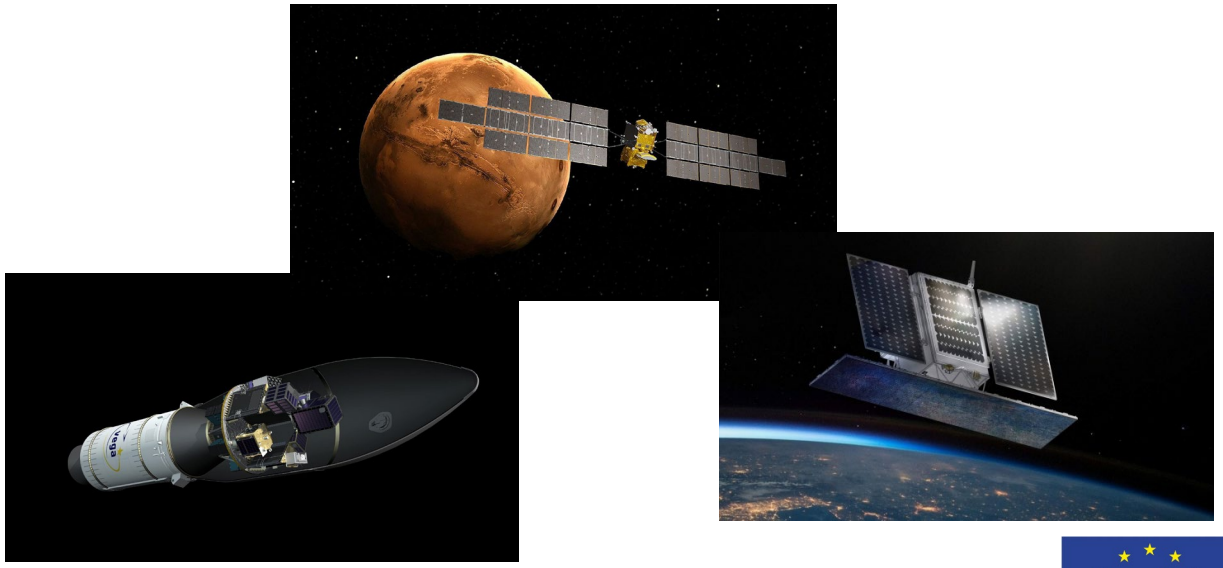
We focus on 2 key areas

Automotive & Motorsport

25+ years of experience + geographic advantage over competitors = a heritage to capitalize in high-end Automotive.

Space & Defense

Capitalizing the market penetration actions started in 2015 that brought us to a strong position in the Italian Market, targeting the Large Constellations segment.



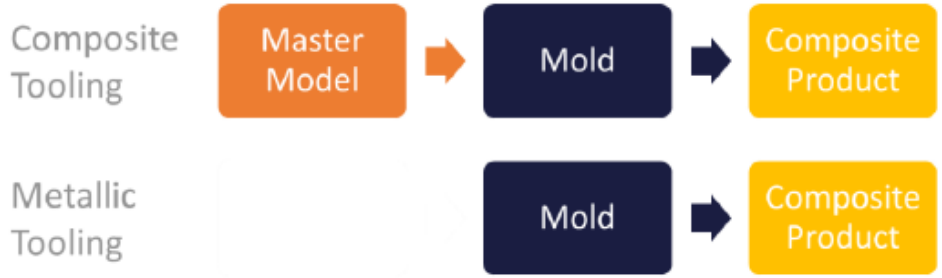
Main Objectives of the TOOL4LIFE project

The pre-processing of composites relies on the application of tooling as moulds: currently done in thermosetting foam, heavily impacting the global composites balance, being intrinsically non-recyclable, typically landfilled after their use

The TOOL4LIFE project is aimed **to develop tooling in thermoplastic materials** with hybrid technology (AM followed by milling and in-mould coating)

The process enables the use of 20% to 25% polymer material, 33% less energy and emits only the 9,2% of the CO2equivalent against the SoA

Furthermore, it entails complete **recyclability after use**. The solution is fully retrofittable in the composites processing thanks to the in-mould sealant, demoulding, and finishing agents, purposely developed with a water-based platform.

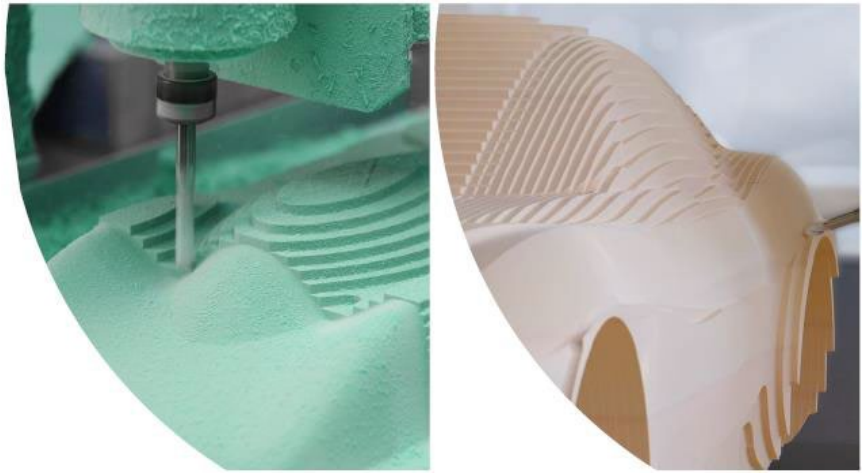


Main Objectives of the project – Current drawbacks

The development of specific solutions to the sustainability issue of tooling for the composites manufacturing is associated to mostly two elements in the current management of such process:

