Analysis and Development of Fiber Laminated Composite Beam

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Abstract:- High strength to weight ratio, directional strength and stiffness are the significant factors, forcing laminated composites into the aerospace, marine, and automotive industries. Due to these major factors fuel efficiency and crashworthiness Properties are the significant out comes from the use of these advanced polymer laminated composites. The purpose of this work is to analyze the flexural behavior and progressive failure of laminated composites subjected to a bending load. Only the mechanical properties of constituent Fiber and matrix materials under the bending load condition. All these data can be measured independently before composite fabrication. Hence, in this work, it is proposed to carry out a detailed experimental work to investigate the flexural and shear properties of high performance lightweight laminated composites.

Keywords: *directional strength, stiffness, Advance polymer laminate, flexural properties.*

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1. Introduction

Composite materials are one of the most favoured solutions to this problem in the field. By combining the stronger properties of traditional materials and composite materials technology is providing compromising solutions and alternatives to many engineering fields. Problems born from material limitations like heavy weight, structural strength, and thermal resistance are being solved by the composite material alternatives, and many more alternatives are being introduced to readily used engineering applications. Composite materials, with their high strength/weight ratio are becoming popular with their increasing availability due to advancement in their manufacturing processes

Glass fibers with polymeric matrices have been widely used in various commercial products such as piping, tanks, boats and sporting goods. Glass is by far the most widely used fiber, because of the combination of low cost, corrosion resistance, and in many cases efficient manufacturing potential. It has relatively low stiffness, high elongation, and moderate strength and weight, and generally lower cost relative to other composites. Glass fibers are also available in woven form, such as woven roving and woving cloth. Woven roving is coarse, droppable fabric in which continuous roving are woven in two mutually perpendicular directions.

2. Problem Definition

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3. METHODOLOGY

1. An interface is created using GUI in MATLAB to compute the deflection and stresses of the composite.

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2. Using ANSYS and HELIUS the overall material properties are computed and tried to validate with classical theory.

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3. Using these equivalent properties of the composite the natural frequency computations are done.

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4. Testing the composite beam with universal testing machine or vibration shaker

5. E-Glass

- Fibres glass (or fibreglass) is a type of fibre-reinforced plastic where the reinforcement fibre is specifically glass fibre
- E-glass is made of alumina-borosilicate
- The glass fibres are made of various types of glass depending upon the fibreglass use. These glasses all contain silica or silicate, with varying amounts of oxides of calcium, magnesium, and sometimes boron. To be used in fibre glass, glass fibbers have to be made with very low levels of defects

Fig-1 E-Glass Fibre

3.1.1 PROPERTIES

Ex	4.493E04
Ey	1.404E04
Ez	1.404E04
Gxy	5.263E03
Gyz	5.100E03
Gxz	5.263E03
Nu(xy)	2.480E-01
Nu(yz)	3.775E-01
Nu(xz)	2.480E-01
Density	2.081E-03

