INNOVATIVE
COMPOSITE ENGINEERING FZE

Introduction to Composite Technology

Comparison of swimming pools made from the traditional Polyester based FRP with the more advance epoxy sandwiched structures

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Introduction

Innovative Composite Engineering FZE is an advance composite manufacturing based in RAK UAE. Innovative Composite specializes in high strength & high performance composite manufacturing solution. We have extensive experience in fibre glass and Carbon fiber reinforced composites which give excellent weight to strength ratio and are thus extensively in the aerospace industry. Innovative Composite Engineering does not only have the technology to process & manufacture advance composites but also has the experience to undertake large volume projects.

Innovative Composite Engineering aims at introducing advance composite solutions in industries and business segments traditionally unaware of the potential of advance engineered composites.

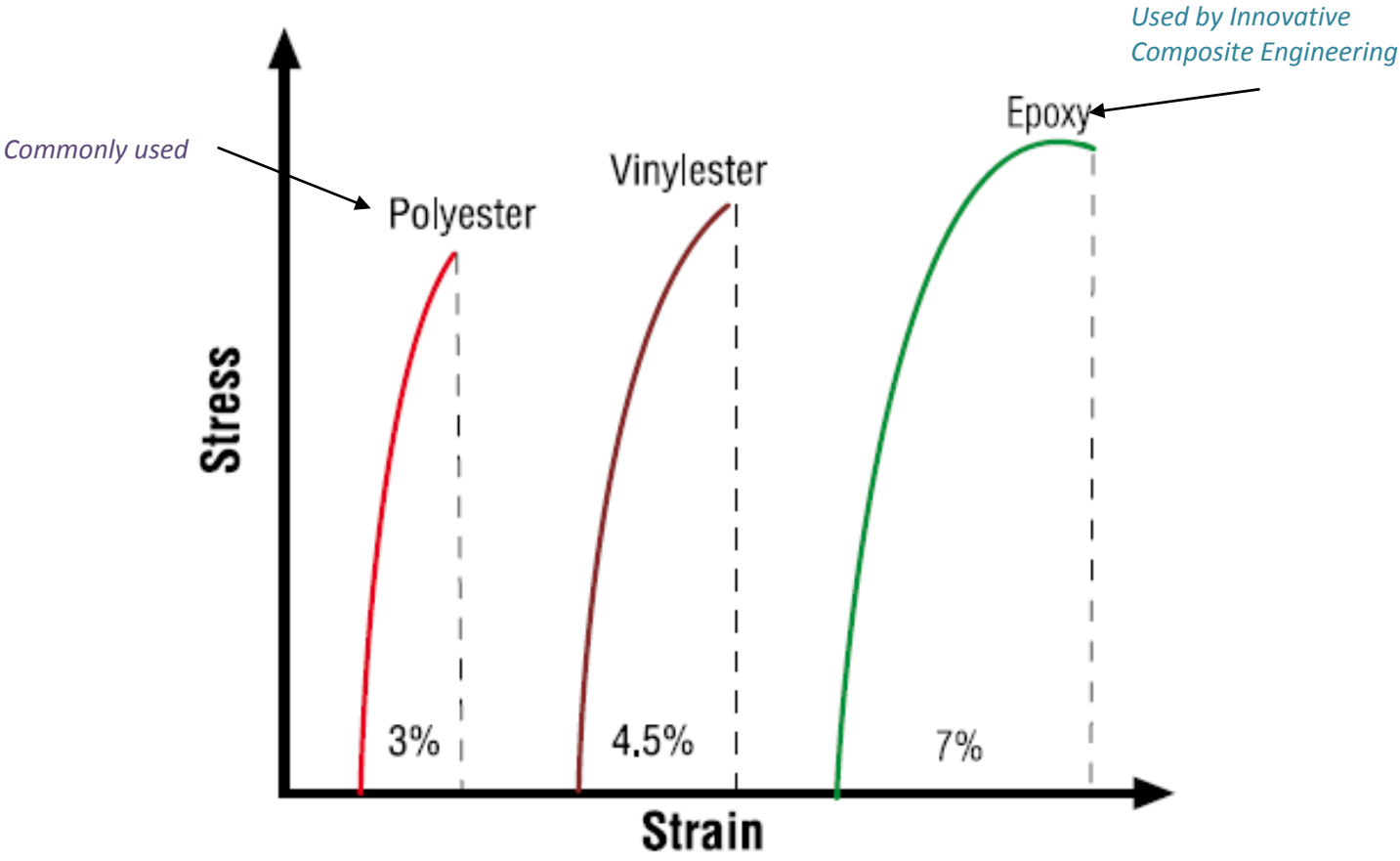
Technology

Innovative Composite Engineering excels at providing advance composites. We use high quality raw materials in order to deliver high performance products.