• From the 30% to the 60% **volume of material wasted** in subtractive manufacturing, of the initial tables. The material itself, being a **thermoset**, is by nature inherently non-recyclable

• The composite transformer is dealing with the end-of-life management of the tables (scrapping and **landfilling**). Typically, the composites manufacturer is not the owner of such tooling, being them property of the end customer, thus a radically new model of business is to be thought



Main Objectives of the project – Buying factors

The improved performances of the end-products can be key elements to support the development of an immediate market, gaining acceptance from energy-savvy and green-sensible buyers:

- 9,2% CO2 embedded against the current benchmark
- 67% energy footprint
- 20% to 23% reduction in the unit costs, associated to savings in the process (estimate)

Main Objectives of the project – Development

The **design of the tooling** is established on dedicated voids and lightened structures (trabecular inner design).

Thanks to a model-based approach the technicians have understood far better performances to be achieved, **higher structural capacity at lesser amount of material**.

Subject of improvement within the TOOL4LIFE: optimization of the inner shape of the voids, at no compromise on rigidity and the capacity to resist at the desired moulding temperature, the tooling does not show deflection, thanks to the cooperation between BERCELLA and RINA-C technicians, their expertise in materials modelling and the extensive portfolio of shape optimization

Main Objectives of the project – Development

Surface standard **sealant agents** are being applied, showing the feasibility for improvement of the surface of the moulds as well with thermoplastics AM elements.

Subject of improvement within the TOOL4LIFE: the results leave wide room for improvement and the possibility for MARBO to develop customized solutions, creating a barrier to the voids and interlocking the molecular structure of the polymers to be used.

In addition, specific **in-mould conditioners** are developed that combine specific performances with the mating surfaces, and low impact thanks to all-water formulation.

Main Objectives of the project – Development

PC-ABS + 30% short CF combination of **polymers** is applied to optimize different performances and functions of the tooling: mechanical resistance, thermal conductivity and lowest-as-possible thermal expansion (CTE).

The combination proved to resist under the aimed conditions and within the due deflection up to near 130°C, sufficient for most of the standard medium-temperature moulding.

Subject of improvement within the TOOL4LIFE: **identification of other types of polymers, blends and eventual fillers**, that can be reliably applied to different types of scenarios, and eventually upgraded to the class of recycled materials, or biobased origins to further reduce the impacts

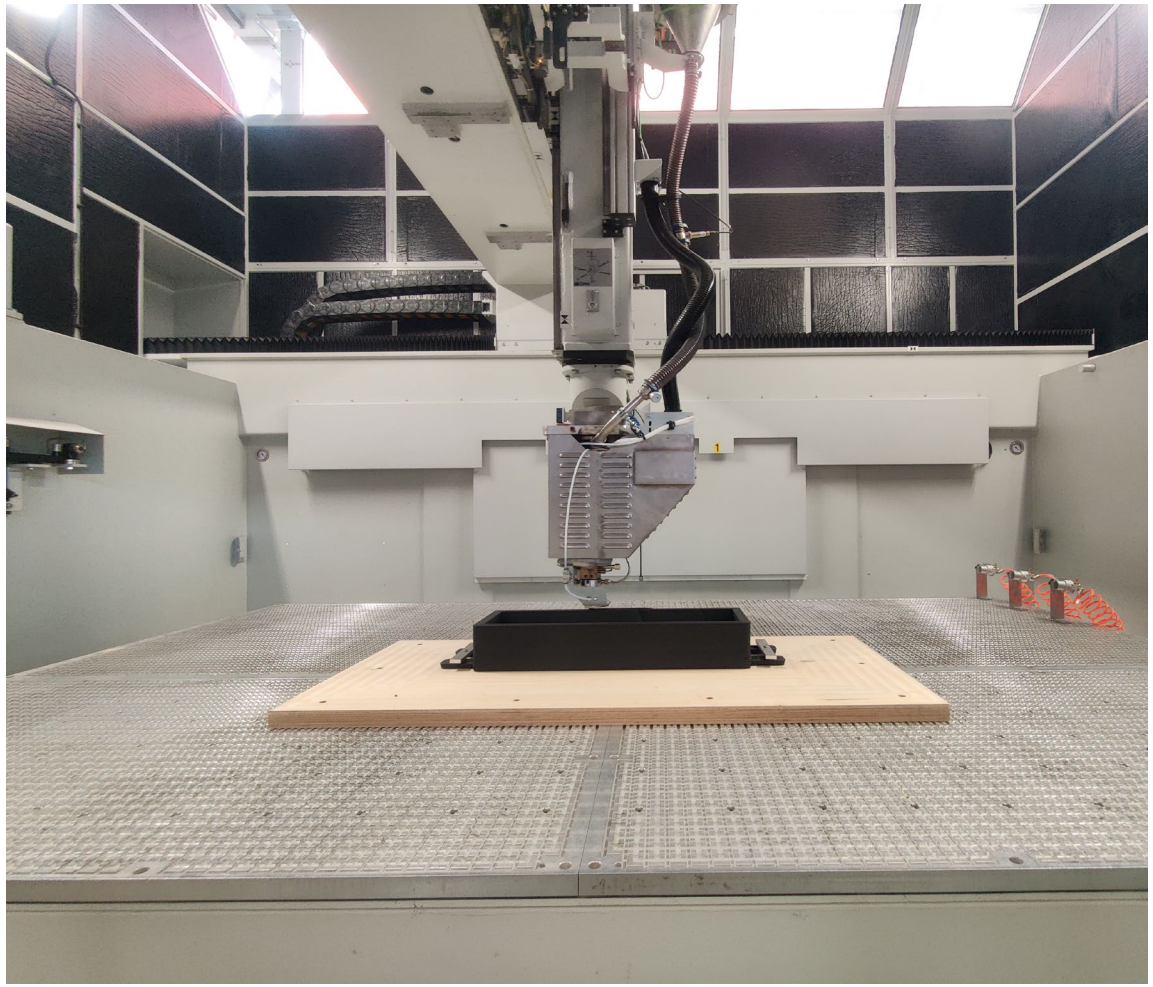
Main Objectives of the project – Development