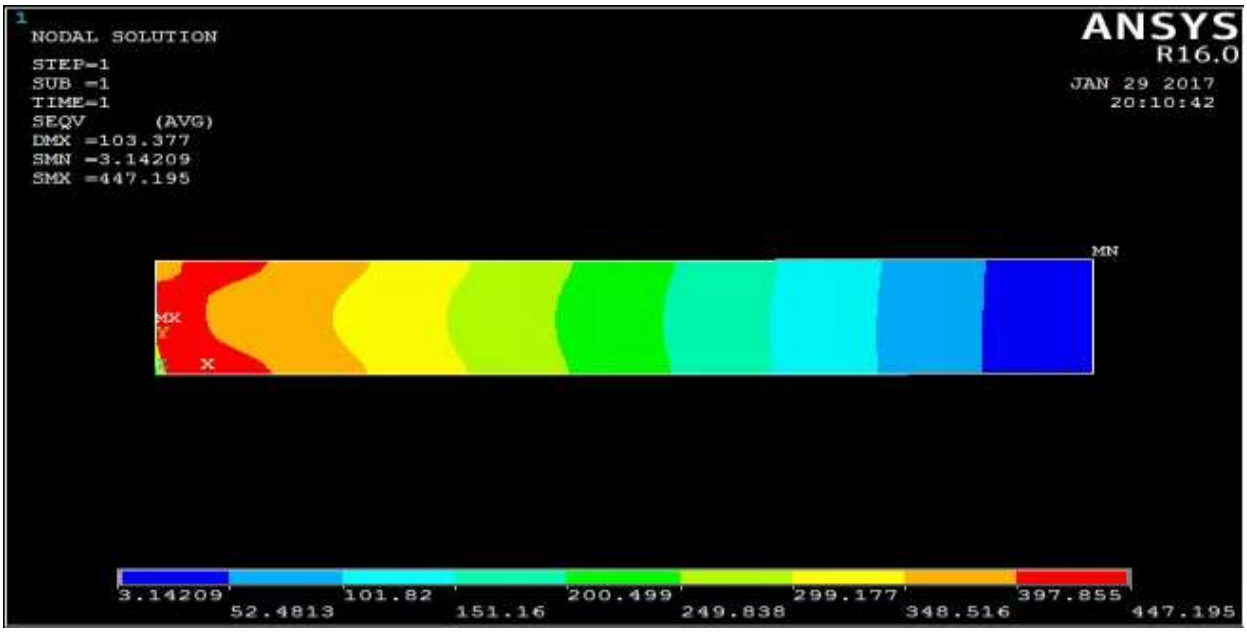
3.2. Analytical solution using ansys

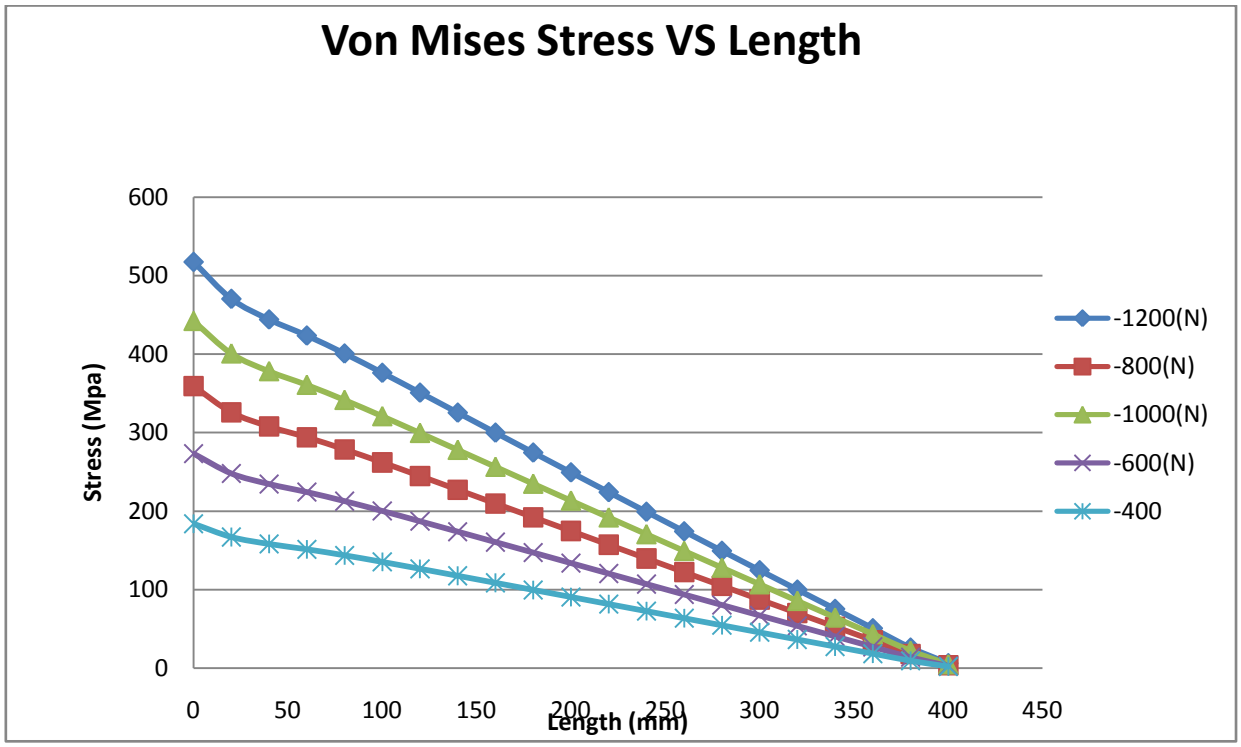
3.2.1 Angle orientation

Set 1	Set 2	Set 3	Set 4	Set 5
0	0	0	0	0
0	0	45	0	45
0	45	90	0	90
45	45	-45	45	-45
90	90	0	90	0
-45	-45	0	-45	0
0	0	0	-45	0
0	0	45	0	45
45	0	0	0	0
90	45	45	0	45
-45	90	90	45	0
0	-45	-45	90	0
0	0	0	-45	0
0	0	45	0	45
45	45	45	45	45

3.2.2 Validation

Set 1





By solving on ansys we come to an conclusion that set 1 is the optimum set carrying less stress and distribution among all set so E-Glass with angle orientation of set 3 can be used for future material purpose

4. CONCLUSION

Thus this prototype proves that this angle orientation for e-glass epoxy can be used for reduction in weight of material for future use

ACKNOWLEDGEMENT

We are thankful to the Department of Mechanical Engineering (Smt. Kashibai Navale College of Engineering Pune) and. for their support.

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