Raw Material

Fiber reinforced Plastic (FRP) is a generic term used to describe all composite that use plastic as their matrix (resin) and have fibers reinforcing the matrix. The fibers can be of glass or of carbon; the matrix (resin) is generally Polyester, Vinyl Ester or Epoxy. The purpose of the matrix is to distribute the load over the reinforcements evenly. This micro-mechanics give composites their high specific strength.

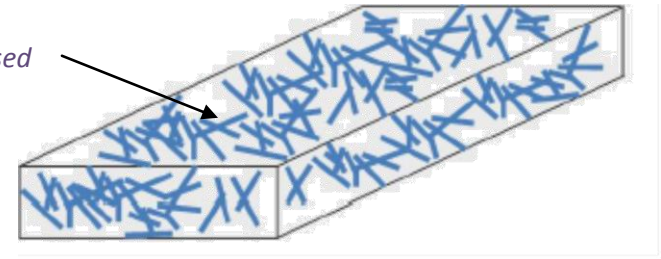
Resin: The final properties vary greatly when different resin is used. In the local market almost all supplier & manufacturers use Polyester as the resin system. Polyester is the cheapest of the resin systems but also has the lowest properties.

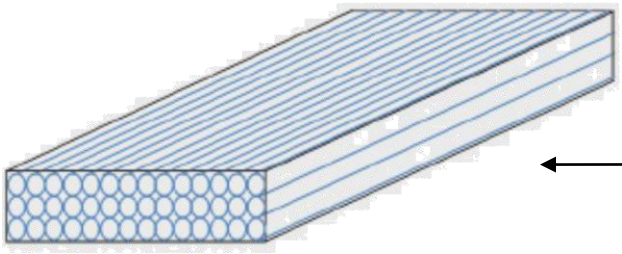


Reinforcements: Reinforcements can be glass fiber (Fiber Glass) or Carbon fiber; Fiber glass being the most commonly used. Reinforcements are the load carrying component in the composite. The orientation of the fibers is critical. The composite have the maximum strength in the direction of fiber orientation.

Commonly used polyester based FRP products used "Chopped" fiber glass. Which is strands of fiber glass randomly distributed in the matrix (resin). This system does not incorporate the forces and loads and as a result only a fraction of the total fibers are actually aligned with the load direction, meaning the load bearing capabilities are very limited. However this is a very easy & economical method to manufacture FRP.

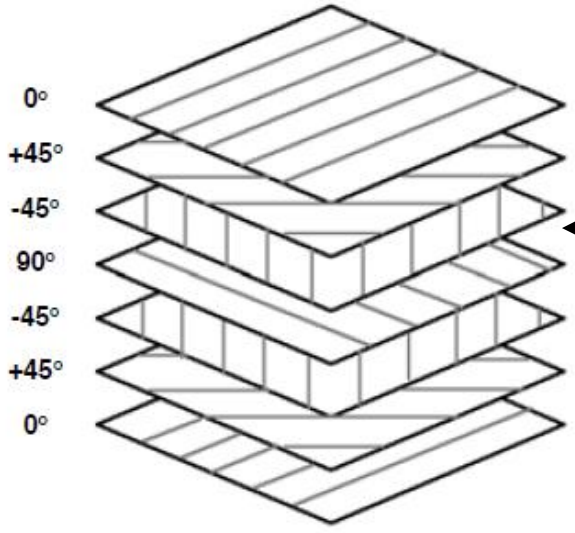
Commonly used





Used by Innovative Composite Engineering

Innovative Composite Engineering uses continues fibers, which have much superior load bearing properties. We engineer each product to know the exact loads and forces acting on the part and thus engineer the fiber orientation accordingly. This needs a complete stress analysis of the part and a much advanced manufacturing technique.

