

Composite Materials (For Aerospace, Marine & Offshore Oil and Gas Industry Professionals)

Conducted by:

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Continuous carbon-fibre reinforced polymer composites are one of the modern commercial-grade composite materials that are

increasingly being used in the *aerospace, maritime and oil and gas industries* because of their inherent advantages such as high strength (and stiffness) to weight ratio, corrosion resistance and improved toughness compared to conventional materials such as steels or aluminum. When these composites are used in critical loading-bearing applications such as aircraft structures or off-shore oil-rigs and pipelines, it becomes ever more important to have a sound understanding of their response to various loading conditions and directions. This short course aims to equip you with a good understanding of commercial composite material properties, architecture, limitations and related industrial applications. While it does not aim to make you 'an ultimate guru' in the subject, it certainly strives towards providing you with a sound fundamental understanding that would put you in good stead in most, if not

all, of your challenging endeavors as industry professionals. Today it is widely accepted that knowledge of the science and technology of composite materials is vital to the cost effective design and manufacturing of innovative products, structures and components. For example, in designing a composite aircraft wing or pipeline what design-limiting features should a designer look out for? What mechanical properties should an engineer pay attention to? Could he provide a more innovative cost-effective solution to mankind in its unrelenting quest for excellence?

Course Outline

- Understanding the various types and *critical properties of composite materials* used in engineering design.
- Failure of *Adhesively-Bonded Composite Scarf-Joints* in Tension and Compression.
- Composite material properties summarized on materials selection charts.
- Understanding the *design-limiting features* of modern commercial continuous-fibre reinforced composite materials.
- Understanding *failure modes, fracture and damage propagation* of modern *unidirectional* commercial continuous-fibre reinforced composite materials subjected to both tension and compressive loading.
- Understanding failure modes, fracture and damage propagation in *multi-directional* commercial continuous-fibre reinforced composite materials subjected to both *tension and compression*.

- Compressive failure of unidirectional composites at *high-strain-rates*.
- Case-study – e.g. Optimal fibre volume fraction selection for a modulus-limited minimum-weight design.
- *In-situ testing* of composites in the presence of *stress-raisers*.

Who Should Attend?

This is a course assumes no previous background knowledge in Composite Materials. As such it can be a very useful preparatory or bridging course for entry-level industry professionals and budding researchers in the *aerospace, marine and oil and gas industries*. The course would also be useful for practicing engineers, designers, manufacturers and technical specialists with a wide spectrum of interests centered on the problems and challenges associated with composite material properties and their applications. The focus of the course would be on fundamental composite material concepts, practical design-limiting features of modern commercial continuous fibre-reinforced multi-directional composites, test-specimen design, proper testing-techniques both in compression and tension at low and high strain rates and damage characterization using optical and scanning electron microscopy.