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Finite Element Modeling of Different Composite (Hybrid) Beam

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***Abstract*: In this modelling, design phenomena of hybrid beams is a crucial factor. By designing we have analyses different stress concentration and the many other deflection of beam under different loads. In the recent past, some good works appeared in various journals and conferences proceeding on designing analysis of beams. In this project we do designing analysis of hybrid beam and stress concentration with different boundary condition**

Keyword: **PIEZOELECTRIC MATERIAL; HYBRID BEAM; ABAQUS ELEMENTAL ANALYSIS,**

I. INTRODUCTION

A Hybrid beam is a construction element typically consisting of a reinforced concreted slab attached to and supported by profiled steel beams. Hybrid beams are stronger than the sum of their constituent parts and exhibit a favorable combination of the strength characteristics of both materials. This means a steel and concrete Hybrid beam will possess both the compressive strength of steel. There are several other types of Hybrid beams used in the construction industry which combine various grades of material and their alloys. The steel and reinforced concrete Hybrid beam is, however, the most commonly used. Joining two dissimilar materials to form a Hybrid does not only combine the collective strengths of the two materials. Forming a union between relevant materials actually enhances their physical characteristics and makes the Hybrid stronger than the sum of their strengths. In large scale construction, steel and concrete are most frequently used combinations times. But we use modern hybrid beams without steel and contains only the metal and their alloys. Here we are using the hybrid beam having composition (al-cu-al)& (al-cu-qz-cu-al).

LITERATURE SURVEY

A review of the recent development of the finite element analysis for laminated composite plates from 1990 till date is presented by Zhang and Yang. The literature review is devoted to the recently developed finite element models based on the various laminated plate theories for the free vibration and dynamics, buckling and post buckling analysis, the geometric nonlinearity large deformation analysis, failure and damage analysis of composite laminated plates are also presented.Song and Waas (1987) presented a higher order theory for the buckling and vibration analysis of composite beams and the accuracy of HSDT was demonstrated compared to 1-D Euler-Bernoulli, 2-D classical elasticity theory and Timoshenko beam theory.

Chandrashekhra and Bhatia (1993) presented a finite element model for active buckling control of composite plates, with surface bonded or embedded,continuous or segmented, piezoelectric sensors and actuators. Khdeir and Reddy (1994) developed analytical solutions for free vibration and buckling of cross-ply composite beams with arbitrary boundary conditions in conjunction with the state space approach. Wang (1995) and Wang and Quek (1995) have presented coupled 1D classical beam theory for buckling and further analysis of a column with a pair of piezoelectric layers partially or fully covering it. Finite difference method is used for solution and it is shown that with proper placement of

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the actuators, the buckling load for the statically actuated beams can be significantly increased.Thompson and Loughlan (1998) demonstrated experimentally that the buckling capacity of a column is increased by applying controlled voltage to the piezoelectric actuators.

WHY HYBRID?

Hybrids are formed by combining materials together to form an overall structure that is better than the individual components having uniform composition throughout its surface.

The biggest advantage of modern Hybrid materials is that they are light in weight as well as strong. By choosing an appropriate combination of matrix and reinforcement material, a new material can be made that exactly meets the requirements of a particular application. Hybrids also provide design flexibility because many of them can be molded into complex shapes. The downside is often the cost. Although the resulting product is more efficient, the raw materials are often expensive.

APPLICATIONS

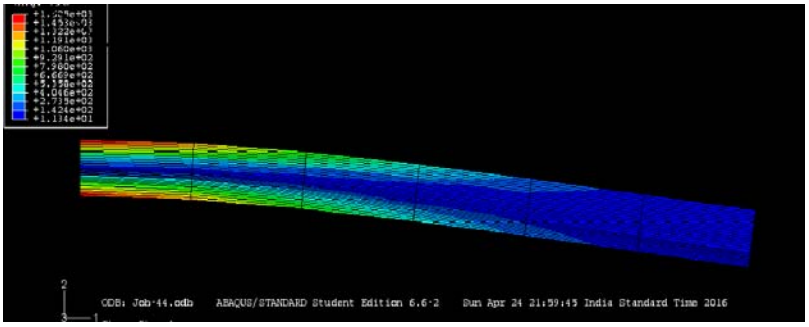
Hybrid materials are generally used for Rail Bridge, wings of planes, buildings, bridges and structures such as boat hulls, swimming pool panels, race car bodies, shower stalls, bathtubs, and storage tanks, imitation granite and cultured marble sinks and counter tops. The most advanced examples perform routinely on spacecraft in demanding environments.

ABOUT ABAQUS

ABAQUS FEA (formerly ABAQUS) is a software suite for finite element analysis and computer-aided engineering, originally released in 1978. The name and logo of this software are based on the abacus calculation tool.Abaqus/CAE is capable of pre-processing, post-processing, and monitoring the processing stage of the solver; however, the first stage can also be done by other compatible CAD software, or even a text editor. Abaqus/Standard, Abaqus/Explicit or Abaqus/CFD are capable of accomplishing the processing stage. Dassault Systems also produces *Abaqus for CATIA* for adding advanced processing and post processing stages to a pre-processor like CATIA.