The **recycling of the polymer** has not yet been attempted, still trials with mechanical means and grinding equipment have shown a good compliance of the materials with the processing technologies, and easy scalability.

Subject of improvement within the TOOL4LIFE: selection of **optimal solutions suited to a comminution and regranulation,** potentially to be deployed entirely within the perimeter of the BERCELLA facilities.

This is expected to represent the core of the sustainability and ease of implementation. CTB is committed to lead their expertise and technological capability to achieve the desired result through simple and scalable processes, and to test the performances of polymers leading to routines for recovery of the target viscosity and mechanical performance.

Large Scale Additive Manufacturing



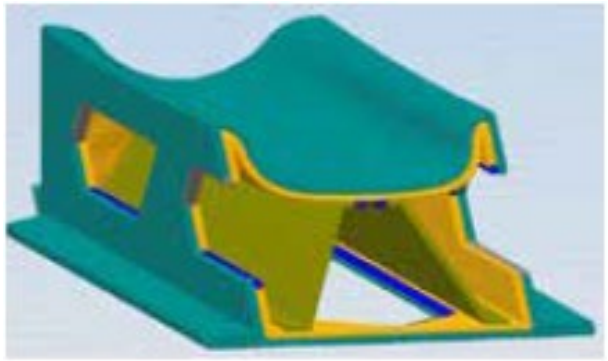
Printing Volume:

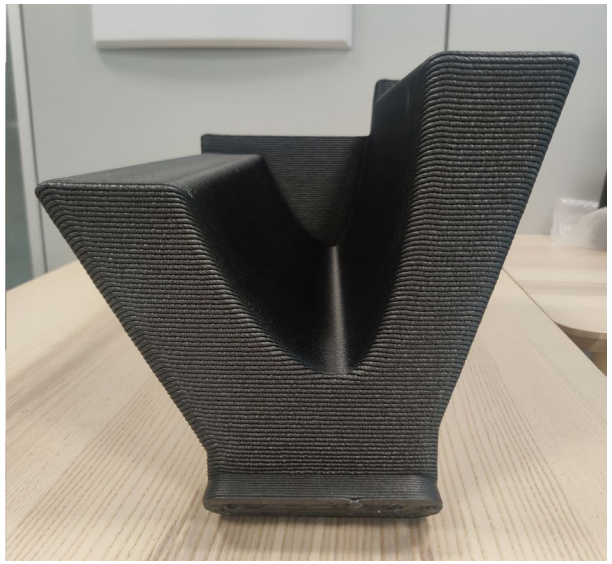
300 x 200 x 100 cm

3 main scenarios:

- **Prototypes & finished products**
- **Master Models**
- **Moulds**

Large Scale Additive Manufacturing





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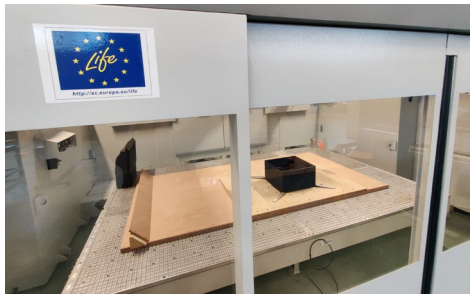

