

Modelling and stress Analysis of Impact Attenuator for vehicles protection

P.KARTHIK (m.tech) mech dept mallareddy engineering college (autonomous) maisammaguda, dhulapally, kompally, medchal, hydrabad.

A. SRAVAN BHAVAN asst professor mech dept mallareddy engineering college (autonomous) maisammaguda, dhulapally, kompally, medchal, hydrabad.

Abstract:

In rapid race auto having An effect attenuator, otherwise called a crash pad, crash attenuator, or cattle rustler pad, is a gadget planned to diminish the harm to structures, vehicles, and drivers coming about because of an engine vehicle impact or sudden happen mishaps. So In this venture Impact attenuators are planned with honeycomb structure to assimilate the impacting vehicle's active vitality or sudden acted powers. Honeycomb Impact attenuator is a deformable, vitality retaining structure situated at the front of the vehicle whose sole design is to assimilate the motor vitality of the rapid race auto and breaking point the deceleration following up on the human body. Likewise examines the sudden crash examination of the outlined attenuator honeycomb structure with a specific end goal to decide the wellbeing of the plan. The plan with the assistance of the PC supported programming catia. Dynamic and auxiliary investigation and anxiety, von misses pressure,

proportional pressure, add up to disfigurement is anlyse with the assistance of ansys .while

Starting prerequisites of utilized materials are taken propelled carbon fiber strengthened plastic materials after consummation of the examination correlation the current material and new materials of honeycomb structure.

Keywords : Design, Impact attenuator, dynamic basic examination, Honeycomb structure, catia v5, ansys.

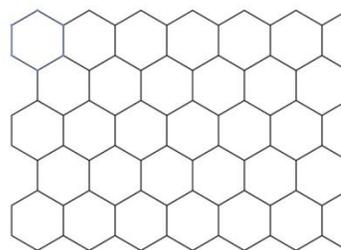
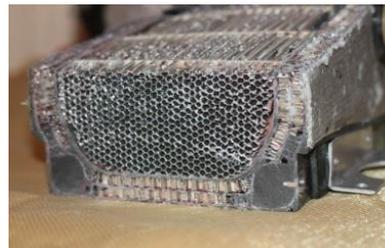


Fig1: honeycomb structure

1. INTRODUCTION:-

The most vital piece of the aeronautical structures, the helicopter primary rotor cutting edge, can utilize solely composite materials. The most incessant arrangement is that of the sandwich structure with a center made of a light material, in which the outer surfaces have high quality breaking point. A champion among the most oftentimes utilized structures for the center is the honeycomb structure. Consequently, this paper introduce the uses of the limited component strategy for the assurance of the versatile attributes of the sandwich structure made of Dural sheets and honeycomb center. In figure 1, a honeycomb center is displayed, the materials utilized being aluminum, paper or carbon fiber, contingent upon the weights to which the sandwich structure is subjected.

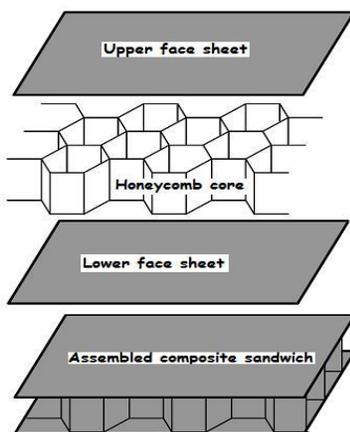


Fig 2: sandwich structure

Honeycomb structures are common or man-made structures that have the geometry of a honeycomb to allow the minimization of the measure of utilized material to achieve negligible weight and insignificant material cost. The geometry of honeycomb structures can fluctuate generally yet the normal element of every such structure is a variety of empty cells shaped between thin vertical dividers. The cells are frequently columnar and hexagonal fit as a fiddle. The standard hexagonal honeycomb is the essential and most regular cell honeycomb arrangement.

1.2 Geometric types of honeycomb structures:

In geometry, a honeycomb is a space filling or close squeezing of polyhedral or higher-dimensional cells, so that there are no openings. The honeycomb sandwich advancement is a champion among the most esteemed basic designing advancements created by the composites business. Utilized broadly in aviation and numerous different enterprises, the honeycomb sandwich gives the accompanying key advantages over customary materials: -

- Very low weight
- High stiffness
- Durability
- Production cost savings

Today, the produce of honeycomb centers includes the utilization of the development and

crease forms where composite materials, for example, fiberglass, aluminum, and carbon fiber fortified plastic are utilized. To produce thermoplastic honeycomb centers, the crude material utilized is polypropylene and the strategy utilized is expulsion.

