

COMPOSITES

UTM CENTRE FOR COMPOSITE (PUSKOM)

GFRP DRAINAGE TRASH TRAP SYSTEM

COMPOSITES

Research & Development



UTM CENTRE FOR COMPOSITE (PUSKOM)

Solar Car Project: Fully Carbon-Epoxy Composite

24 4 2002



COMPOSITES

Research and Development



Solar Bicycle: Fully Carbon-Epoxy Composite

UTM CENTRE FOR COMPOSITE (PUSKOM)

24 10 2001



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UTM CENTRE FOR COMPOSITE (PUSKOM)

Research and Development

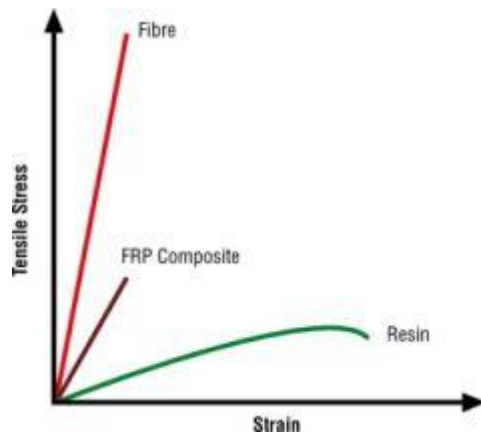


**GFRP Composite Pedestrian Bridge
Fully Bonded System
14 meter long (maximum span 7 meter)**

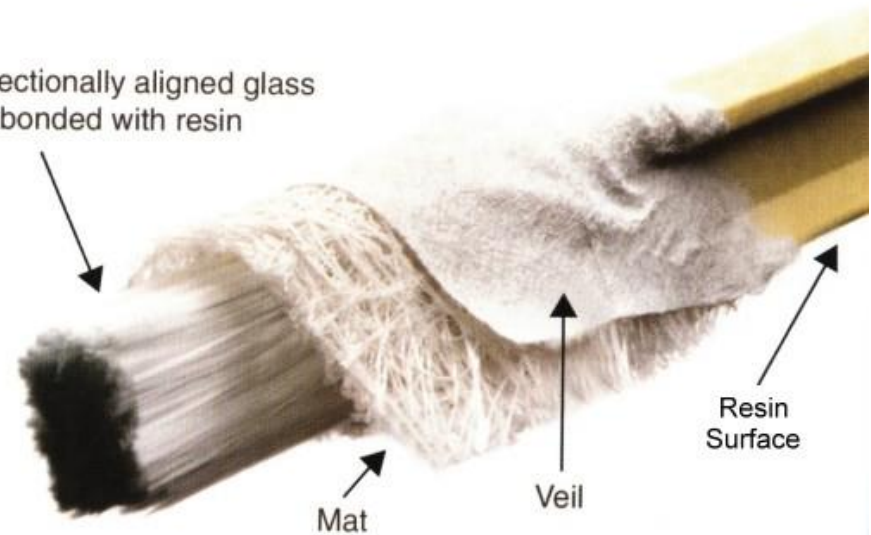
“ An advanced material technology that combine two or more materials of different properties and characteristics to produce

”

a superior material properties of those materials on their own



Unidirectionally aligned glass fibres bonded with resin





GLASS FIBER

Low cost reinforcement
for general application.
Widely used in
corrosion resistance.