Large Scale Additive Manufacturing: some examples

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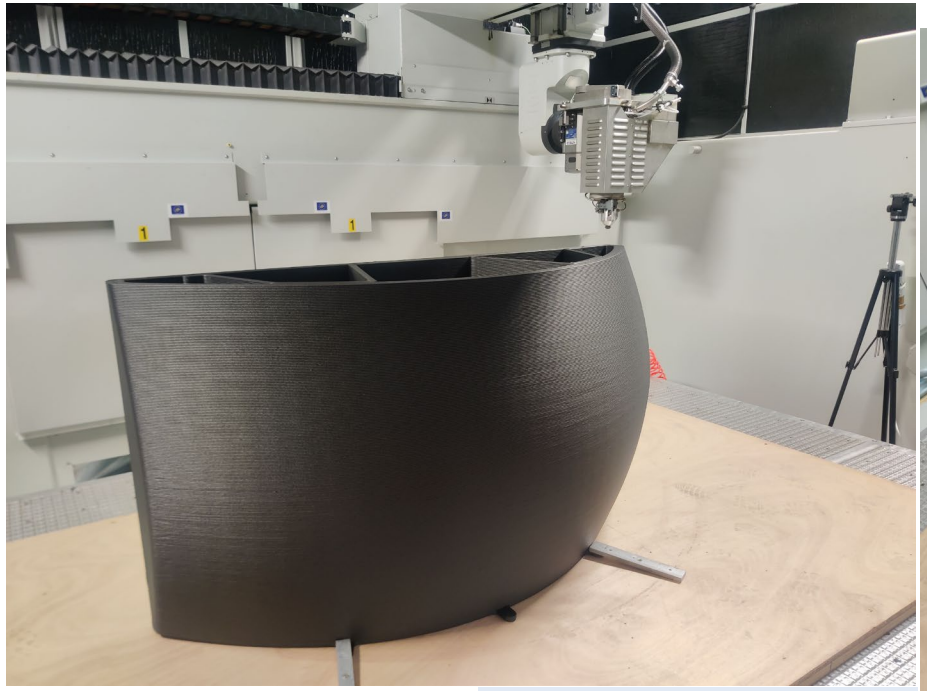

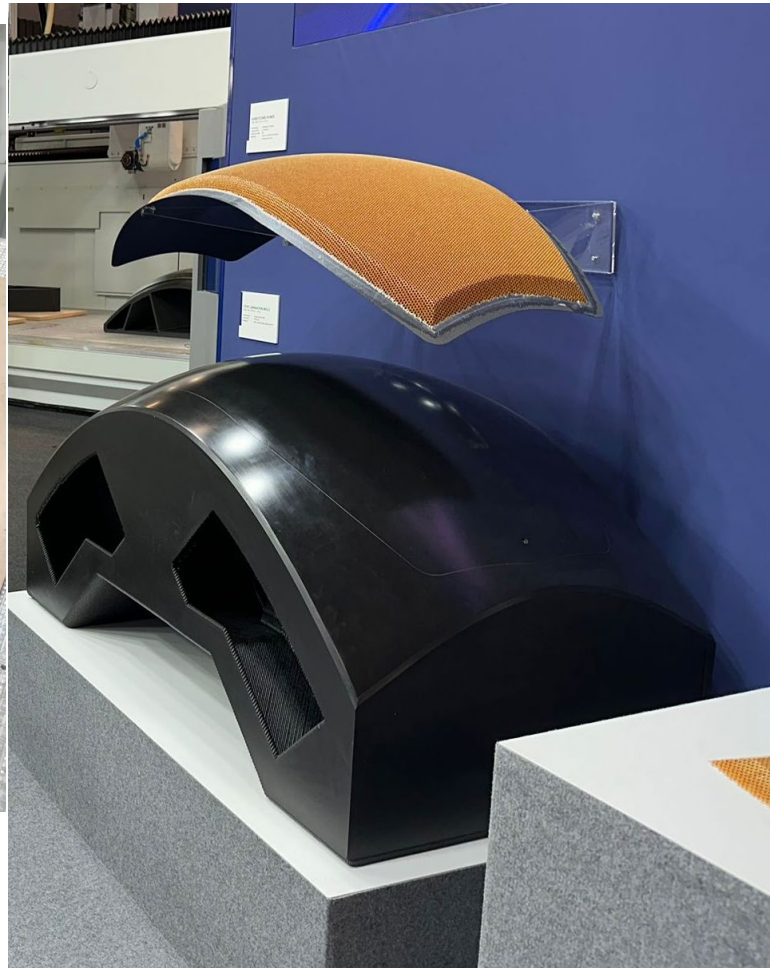

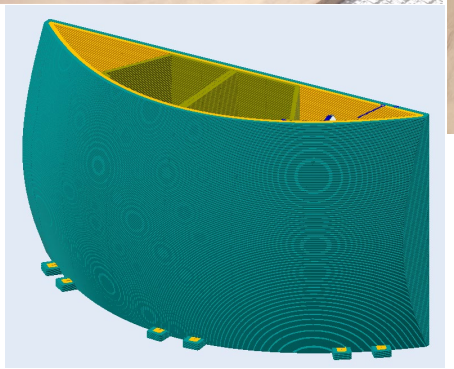

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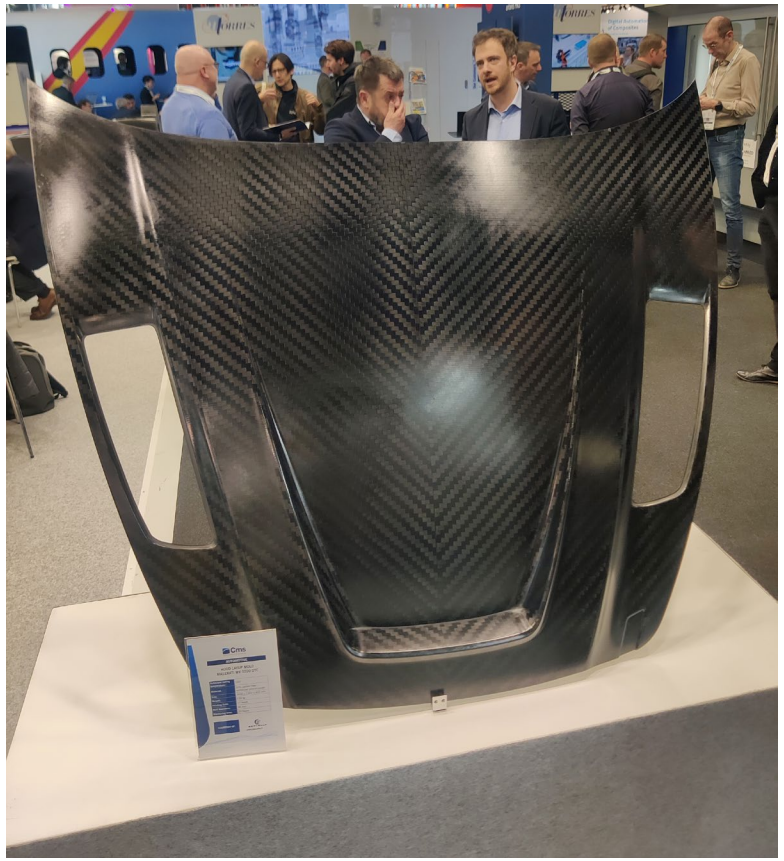