1.3 The key benefits of using honeycomb composites are given below:

- Exceptional quality to weight proportion
- Corrosion obstruction
- High sturdiness
- Fire and growth safe
- High temperature execution
- Does not ingest dampness
- Easily machinable and formable

2. LITERATURE REVIEW:

The structures that normally have the geometry of honeycomb shape are known as honeycomb structures. The base measure of materials is utilized in honeycomb materials. Thusly, the cost of crude materials in honeycomb materials is low however the assembling procedure highly affects the cost of these materials. Diverse kinds of materials, for example, paper, aluminum, steel, composite materials and plastic can be utilized in creation of

honeycomb materials. Aluminum honeycomb, polypropylene honeycomb and paper honeycomb are three cases of honeycomb materials.



(a) Aluminum honeycomb (b) paper honeycomb (c) polypropylene honeycomb

Fig 3: honeycomb materials

- Paper honeycomb for auxiliary building boards was assessed by Seidl, Kuenzi and Fahey. They researched the impact of the rot, sharpness,, alkalinity and maturing on the shear and compressive quality of paper centers. The weight percent of the phenolic pitch, urea, and sodium silicate glues were shifted trying to decide ideal extents of base material (Kraft paper) and glue for center assembling
- Joel Galos at el have examined in look into subject that in street haulage the vacant weight of a vehicle is a noteworthy supporter of fuel utilization and coming about CO2 discharges. The use of lightweight materials in configuration is one road that should be investigated in diminishing the carbon impression of street cargo vehicles
- Kuenzi proceeded to examine how a progression of tests were directed to evaluate the auxiliary capacity of titanium combination

sandwich development having the facings and the honeycomb center reinforced by dispersion. Results in flatwise strain and pressure, edgewise pressure and shear tests were exhibited.

3.1 DESIGN:

CATIA offers a solution to shape design, styling, surfacing workflow and visualization to create, modify, and validate complex innovative shapes from industrial design to Class-A surfacing with the ICEM surfacing technologies. CATIA supports multiple stages of product design whether started from scratch or from 2D sketches. CATIA is able to read and produce STEP format files for reverse engineering and surface reuse

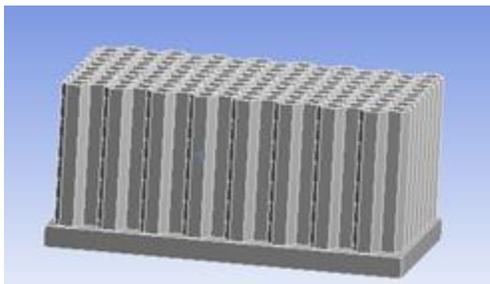


Fig 4: final model of honeycomb

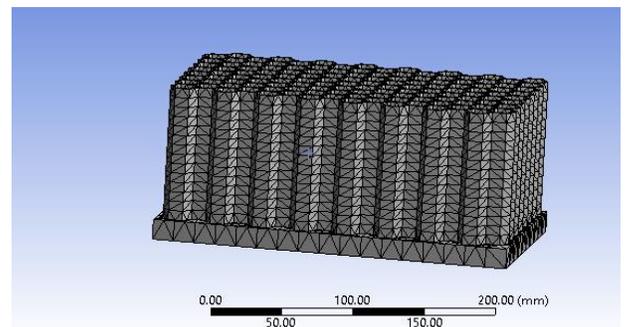
4 Ansys:

ANSYS is general-purpose finite element analysis software, which enables engineers to perform the following tasks:

1. Build computer models or transfer CAD model of structures, products, components or systems
2. Apply operating loads or other design performance conditions.
3. Study the physical responses such as stress levels, temperatures distributions or the impact of electromagnetic fields.
4. Optimize a design early in the development process to reduce production costs.
5. A typical ANSYS analysis has three distinct steps.
6. Pre Processor (Build the Model).

