

Design evaluation of a car bumper for variable speeds by using material Impact Abs plastic

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ABSTRACT:

Bumper is an important part which is used as protection for passengers from front and rear collision. The intend of this study was to investigate the structure and material employed for car bumper in one of the car manufacturer. In this study, the most important variables like material, structures, shapes and impact conditions are studied for analysis of the bumper beam in order to improve the crashworthiness during collision. The simulation of a bumper is characterized by impact modelling using CATIA impact analysis is done by ANSYS according to the speed that is 13.3 m sec⁻¹ (48 km h⁻¹) given in order to analyze the results. This speed is according to regulations of Federal Motor Vehicle Safety Standards, FMVSS 208- Occupant Crash Protection whereby the purpose and scope of this standard specifies requirements to afford impact protection for passengers. In this research, analysis is done for

speed according to regulations and also by changing the speeds. Simulation using Finite Element Analysis software was conducted. The material used for bumper is ABS Plastic ands2 Glass Epoxy.

INTRODUCTION

BUMPER

A bumper is a structure attached or integrated to the front and rear of an automobile to absorb impact in a minor collision, ideally minimizing repair costs. Bumpers also have two safety functions: minimizing height mismatches between vehicles, and protecting pedestrians from injury

CONSTRUCTION

Bumpers were just rigid metal bars. On the 1968 Pontiac GTO, General Motors brought forth an "Endura" body-coloured plastic front bumper designed to absorb low-speed impact without permanent deformation. It appeared in a notable television commercial where John DeLorean hit the new car with a sledgehammer and no

damage resulted. Similar elastomeric bumpers were available on the front and rear of the 1970-'71 Plymouth Barracuda, and in 1972, Renault introduced a plastic bumper on the Renault 5.

INTERNATIONAL STANDARDS

European countries have implemented regulations to address the issue of 270,000 deaths annually in worldwide pedestrian/auto accidents.

International safety regulations, originally devised as European standards under the auspices of the United Nations, have now been adopted by most countries outside North America. These specify that a car's safety systems must still function normally after a straight-on pendulum or moving-barrier impact of 4 km/h (2.5 mph) to the front and the rear, and to the front and rear corners of 2.5 km/h (1.6 mph) at 45.5 cm (18 in) above the ground with the vehicle loaded or unloaded.

ABS (ACRYLONITRILE-BUTADIENE-STYRENE)

ABS is a low cost engineering plastic that is easy to machine and fabricate. ABS is an ideal material for structural applications when impact resistance, strength, and stiffness are required. It is widely used for machining pre-production prototypes since it has excellent dimensional stability and is easy to paint and glue. Natural (beige) ABS and black ABS are FDA compliant for use in food processing applications. The following physical property information is based on

typical values of the base acrylonitrile-butadiene-styrene resin.

Characteristics of ABS

- Excellent impact resistance
- Good machinability
- Excellent aesthetic qualities
- Easy to paint and glue
- Good strength and stiffness
- Relatively low cost

CATIA

CATIA - which stands for Computer Aided Three-dimensional Interactive Application - is the most powerful and widely used CAD (computer aided design) software of its kind in the world. CATIA is owned/developed by Dassault Systems of France and until 2010, was marketed worldwide by IBM.