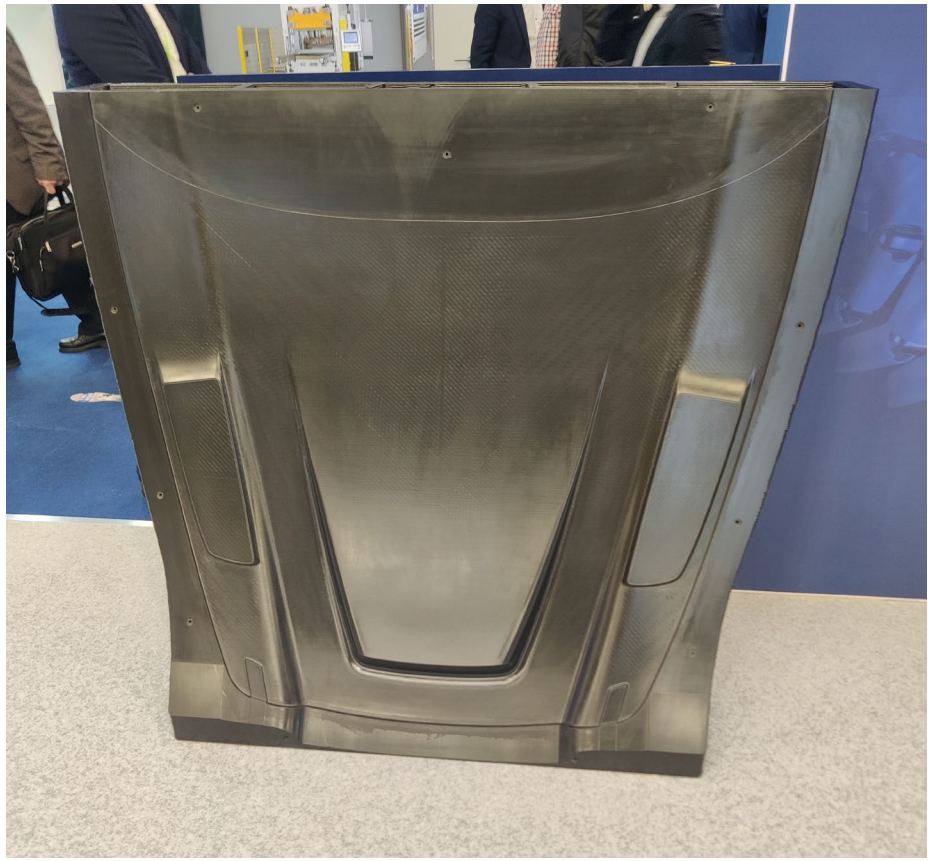

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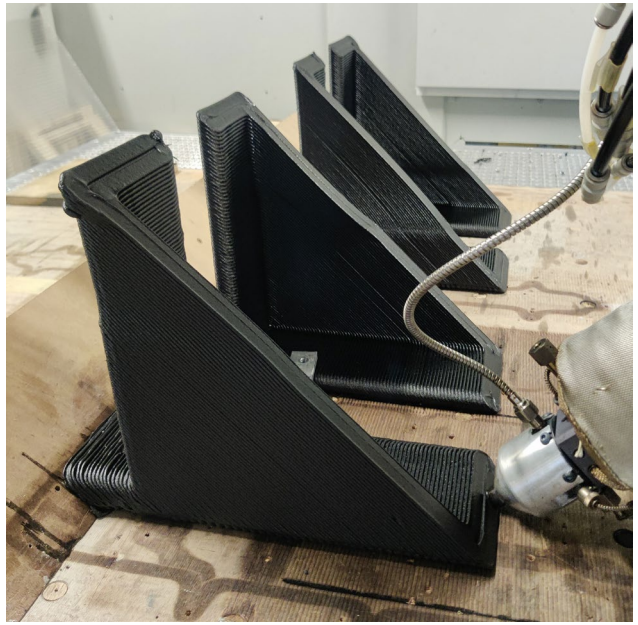