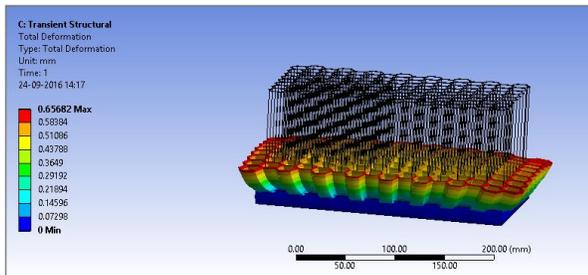
4.1 Results:

Mesh:



Alluminum ally:

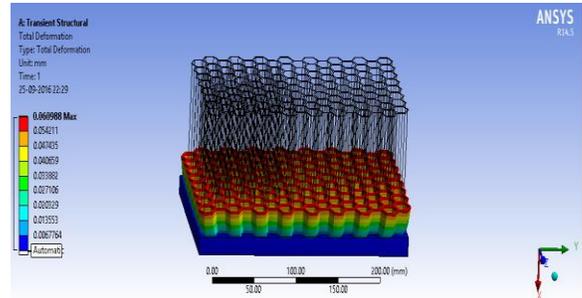
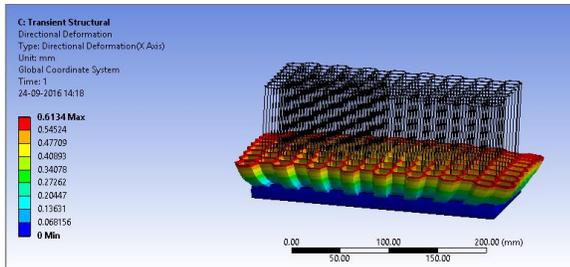
Total deformation



Carbon fiber composite materials:

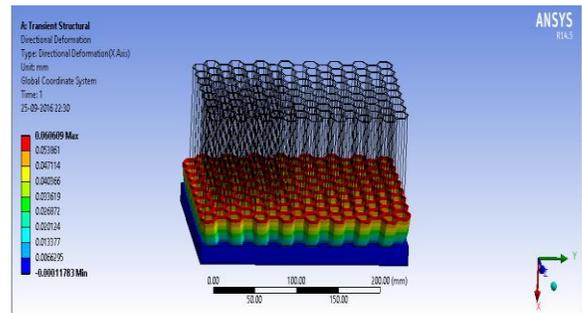
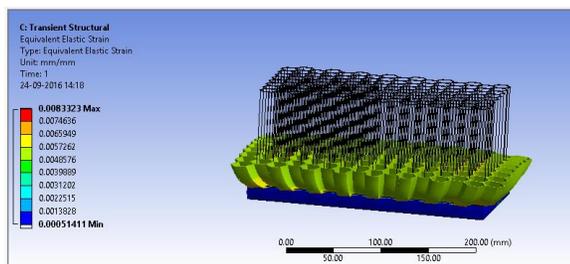
Total deformation:

Directional deformation:



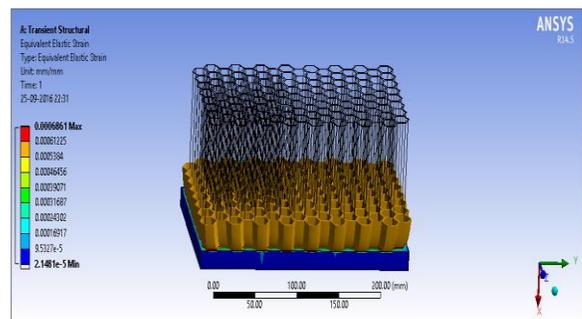
Directional deformation:

Equivalent elastic strain:



Equivalent elastic strain:

	minimum	maximum
Total deformation	0. mm	0.65682 mm
Directional deformation	0. mm	0.6134 mm
Equivalent elastic strain	5.1411e-004 mm/mm	8.3323e-003 mm/mm



	minimum	maximum
Total		6.0988e-002

deformation	0. mm	mm
Directional deformation	-1.1783e-004 mm	6.0609e-002 mm
Equivalent elastic strain	2.1481e-005 mm/mm	6.861e-004 mm/mm

Conclusion:

From the above results are obtained from ansys software, And design is done using catia v5 software. With the help of the ansys software change the materials and find the deferent stress effecting on honeycomb stricture with applying deferent loads, from above results observing

- Comparing with existing material aluminum alloy the Carbone fibber materials are good deformation value 6.0988e-002 mm
- Von misses stress are withstand limit is more in carbon fiber material and shear stress are more comparing aluminum alloy

Future Scope

Different other composite materials can be used for analysis and for Different thickness i.e. for Symmetric condition of the honeycomb stricture can be analysed for further investigation. For

further investigation, the honeycomb stricture can be analysed with transient analysis. It is possible to do the regression analysis for same work. For the same geometry honeycomb stricture transient analysis to find the effecting stress of honeycomb stricture is possible.

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