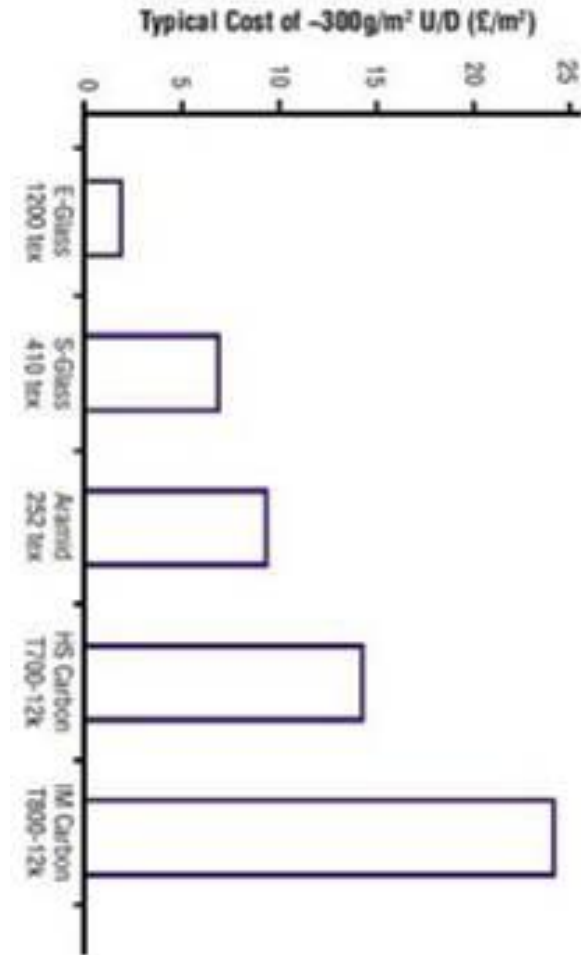
ARAMID FIBER

High end impact
absorption application
such as ballistic
protection

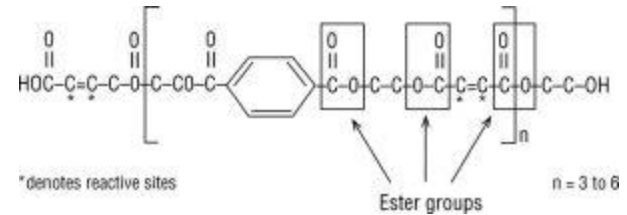


CARBON FIBER

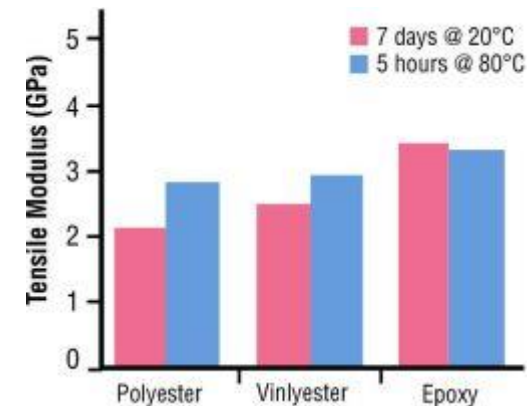
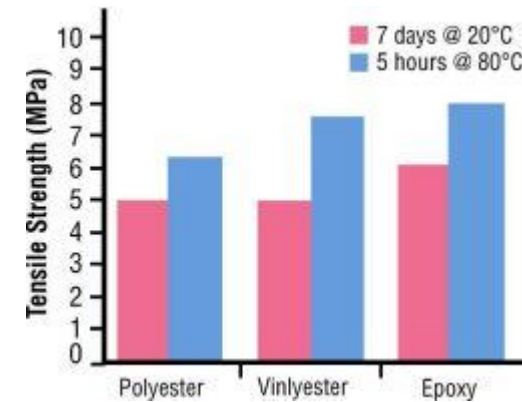
High end low weight
high strength
application such as
structural reinforcement
and aerospace parts



“ Resins is a polymer based material that bind the reinforcement i.e. fibers. ”

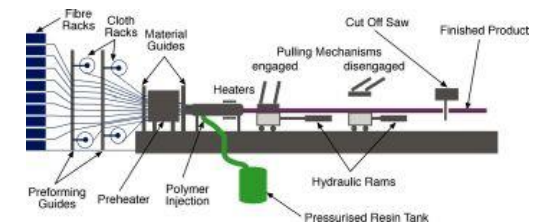
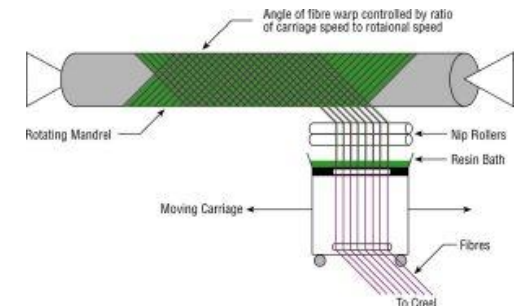
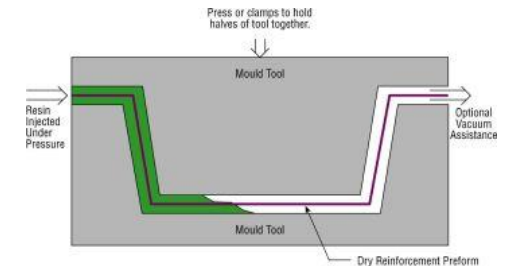
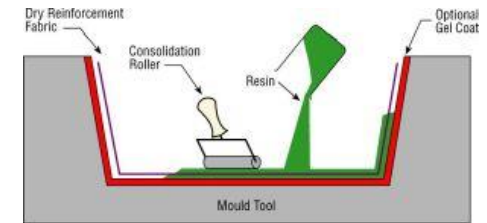