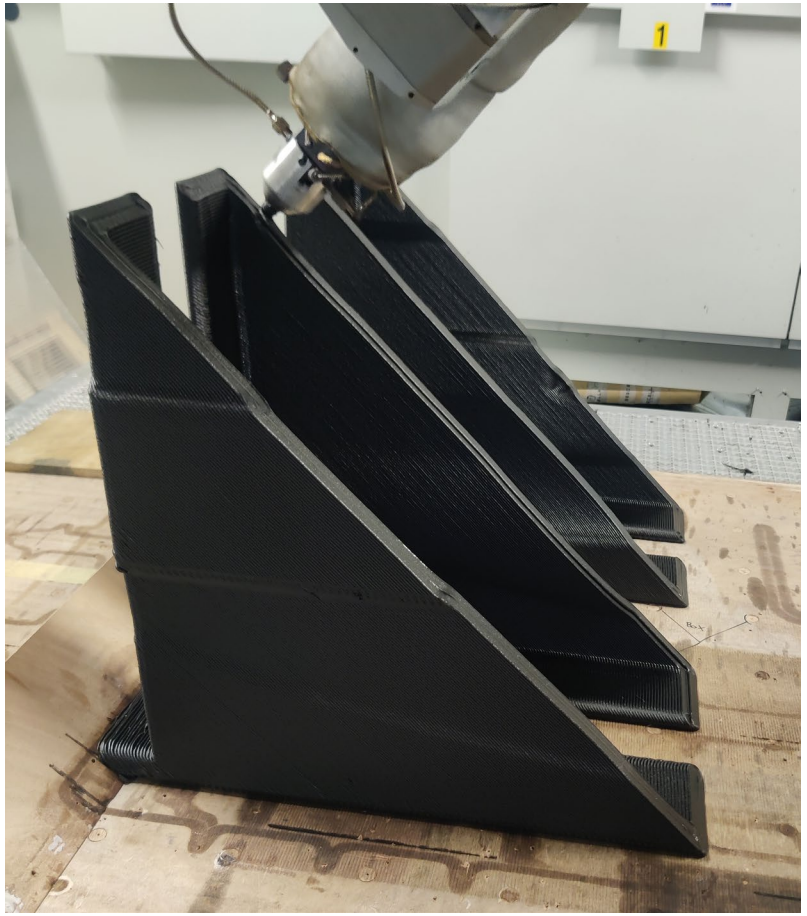

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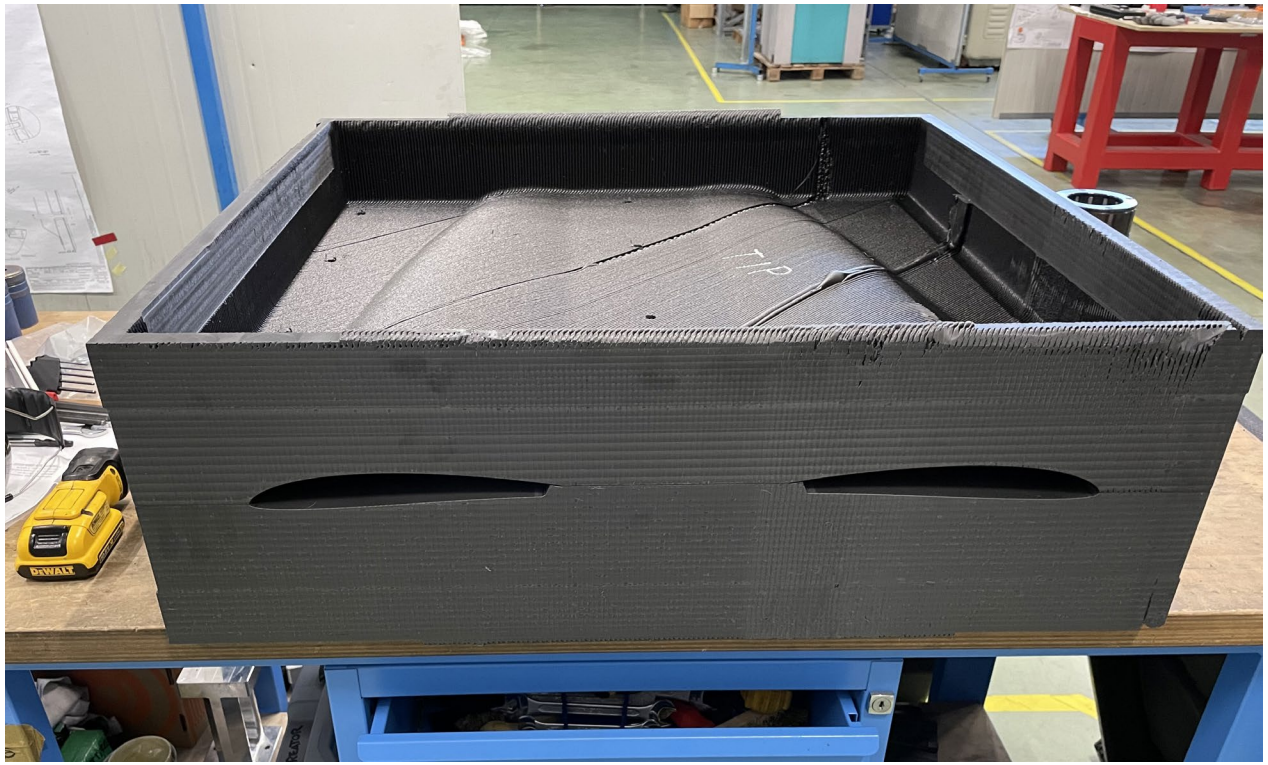