RESULTS

ALUMINIUM
COPPER
ALUMINIUM



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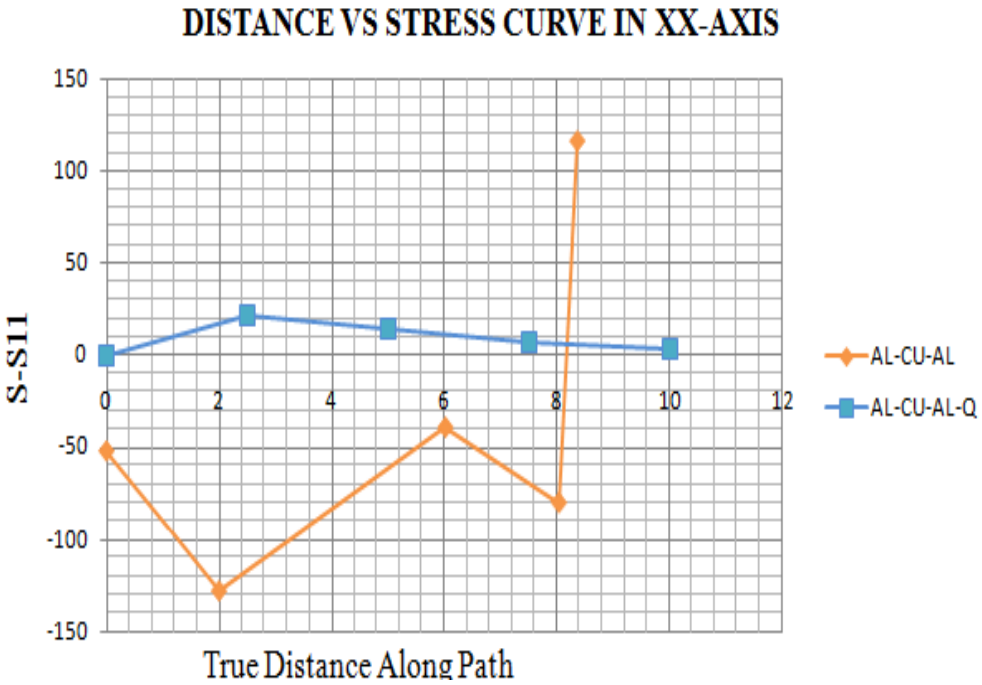
X	S11(σ_{xx})	XQz	S11Qz(σ_{xx})
0	-52.0824	0	0.034802
1.99831	-128.472	2.50165	21.1664
6.0153	-39.0659	5.00286	14.0695
8.02829	-80.2223	7.50355	7.06794
8.35548	116.103	10.0038	3.68335



CONCLUSION

In this project we have analyzed in the hybrid beam stress concentration at various distance. So we finally comes out with various data showing the beam behavior under different loading and boundary conditions. After this analysis we are able to do stress analysis of any beam with different loading conditions.

In this project we applied different boundary conditions on beams and we get different stress value at different node. We get different stress intensity at different node by applying point load on the beams. We done analysis on two hybrid beams one having composition al-cu-al and other having composition al-cu-quartz-cu-al and we applied different conditions i.e. cantilever, simply supported, clamped and on analysis we get results that on how particular beam the distribution of stress occur. And now with this analysis we have different results of different beams and any combination can be used according to its application and be easy to choose the beam as it shows stress intensity at different point. We done analysis on hybrid beams because, the biggest

advantage of modern hybrid materials is that they are light in weight as well as strong. By choosing an appropriate combination of matrix and reinforcement material, a new material can be made that exactly meets the requirements of a particular application. In this project we applied mechanical force on the beams and we analyze deflection of the beam at different condition.

REFERENCES

[1]. Althan&Kartal, Investigation of buckling behavior of laminated reinforced concrete plates with central rectangular hole using finite element method, Materials and Design,30(2009) 2243-2249.

[2]. Kamruzzaman et al., Effect of composite type and its configuration on buckling strength of thin laminated composite plates, Latin American Journal of Solids & Structure 3(2006).

[3]. Zhang & Yang, Recent developments in finite element analysis for laminated Composite plates, *Composite Structures 88 (2009) 147-157.*

[4]. S. Kapuria, N.Alam, ZigZag Theory for buckling of hybrid composite beams under electromechanical loads. *International journal of Mechanical Sc. 46-(2004) 1-25.*

[5]. Meressi T, Paden B. Buckling control of a 5exible beam using piezoelectric actuators. Journal of Guidance Control and Dynamics 1999.

[6]. Thompson SP, Loughlan J. The active buckling control of some composite column structure strips using piezoceramic actuators. Computers and Structures 1995.

[7]. Wang Q. On buckling of column structures with a pair of piezoelectric layers. Engineering Structures 1999–2015.

[1].Wang Q, QuekST. Enhancing 5utter and buckling capacity of column by piezoelectric layers. International Journal of Solids and Structures 2002.

[8]. Bao Y, Tzou HS, Venkayya VB. Analysis of nonlinear piezothermoelastic laminated beams with electric and temperature eJects. Journal of Sound and Vibration 1998.