



Automobili Lamborghini and composite materials

More than 35 years of history told in 12 chapters

Sant'Agata Bolognese, 9 September 2021 - One strength of Automobili Lamborghini's product design is the development and application of lightweight carbon fiber materials. Continuous research and an innovative approach have helped put Lamborghini at the forefront of this sector over more than 35 years. Here are 12 milestones in this extraordinary history:

1983: Lamborghini launches the development and use of carbon fiber for the first time. The new 'Esperienza Materiali Compositi' Department (known as E.Co), was set up thanks to the arrival of know-how from Seattle, developed from the first carbon fiber and Kevlar components within the Boeing 767. The first carbon fiber chassis prototype is created, known as the Countach Evoluzione. This is the first use of composite materials by Lamborghini and an absolute first of its type in a road car project.

2007: a close partnership with the University of Washington (UW) is established; an important milestone in the history of composites at Lamborghini. Some fundamental aspects of the development of RTM out-of-autoclave technology are delegated to the U.S. university: technology that would eventually be the basis for the monocoque of the future Aventador.

In 2007, a division is set up in the Research and Development Center, now called the "Composites Development Center", to focus on research into innovative materials and the development of new concepts and technologies for carbon fiber applications.

2008: the first collaboration agreement is signed with Boeing to study the crash behavior of composite materials and the Aventador monocoque. Before anyone else in the automotive industry, Automobili Lamborghini starts to implement composite material technologies, processes, simulation and characterization methods from the aeronautics and aerospace industries.

2010: as a result of its collaboration with Boeing and Callaway - the golf club manufacturer - Lamborghini develops Forged Composites® technology, a specific patent leading to the Sesto Elemento supercar concept in the space of just a few days. In the same year, a plant dedicated to the production of composite components is built at the Lamborghini production site (subsequently used to produce the Lamborghini Aventador monocoque), delivering both automated production and careful craftsmanship.

2011: debut of the new Aventador LP 700-4, equipped with an innovative carbon fiber monocoque designed and manufactured entirely in Sant'Agata Bolognese. The Aventador body shell, made entirely of carbon fiber and designed with a unique structure, guarantees a chassis weighing just 229.5 kg. Precisely because of the unique and complex nature of the process used to manufacture the composite material monocoque, which no supplier can provide at this time, Lamborghini decides to produce the monocoque in-house.



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Most of the parts making up the monocoque are produced using Lamborghini's patented "RTM-Lambo" technology. This process eliminates the need for manual lamination and autoclaves, but at the same time enables the use of carbon fiber molds, reducing production times and making RTM-Lambo a cutting-edge manufacturing technology.

2011 also sees the start of developing the Repair strategy through a new partnership with Boeing.

2014: Automobili Lamborghini becomes the first automotive firm in the world to obtain TÜV certification for its carbon fiber car repair service. This repair service, the development of which started in 2011, is audited by TÜV Italia experts and certified for accountability, traceability, reliability, punctuality and accuracy. The service is offered through specialist experts, known as "Flying Doctors". These are professionals who have undergone initial training at the Boeing Co. Repair Department, followed by further in-depth training at Abaris Training Resources Inc. in Nevada, where they obtain the Advanced Composite Structures Damage Repair qualification, recognized by the US Federal Aviation Administration. The aim of this Lamborghini repair service is to guarantee that the technical performance of the repaired part will be 100% identical to the original part.

2015: creation of Carbonskin®. Automobili Lamborghini extends its activities in the field of flexible materials and, after years of research and development, designs a new carbon fiber material with flexible matrix, suitable for applications in car interiors. From here, Carbonskin® is created (another exclusive Lamborghini patent): a unique, flexible composite material certified for automotive use. Carbonskin® was developed entirely by the Automobili Lamborghini Research and Development team and complies with all type-approval and validation requirements of the automotive industry. As well as reducing the weight (28% lighter than Alcantara and 65% lighter than leather), this innovative new material offers unique characteristics such as the naturalness of carbon fiber; a three-dimensional effect; and an immediate softness to the touch when compared with other materials.

2016: inauguration of the new carbon fiber research laboratory, the Advanced Composite Structures Laboratory (ACSL), in Seattle (Washington, USA). Operating as an external entity to the company's headquarters in Sant'Agata Bolognese, the ACSL investigates any potential innovations in carbon fiber.

2017: research project with the Houston Methodist Research Institute for the study of composite materials in medicine. Automobili Lamborghini makes its know-how in the study of carbon fiber composite materials available to the Houston Methodist Research Institute, launching a collaboration for the study of these materials in the medical field. The research project focuses on the study of the in-vitro biocompatibility of composite materials that could potentially be used for the development of prosthetic implants and for subcutaneous devices. The aim is to identify new, lighter materials that are radio-transparent, better tolerated by the human body, and more durable over time than those currently used in the medical field.

2019: testing in space. Automobili Lamborghini is the first automaker in the world to carry out research on carbon fiber materials aboard the International Space Station (ISS). The joint research in advanced carbon fiber composite materials initiated two years ago between Automobili



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Lamborghini and the Houston Methodist Research Institute has now reached an important milestone. The launch of the Northrop Grumman Antares launcher from the Wallops Flight Facility in Virginia took place on November 2, 2019, with the mission to take a series of composite material samples produced by Automobili Lamborghini to the ISS. The launch is part of a test campaign sponsored by the ISS U.S. National Laboratory and overseen by the Houston Methodist Research Institute. Specifically, these tests are aimed at analyzing the response of five different composite materials produced by Lamborghini to the extreme stresses generated by the space environment, with a view to future applications by Lamborghini and in the medical field.

2021: launch of the Lamborghini Essenza SCV12, the first car on the market with a carbon fiber roll cage type-approved according to FIA Hypercar safety standards. This extraordinary achievement is the result of Automobili Lamborghini's thirty years of experience in the study and application of composite materials in the automotive field.

To achieve this result, the carbon fiber monocoque produced in Lamborghini's CFK department's autoclaves is reinforced at several points, given that it must support forces of more than 12 tons without significant deformation during the extremely rigorous static and dynamic testing for FIA type approval. There are more than 20 static tests which, in addition to the chassis, involve the pedals, belts and fuel tank. The dynamic crash tests, on the other hand, involve impacts at speeds up to 14 meters/second. It is important to note that in this type of test, the chassis must not be exposed to intrusions of external elements that could come into contact with the driver, and the fuel tank must not leak.

Today: sustainability and waste recycling. Another aspect worked on by Lamborghini over the years is the environmental sustainability of the composite material production processes. Today, the research and projects undertaken by Lamborghini engineers have led to the implementation of specific production technologies that reduce the consumption of energy and precious resources like water, and drastically reduce the amount of composite production waste.

All waste is reused in other applications, either on the vehicle or put to some other use at the factory, such as paneling or trolleys. Anything that cannot be reused is collected and recycled to recover the fiber, which is then used to make new products in "recycled carbon fiber". These may even be other vehicle parts with less demanding structural and aesthetic specifications, such as vehicle floor panels. Furthermore, process waste is used to create by-products such as promotional products for customers and guests during events organized by Lamborghini. The ultimate goal is to create the genuine circular sustainability of carbon fiber.

Photos and videos: media.lamborghini.com

Information on Automobili Lamborghini: www.lamborghini.com



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