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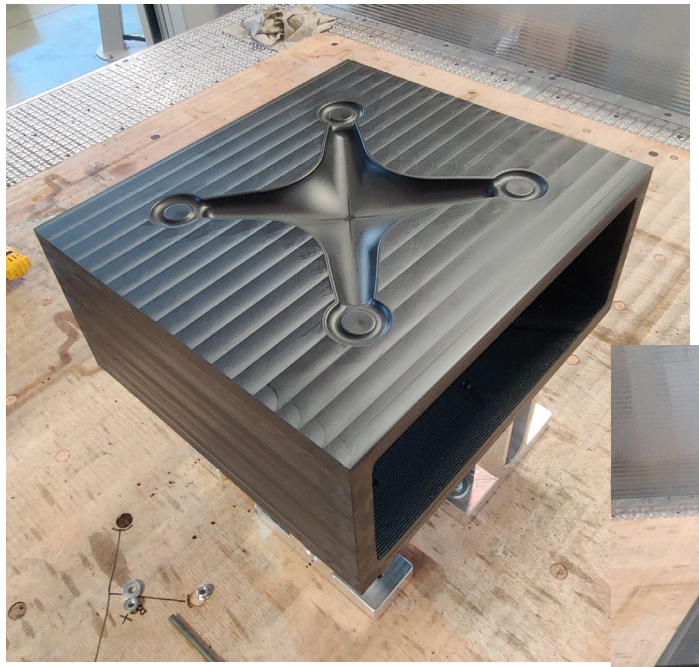

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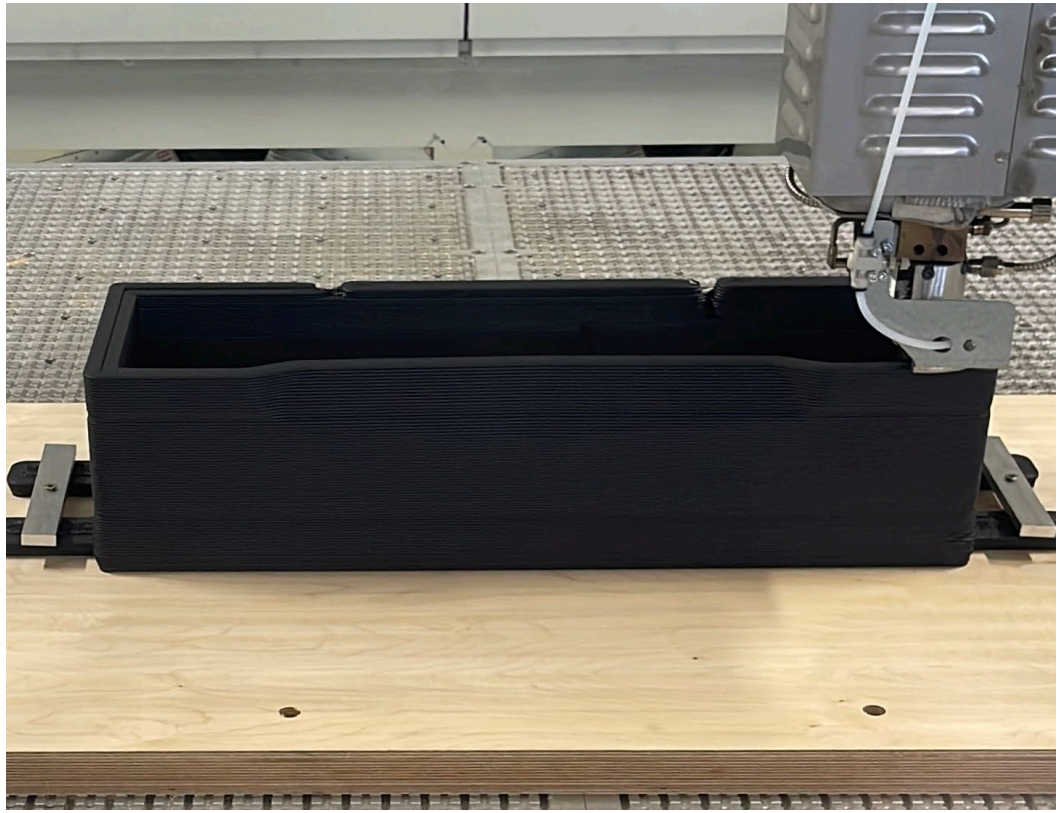

