

Automobili Lamborghini Academy for carbon fiber arts and sciences

MODULE 1.4 Introduction to Forged Composite technology

1-day program (9 am to 5 pm)
Maximum enrollment: 8 people
Personnel: Paolo Feraboli, instructor

Enrollment fee: USD 900 per person.
No prerequisites required for enrolling.
Bonnie Wade, lab supervisor

About the course:

Purpose of the course is to introduce the students to *Forged Composite* technology, a breakthrough carbon fiber process which enables the realization of high performance primary structures at lower cost and higher rates than traditional composite processes. This process, which was launched by the ACSL in 2010 with the release of the Lamborghini Sesto Elemento monocoque and the Callaway Diablo Octane driver, has now been utilized for other award-winning products such as the Union FC snowboard binding. During the one-day introductory course, the students will develop understanding of the Forged Composite material form and manufacturing process, its key mechanical properties and physical characteristics, and fundamental design criteria. With the aid of real-life case studies from the ACSL experience, the students will be exposed to the cost-, performance-, and weight-analysis procedures used to develop a business case for Forged Composite. A lab session will feature hands-on experience where the students will be able to make a part using Forged Composite from beginning to end, and take it home with them. The ideal student is a current composite, aerospace, automotive or recreational equipment industry professional/practitioner. General background in composites, engineering and design is required. The Academy reserves itself the right to accept and select the students at its own discretion.

Program of the day:

9:00 – 9:30	Museum visit
10.15 – 11:15	Lecture 1
11:15 – 11:30	Espresso break
11:30 – 12.30	Lecture 2
12:30 – 1:15	Lunch (and videos)
1:15 – 2:00	Lecture 3
2:00 – 4:30	Lab experiments
4:30 – 5:00	Recap of day and conclusions

Lecture content

- Lecture 1** **60 mins** **Materials and process**
Basic definitions
Comparison with prepreg and RTM
Traditional SMC
Pressure, temperature and time
Charge creation
Tooling
Low flow/High flow
Material datasheets
- Lecture 2** **80 mins** **Mechanical and physical properties**
Microscopy and ultrasound
Density and modulus
Tension and notched strength
Damage tolerance and defect sensitivity
Compression and Flexure strengths
Modulus variability
Surface quality
Stiffeners and fastening
- Lab** **90 mins** **Hands-on experiment**
3 people cut material, weigh and prepare charge (Bonnie)
3 people mold part (Jesse)
3 people sand blast and sand (Paolo)
Make 2 more with high vs low flow
- Lecture 3** **60 mins** **Design and economics**
Suppliers
Applications to date in aerospace, automotive, recreational
Cost drivers for prepreg and RTM
Union Binding case study
Cost and rate per lb analysis