RESINS	APPLICATION
POLYESTER	General corrosion resistant application.
VINYLESTER	Heavily corrosive environment
EPOXY	High strength and fire rating performance



“ Various processing method to suit end product design and properties requirements ”

PROCESS	APPLICATION
OPEN MOLD	Economic processing method for non-structural or tolerance critical application
CLOSE MOLD	Complex 3-dimensional requirements with close tolerance
FILAMENT WINDING	Tubular high pressure rating application such as pipe.
PULTRUSION	Profile based end product





- **CORROSION RESISTANT** *Unaffected by a wide range of corrosive chemicals and environments. Minimal maintenance costs.*
- **HIGH STRENGTH, LIGHT WEIGHT** *Density of composite is 20% of steel and 60% of aluminum. Higher performance at less weight costs.*
- **MAINTENANCE FREE** *Non corrosive. No repainting cost.*
- **DIMENSIONAL STABILITY** *Stretch-, warp-, and swell-resistant over a wide range of temperatures and physical stresses. Close tolerances*
- **THERMAL INSULATION** *Low thermal conductivity rating of 1/250 of aluminum; 1/60 of steel. No condensation problems*
- **HIGH DIELECTRIC STRENGTH** *Excellent electrical insulating properties. Non conductive.*
- **DESIGN FLEXIBILITY** *Many individual components can be combined into one large profile. Reduced assembly costs.*
- **THEFT FREE** *ZERO recycle value. Help reduce theft for public facility and infrastructure i.e. signage*

COMPOSITES

TYPICAL PROPERTIES COMPARISON

PROPERTY	COMPOSITE PULTRUDED GRP/PE	CARBON STEEL (M1020)	STAINLESS STEEL (316)	ALUMINUM (6061-T61)	RIGID PVC	PONDEROSA PINE (WOOD)
Tensile Strength (ksi)	30.00 (axial) 7.00 (transverse)	60.00	80.00	45.00	6.20	0.42
Tensile Modulus (Msi)	2.60 (axial) 1.00 (transverse)	30.00	28.00	10.00	0.39	-
Flexural Strength (ksi)	30.00 (axial) 10.0 (transverse)	60.00	80.00	45.00	11.00	15.40 (axial) 9.40 (transverse)
Flexural Modulus (Msi)	2.20 (axial) 0.80 (transverse)	30.00	28.00	10.00	0.35	1.00
Izod Impact (ft-lb/in)	25.0 (axial) 4.0 (transverse)	N/A	8.5-11.0	-	1.6	-
Density (lb/in ²)	0.062-0.070	0.284	0.290	0.092	0.052	0.019
Thermal Conductivity (Btu/ft ² /hr/°F/in)	4.0	260-460	96-185	1200	1.3	0.08
Coefficient of Linear Expansion (10 ⁻⁶ in/in/°F)	4.4	6-8	9-10	13.5	37.0	

“ As a material driven industry, application of composites are not only limited to certain sectors, but limited to designers imagination and capability ”

- **AUTOMOTIVE** *Front end, fender, doors, rocker cover, tail gate, etc.*
- **MARITIME** *Boat, jetty, sheet pile, etc.*
- **INFRASTRUCTURE** *Bridges, railing, grating, pipe, façade & fascia facelift, lighting poles, signage, shed, mosque dome, etc.*
- **AEROSPACE** *Body parts component.*
- **MILITARY** *Ballistic protection, missile launcher, etc.*
- **CORROSION RESISTANT** *Water treatment infrastructure, Jetty infrastructure, offshore platform, etc..*
- **ELECTRICAL** *Feeder pillar cabinets, insulation, doors, cable management system, etc.*
- **OTHERS**





ABERFELDY, UK



The Laroin footbridge is the very first in France to use carbon-fibre composites.

LAROIN, France



WASHINGTON NATIONAL PARK, US



KOLDING, Denmark

“ KOLDING bridge is all composite apart from the nuts and bolts holding it together ”

and bolts holding it together



Steel flange beams were replaced by pultruded FRP beams, reinforced with carbon fibres in the flanges to increase stiffness to over 6 million psi, in this bridge upgrade in Blacksburg, Virginia.



Complete composite sheetpile installation, including SuperLoc™ sheetpile and composite top cap. (Picture courtesy of Creative Pultrusions.)