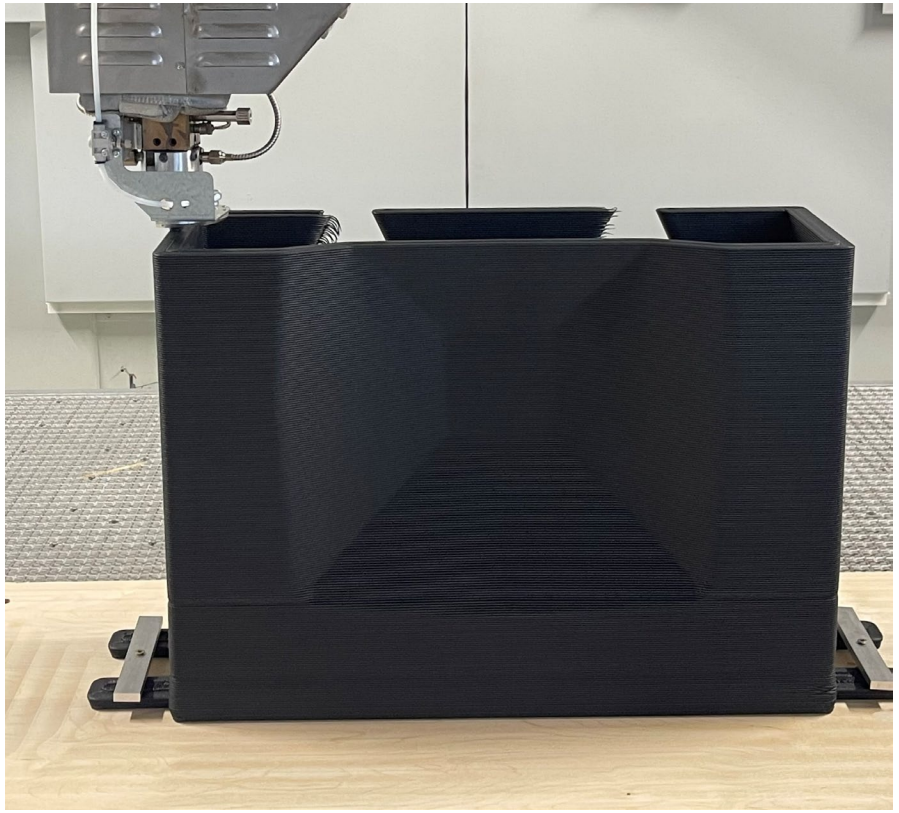

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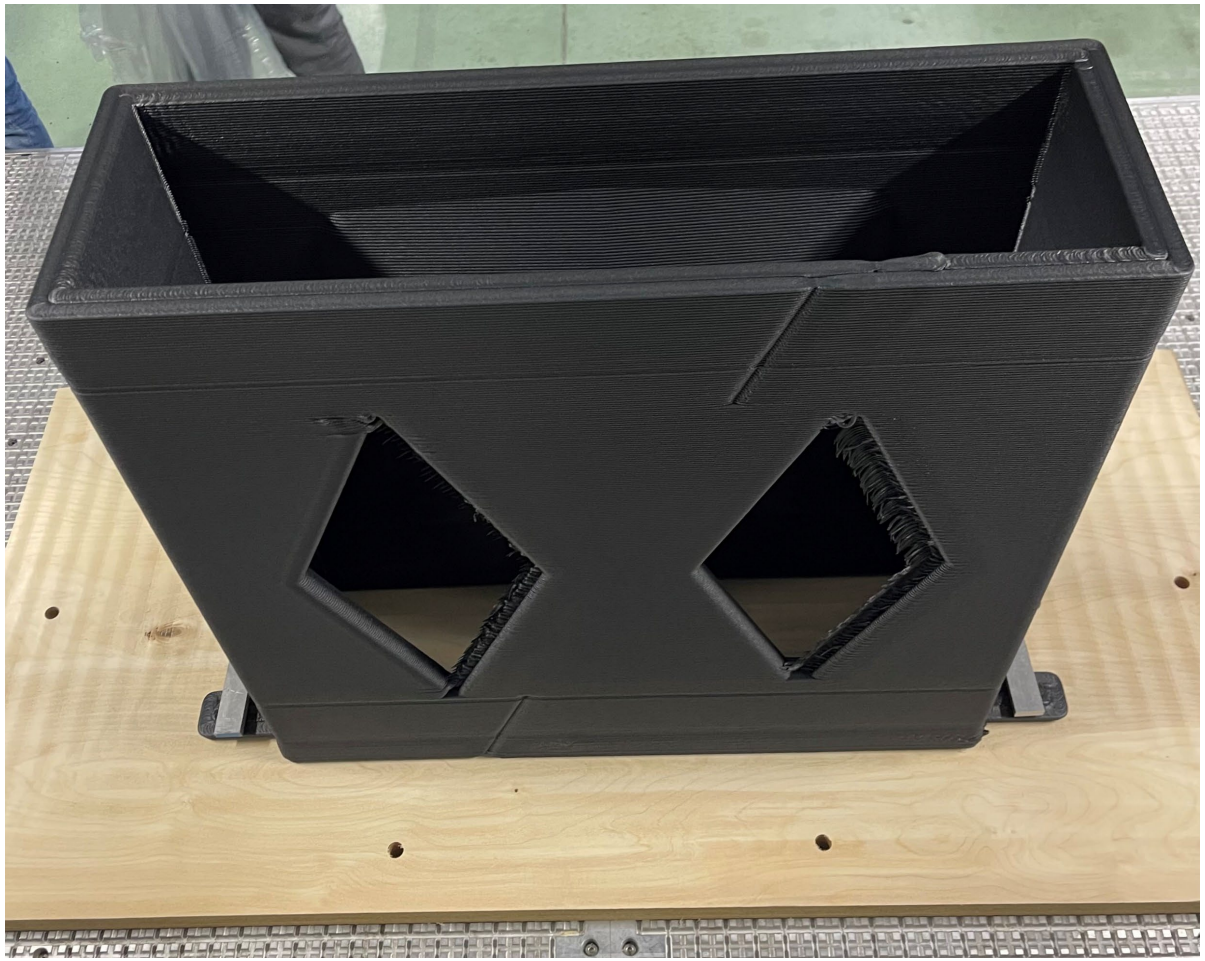

Large Scale Additive Manufacturing: milling phase

GRAZIE PER L'ATTENZIONE

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