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COMPOSITE MATERIAL

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ABSTRACT

Now a day, Composite materials can be used not only for structural applications, but also in various other applications such as automobiles, aerospace, marine, etc. Because of their characteristic like strength, toughness, corrosive resistance. Fiber reinforced plastic materials are widely used in various engineering industries because of their superior performance and tailor made properties. Though FRPs are widely used in various fields, they are flammable.

Introduction In a recent years, the application of fiber reinforcement composite material has increased with increase in need of low weight, high strength, high stiffness etc. in Aerospace industry, Sporting Equipment, Civil Industry etc. In the case of fiber reinforcement plastic composite structure design, the design requirement of certain applications can be achieved not only by sizing the cross-sectional areas and thickness of components but by changing the material system design that is optimizing the material system itself such as fiber orientation angle, ply thickness, stacking sequence.

I. LITERATURE REVIEW

The evolution of composite material has replaced most of the conventional material of construction in automobile, aviation industry etc. Fiber reinforced composites have been widely successful in hundreds of applications where there was a need for high strength materials. There are thousands of custom formulations which offer FRPs a wide variety of tensile and flexural strengths. When compared with traditional materials such as metals, the combination of high strength and lower weight has made FRP an extremely popular choice for improving a product's design and performance.

II. WHAT IS COMPOSITE?

• A composite material is made by combining two or more materials – often ones that have very different properties.

• A composite material can be defined as a combination of two or more materials that results in better properties than those of the individual components used alone.

• The two materials work together to give the composite unique properties. However, within the composite you can easily tell the different materials apart as they do not dissolve or blend into each other.

III. REQUIREMENT OF COMPOSITE MATERIAL

A composite material is a complex solid material which is developed or composed by adding two or more materials on a macroscopic scale to form a different and used full material as per the requirement. The biggest advantage of modern composite materials is that they are light as well as strong. By choosing an appropriate combination of matrix and reinforcement material, a new material can be made that exactly meets the

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requirements of a particular application. Composites also provide design flexibility because many of them can be moulded into complex shapes. The downside is often the cost. Although the resulting product is more efficient, the raw materials are often expensive.

IV. CHARACTERISTICS OF COMPOSITES

Fibre reinforced composite materials offer a combination of strength and elasticity that are better than conventional metallic materials. Composites are superior because of their,

- Low specific gravities,
- High strength-weight ratios and
- High modulus-weight high internal damping
- Better vibration energy absorption within the material and results in reduced transmission of noise and vibrations

V. MAIN PURPOSE OF COMPOSITE MATERIAL

- To increase strength of the material as well as dimensional stability.
- To increase the corrosive resistance property.
- To reduces the harmful and dangerous effects on environment.
- To decrease water absorption and thermal expansion.
- To increases the mechanical damping, toughness, stiffness and design flexibility.
- To increases the high temperature resistance property of the material.

VI. PHASES OF THE COMPOSITES

A composite material consists of two phases:

• Primary

- Forms the matrix within which the secondary phase is imbedded
- Any of three basic material types: polymers, metals, or ceramics.

• Secondary

- Referred to as the imbedded phase or called the reinforcing Serves to strengthen the composite (fibers, particles, etc.)
- Can be one of the three basic materials or an element such as carbon or boron.

Classification of composites

Matrix type	Fiber	Matrix
Polymer	E-Glass S-Glass Carbon(Graphite) Aramid(Kevlar)	Epoxy Polyimide Polyester Thermoplastics

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	Boron	(PEEK Polysulfide)
Metal	Boron Borsic Carbon(Graphite) Silicon carbide Alumina	Aluminum Magnesium Titanium Copper
Ceramics	Silicon carbide Alumina Silicon nitride	Silicon carbide Alumina Glass-ceramic Silicon nitride
Carbon	Carbon	Carbon

VII. MANUFACTURING OF COMPOSITE MATERIAL

There are a mainly two different processes for manufacturing.

1. Direct

a) Wet lay-up

b) Pultrusion

c) Filament winding

d) Resins transfer molding

2. Indirect

a) Hand lay-up

b) Compression molding

c) Filament winding

Applications

1) Mechanical Engineering

- Gears, high-speed rotating machines.
- Bearings and shafts
- Pressure vessels
- Components and structures for fast surface transport, example cars, bikes, buses, Jeep, railways etc.

2) Sports Equipment

- Badminton, tennis, & cricket bats
- Canoes, Oars, Skis, Yacht masts
- Fishing rods
- Racing car bodies etc.

3) Marine Engineering

- Ships propeller,
- Hovercraft
- Sailing-boat masts, Hydrospace etc.

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4) Aerospace Industry

- Passenger planes , Jets
- Missiles, propellers of the aircraft etc.

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