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RESEARCH ARTICLE

CONVERSION OF METAL TO GLASS FIBRE REINFORCED THERMOPLASTIC COMPOSITES FOR AUTOMOTIVE COMPONENTS THROUGH FINITE ELEMENT ANALYSIS

***Ankur Katiyar and Nancy Sahu**

Department of Mechanical Engineering, Kanpur Institute of Technology, Kanpur

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ABSTRACT

As we know there are very competitive atmosphere in the market of automotive. So the total focus of all the manufacturers are towards cost which will in the budget of customer and more comfort of the passengers. The FEA analysis of bracket is performed for the deflection and stresses. A model of bracket of composite material, i.e. (GRP) is also prepared and analyzed by FEA Analysis which is then compared with the previous steel bracket. The use of composite materials resulted into reduction in deflection as well as in stresses.

INTRODUCTION

Automotive industries are showing major interesttowards weight reduction of various components. Weight can be reduced by a new materialwhich having better properties and better manufacturing processes, should be less in weight. At initial stage, bracket was made of steel and after that converted into GRP.

The objective of this work with FEA is to compare the effect of material change on stresses and weight of assembly. For this comparison the material of bracket is replaced from steel to composite material i.e. GRPComposites combine high strength fibers and lightweight matrices, creating materials with high specific properties. Kumar Krishan, Aggarwal M.L (IJAERS/Vol. I/Issue II/January-March, 2012/155-158) Computer aided FEA comparison of mono steel and mono grip leaf spring

Glass Fiber Reinforced Thermoplastic Composites

Fiber reinforced plastic is a material in which the low strength of the polymeric material is increased by high strength fibers. There are two main constituents of fiber reinforced plastic, matrix & fibers. The function of matrix is to provide a rigid base for holding the fibers in correct position. The function of fibers is to transmit the load acting on component.

****Corresponding author: Ankur Katiyar,***
Department of Mechanical Engineering, Kanpur Institute of Technology, Kanpur

Properties of GRP

1) Freedom of design
2) Versatility and affordability
3) Strength and durability
4) Appearance

Finite Element Analysis

The finite element method is a numerical method for solving problems of engineering and mathematical physics. Typical problem areas of interest in engineering and mathematical physics that are solvable by use of the finite element method include structural analysis, heat transfer, fluid flow, mass transport and electromagnetic potential.

Problem Description and Solution

Legislation is constantly demanding improvements to every aspect of new passenger vehicles. This legislation can be simplified into two key requirements.

Cars must be more

- Environmentally friendly in terms of both fuel efficiency and recyclability
- Safer, offering more protection to both passengers and pedestrians in the event of an accident.

So for the analysis, the model of bracket is shown in Figure 1.

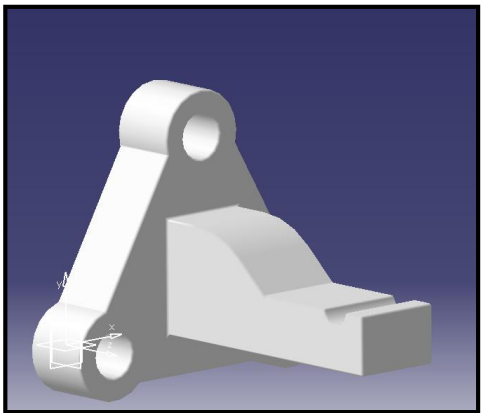

Figure 1. Model of Bracket

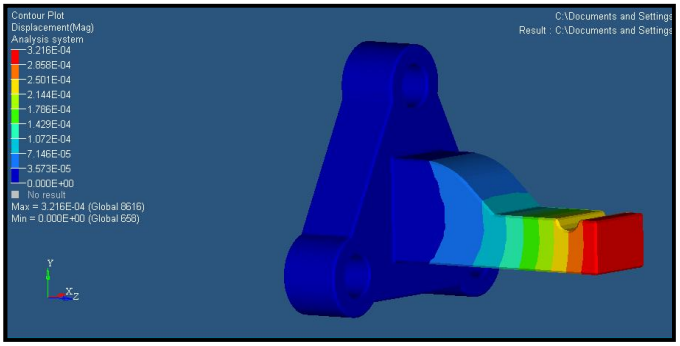

Figure 2. GRP Deflection

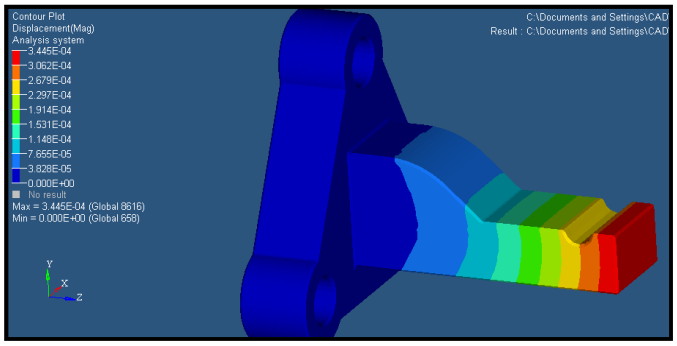

Figure 3. Steel Deflection

Composites materials can offer solutions to both these problems. Increased efficiency is achievable through weight saving since up to 40% of fuel consumption can be attributed to inertia due to the mass of the vehicle, particularly when looking at the urban test cycle.Significant weight reduction can be achieved by novel design and the use of composites with higher specific properties than traditional materials such as steel and aluminum.

It has been observed that when a steel bracket and a GRP bracket analyzed in FEA, for the same static load and boundary conditions, the deflection in the case of steel is 3.5e-6 mm while in case of GRP it is 3.2e-6 mm, On the other hand the value of bending stress is changed from the 0.74 Kgf/mm^2 to 0.66.5Kgf/mm^2 in steel and GRP bracket respectively. At the same time a large weight reduction is also experienced.

The deflection in GRP and Steel Bracket are shown in Figure 2&3.

Conclusion

When steel bracket is replaced by composite material (GRP),

i) The weight of GRP bracket will reduce as compare to steel bracket.
ii) The strength of GRP bracket will improve as compare to steel bracket at same volume. This will analyzed with the help of FEA (Finite Element Analysis).

In future more analysis can be done on GRP bracket for different environment and nature of application.

REFERENCES

Keshavamurthy Y C., Dr. Nanjundaradhya N V., Dr. Ramesh S. Sharma, Dr. R. S. Kulkarni, April 2012. Investigation of tensile properties of fiber reinforced angle ply laminated composites, *International Journal of Emerging Technology and Advanced Engineering,* ISSN 2250-2459, Volume 2, Issue 4.

Kumar Krishan and Aggarwal, M.L. Computer aided FEA comparison of mono steel and mono grip leaf spring, *International Journal of Advanced Engineering Research and Studies (IJAERS/Vol.I/Issue II/January-March, 2012/155-158).*

UmeshS.Ghorpade, Prof. D.S. Chavan and Prof. M.V. Kavade. Static Structural And Modal Analysis Of Engine Bracket Using Finite Element Analysis, *International Journal of Engineering Research and Technology (IJERT),* Vol. 1 December- 2012, Issue 10.

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