Navy pier structure made using pultrusion. (Picture courtesy of Owens Corning: www.owenscorning.com.)



Composite piling being used for a dock installation in Rotterdam. (Picture courtesy of Seaward International/PC Jansen Marine Agencies.)

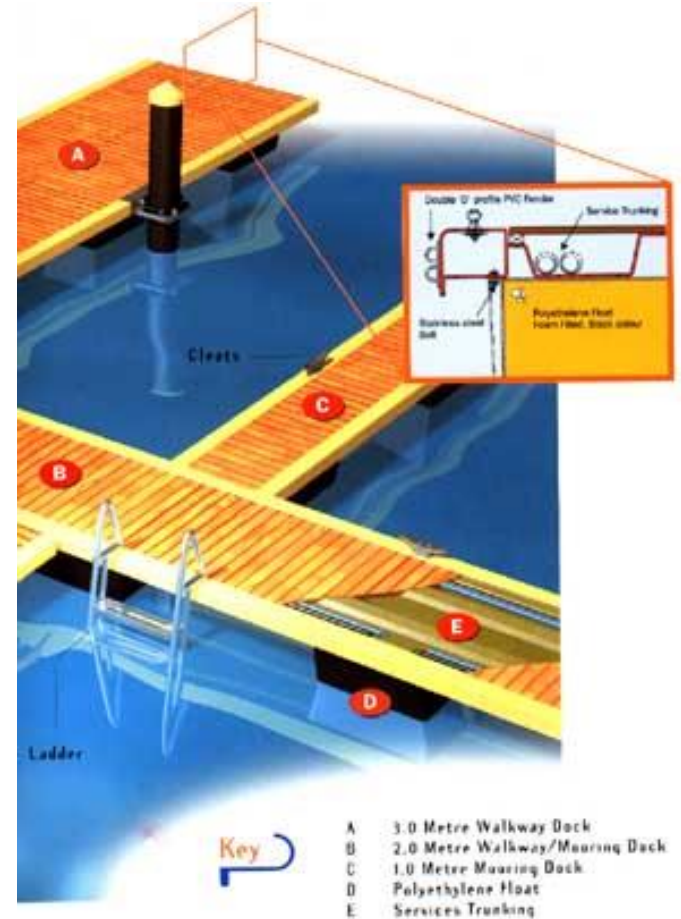
“ Excellent corrosion resistant properties put composites as the most preferred material choice

”

in marine applications



“ The Composite Dock System incorporates an intrinsically strong and stiff structural twin box composites beam platform design which takes advantage of the incomparable strength and non-corrosive nature of the material to provide the best possible performance in terms of endurance and resistance to the harsh and unforgiving marine environment. ”





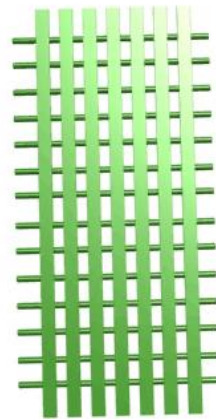
FRP light poles and GRP shading and seating at Jeddah Corniche, Saudi Arabia.



Suspended Access platform made of Pultex® standard structurals and Supergrate™ grating. (Picture courtesy of Creative Pultrusions.)