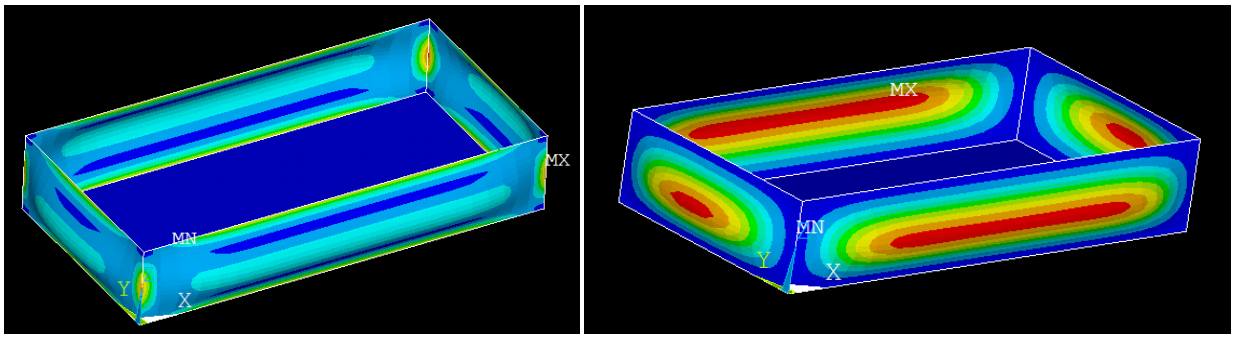


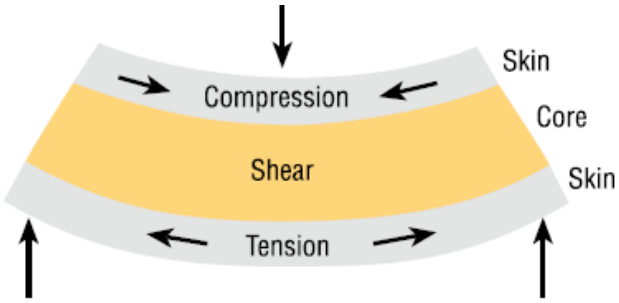
Multiple layers of multiple orientation of continuous fibers used by Innovative Composite Engineering

Starting at the top surface (0/+45/-45/90/-45/+45/0)

Structural Mechanics

Innovative Composite Engineering uses advance stress analysis & modeling in order to engineer a composite part. As per the Laminate Theory the stiffness of composite is related to the thickness of the structure. The relationship is exponential; meaning an increase of thickness of the composite from 1 unit to 2 units will mean an increase in the stiffness by 8 times. We thus use sandwiched structures to increase the thickness without having to sacrifice on weight.

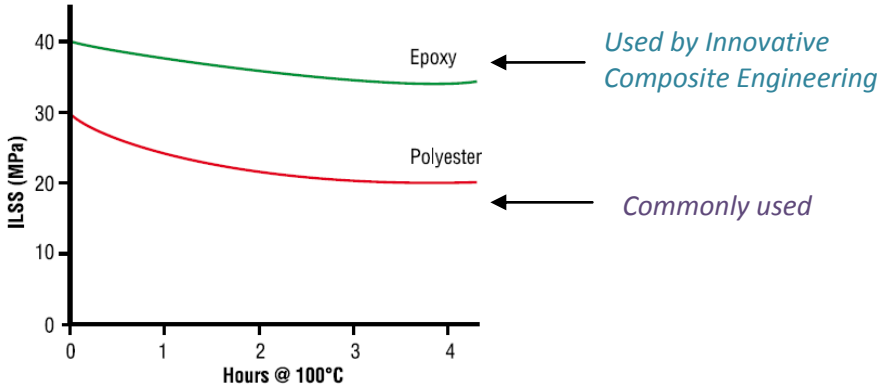




Sandwich panel loading

Water Adsorption

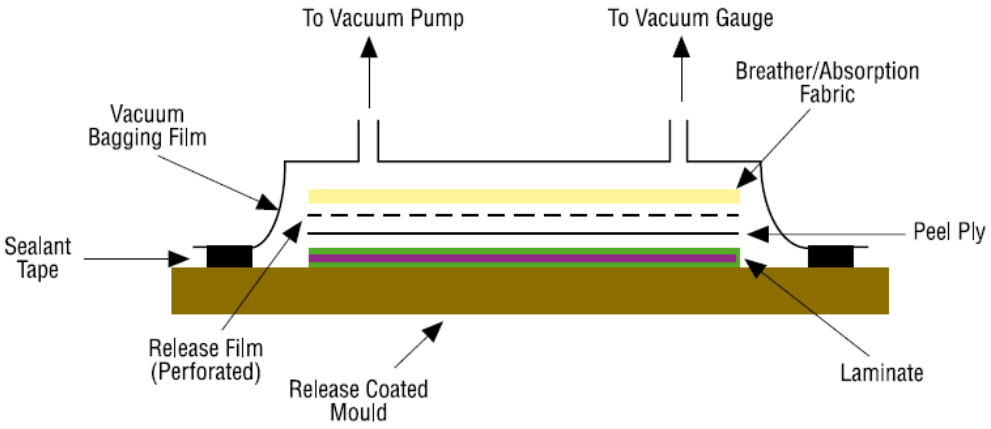
An important property of any resin is its ability to withstand degradation from water ingress. This is significant in how the absorbed water affects the resin and resin/fibre bond in a composite, leading to a gradual and long term loss in mechanical properties. Polyester resin is prone to water degradation and a thin polyester laminate can be expected to retain only 65% of its inter-laminar shear strength after immersion in water for a period of one year, whereas an epoxy laminate immersed for the same period will retain around 90%.



