Summer Internship Report

on

Mechanics of Composites

Introduction

I, Shubhendra Shivam Maurya (Student, Mechanical Engineering, UNSIET VBSPU, Jaunpur) worked as an intern (from 1st June to 30th June 2019) under the supervision of Dr. Gangadharan R (Associate Professor, IITH). During my internship period, I learned about the composite materials, Fabrication of composite, Mechanics of composite, Finite element analysis, Ultrasonic testing, etc.

Composite material

"A composite material is the structural material that consists of two or more constituent which are combined at the macroscopic level to form a useful third material." Composite materials are ideal for structural applications where strength-to-weight and stiffness to weight ratio are required. Some of the properties that can be improved by forming of composite material are – strength, stiffness, corrosion resistance, wear resistance, attractiveness, weight, fatigue life, thermal conductivity, thermal insulation, temperature dependent behavior, acoustical insulation. The composite materials are used in automobile, aerospace, wind energy, etc.

Mechanics of composite

Mechanics of composite deals with the study of mechanical properties and behavior of composite.

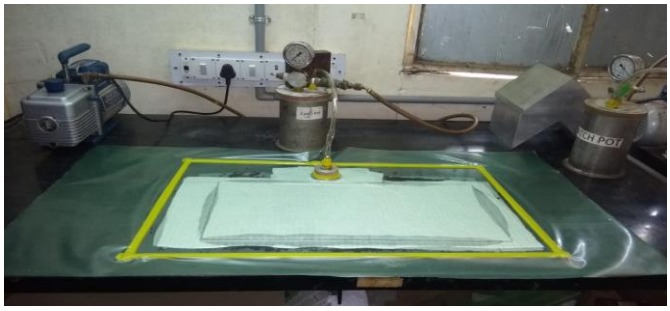
Mechanical behavior of composites

Micromechanics is the study of composite material behavior where in the interaction of the constituent materials examined on a microscopic scale to determine their effect on the properties of the Composite material. **Macromechanics** is the study of the Composite material behavior where in the material is presumed homogeneous and effects of constituent material are detected only as average apparent properties of the composite material.

Fabrication of composite

There are many fabrication processes but we used vacuum bag vacuum bag molding wet forming process, by using this process we made Composite material of dry fiber and carbon pre-preg. For dry fiber composites manufacturing first of all, we take a glass mold plate and make it clean by using liquid (acetone) and after that, we use releasing agent on the mold so that the final product can be easily removed and to ensure a good finish we also use a gel coating. After that we take the required amount of dry fiber in proper dimensions, breather ply,

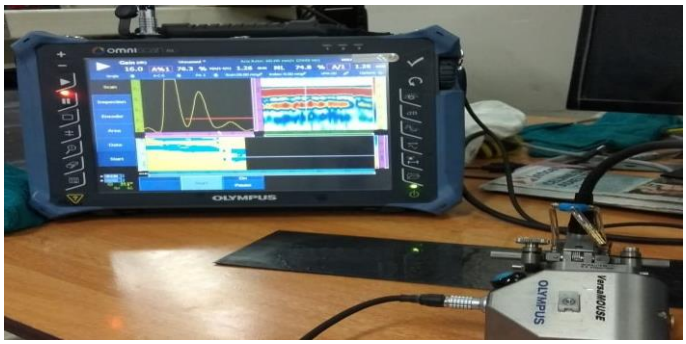
peel-ply, nylon-polythene Io Vacuum pump and other equipment for making it. We place the resin (epoxy+hardener) on the mold properly and then placed a single layer of dry fiber and again place the resin on the dry fiber and use roller to roll on it and we use roller to remove air present in between the fiber and we repeat the process until we get the required thickness of composite and then we use the peel ply and breather ply. Breather ply is used to absorb the extra resin. After this we use nylon polythene for producing vacuum after this we placed this for curing



The same process is used for making the composites of carbon prepreg. Here we do not use the resin because the resin is already present in this. For fabrication of thick composite plate, we use debulking process. The debulking process basically, we produced Vacuum in the intermediate step of fabrication. It is used because when we need a thick composite plate then during the process there may be some air left between the layers so to reduce we use this process.

Ultrasonic testing

In ultrasonic testing, the main components are probe/transducer, display screen. Here we use a normal probe of 5MHz for testing. The transducer generates high-frequency ultrasonic energy. The sound energy is introduced and propagates through the material in the form of waves. When there is discontinuity (such as a crack) in the wave path, part of the energy will be reflected back from the surface. The reflected wave signal is transformed into an electrical signal transducer and is displayed on a screen.



At last, first and foremost I would like to express my deepest gratitude towards my summer internship supervisor Gangadharan R Associate Prof. IITH for his constant guidance, valuable time and encouragement throughout my internship work. A grateful acknowledgment also goes to TEQIP-III for giving this great opportunity. It has been a great learning opportunity for me.