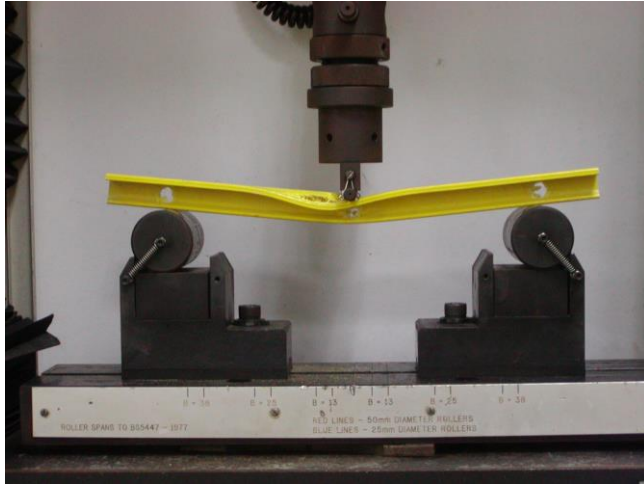
DESIGN CONCEPT

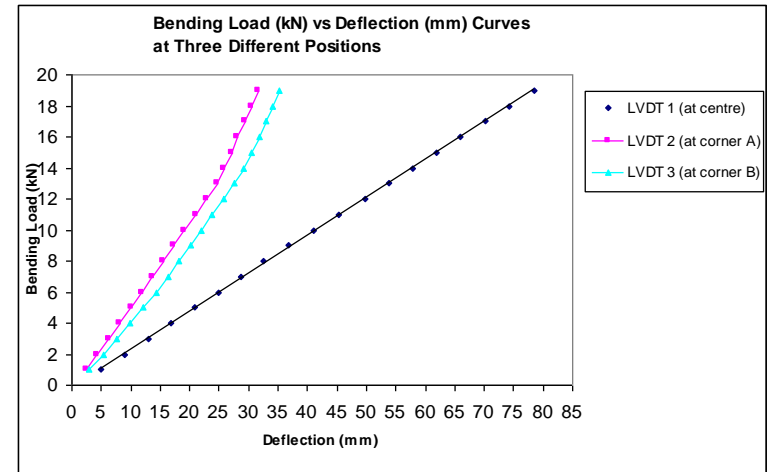
- Corrosion resistance
- Light weight
- Ease of installation
- High strength to weight ratio
- Theft free
- Design flexibility



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MATERIALS TESTING

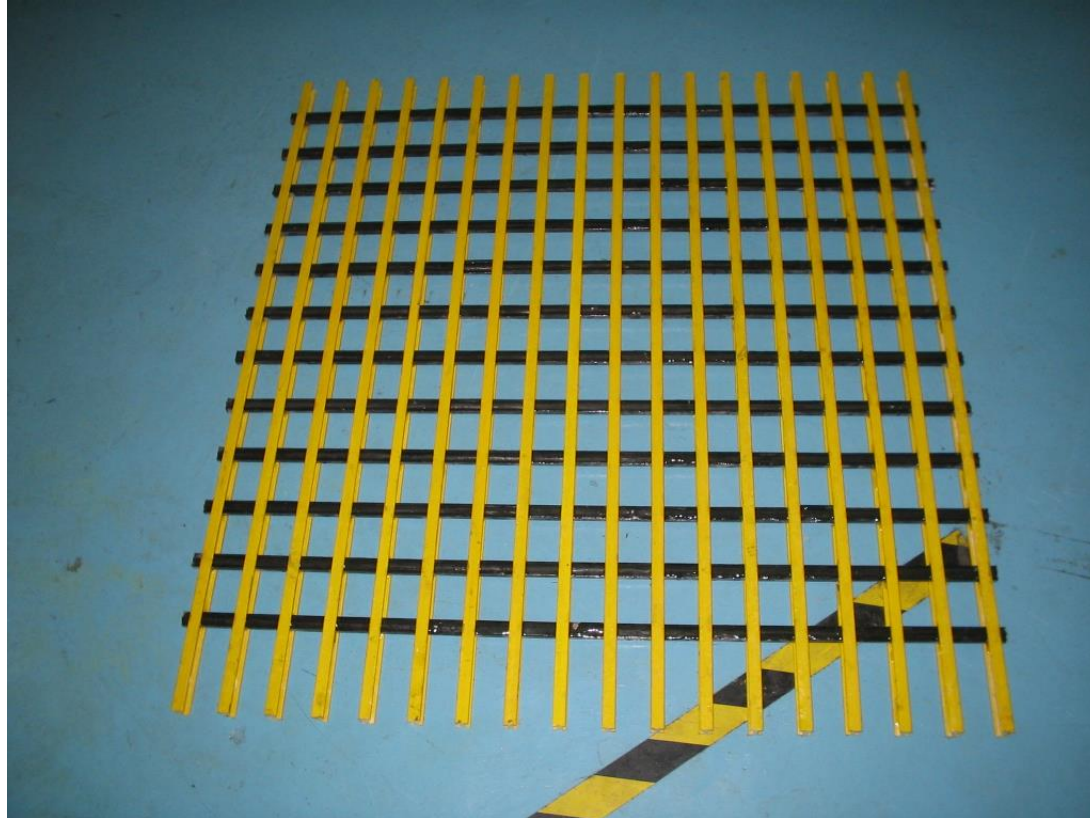




COMPOSITES

GFRP GRATING FLEXURAL PERFORMANCE VEHICLE LOAD TEST





















COMPOSITES

FABRICATION AND PERFORMANCE AT SITE (TMN UNIVERSITI)







COMPOSITES

THANK YOU VERY MUCH

for your attention