- Effect of Periods of Water Soak at 100°C on Resin Inter-Laminar Shear Strength

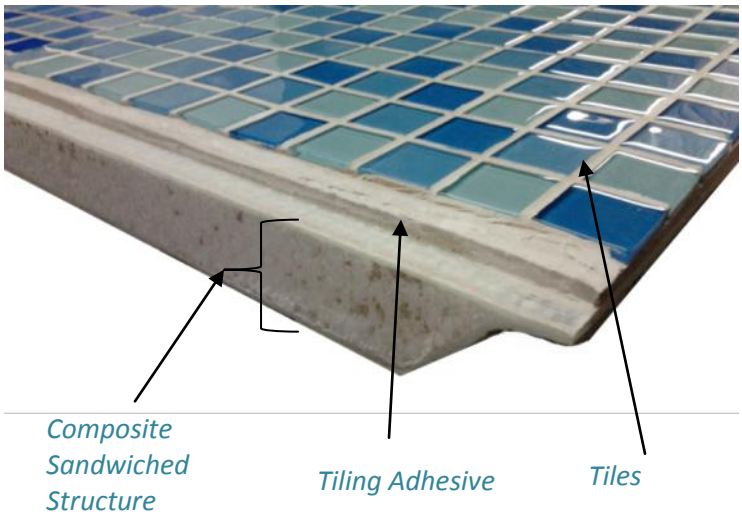
Process

The common local market practice is using Spray Lay-up process which sprays fragments of fiber glass onto the mould and eventually builds up a laminate thickness.
Innovative Composite Engineering uses a more advanced Vacuum Bagging technique. This, as illustrated below, using vacuum to not only remove air bubbles & porosity but also consolidates the layers in the structure. This process gives higher mechanical properties

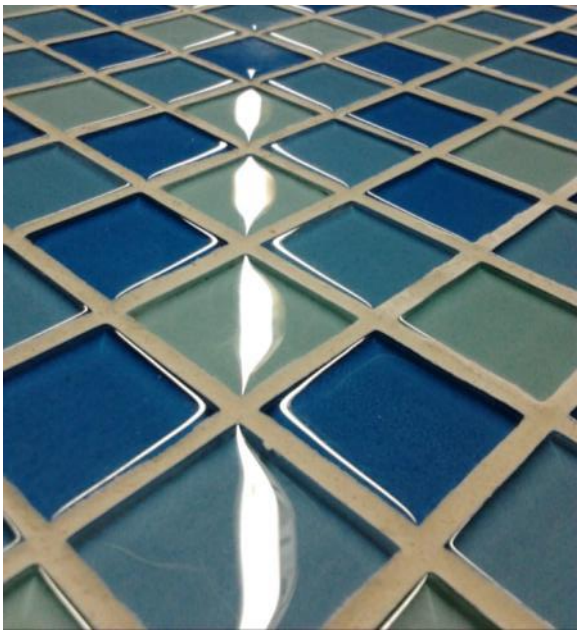


Finishing

Innovative Composite Engineering offers a wide variety of finishing on its product. We have expertise in using ceramic or glass mosaic tiles as a finishing option. We also offer our clients a very large array of finishing options including the traditional gel coat and the more modern metallic tiles.



A cross section of a tiled composite structure made by Innovative Composite Engineering



Products (Architectural)

Innovative composites serves a wide range of industries. As a part of our architectural business line we introduce the capability to produce pools, claddings, composite domes and customized structural & aesthetic architectural elements. We work with the client's designers and architects to produce totally customized products.

ICE Pools

Innovative Composite Engineering now offers ***ICE Pools***, a single piece engineered composite structure with tiled finishing. We give our clients freedom to chose from an almost unlimited array of tiling options (Colours & patterns).

Customization Options

Innovative Composite Engineering offers customization options on all of its pools. Some of options available on our standardized rectangular pool are:

Option	Availability
Shape & Shape	As per client's requirement
Tiling	Mosaic, Glass & Stone patterns
Gel Coat	All Colours & Basic patterns
Stairs & Ladders	Size, Shape & location
Lighting	Traditional Lamps & Custom designed Fiber Optics
Special Accessories	Floating bars, pool covers, special personalized elements