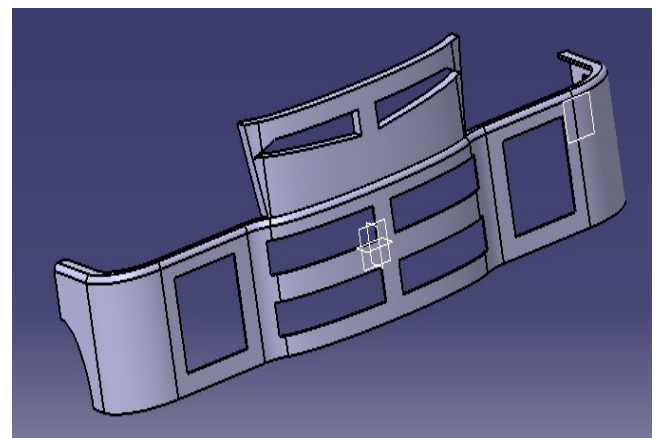
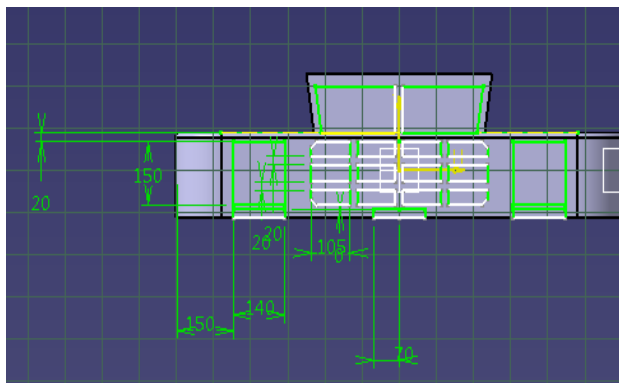
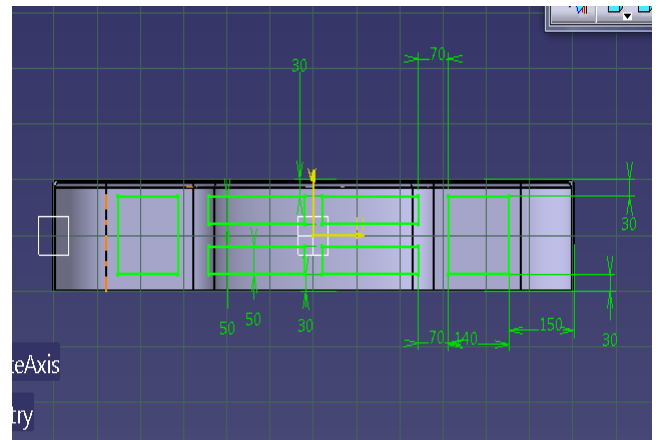
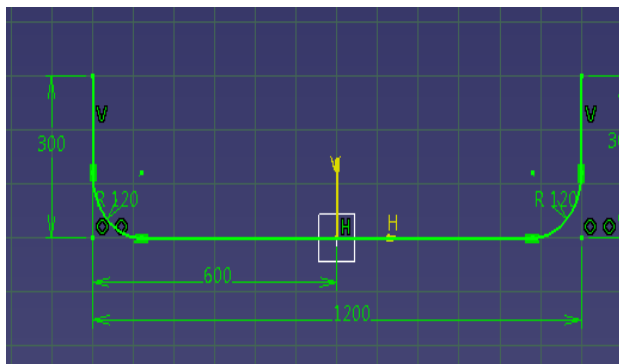
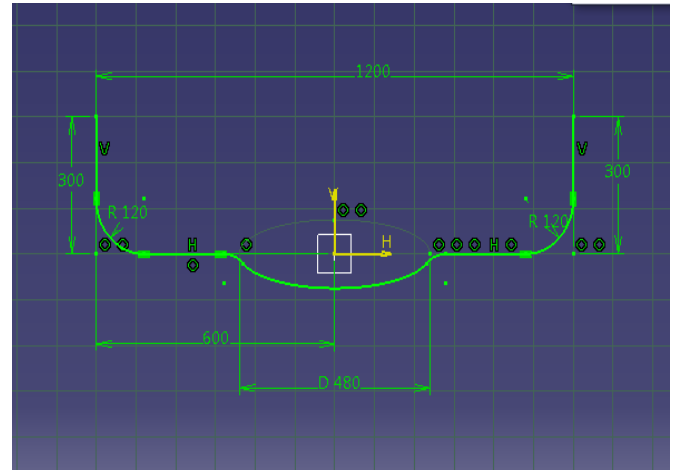
Uses of CATIA

Anything and everything you see had to be designed before it could be manufactured. The pen on your



desk, your desk, and the chair you're sitting in, your appliances, your automobile, etc. The list is almost endless. Today, nearly all products are designed on computers. Computers are even designed on computers. CATIA plays a major role in the design process. Architects are now using CATIA. The great Guggenheim Museum in Spain, considered an architectural masterpiece, was designed using CATIA.

DESIGNING OF BUMPER IN CATIA



ANSYS

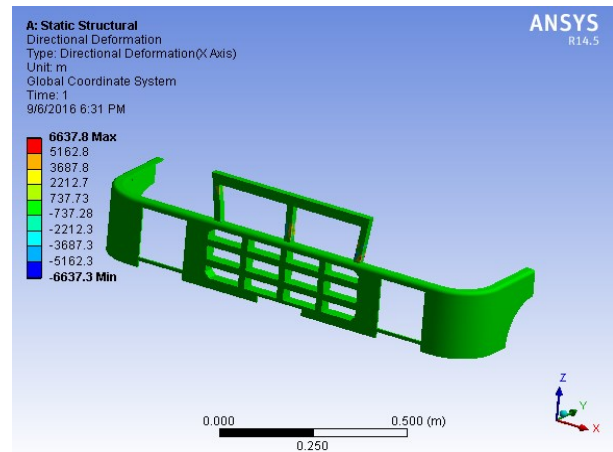
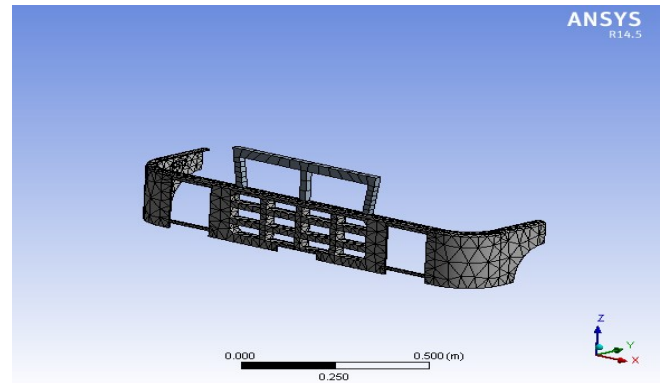
ANSYS is general-purpose finite element analysis (FEA) software package. Finite Element Analysis is a numerical method of deconstructing a complex system into very small pieces (of user-designated size) called elements. The software implements equations that govern the behaviour of these elements and solves them all; creating a comprehensive explanation of how the system acts as a whole. These results then can be presented in tabulated or graphical forms. This type of analysis is typically used for the design and optimization of a system far too complex to analyse by hand. Systems that may fit into this category are too complex due to their geometry, scale, or governing equations.

ANSYS is the standard FEA teaching tool within the Mechanical Engineering Department at many colleges. ANSYS is also used in Civil and Electrical Engineering, as well as the Physics and Chemistry departments.

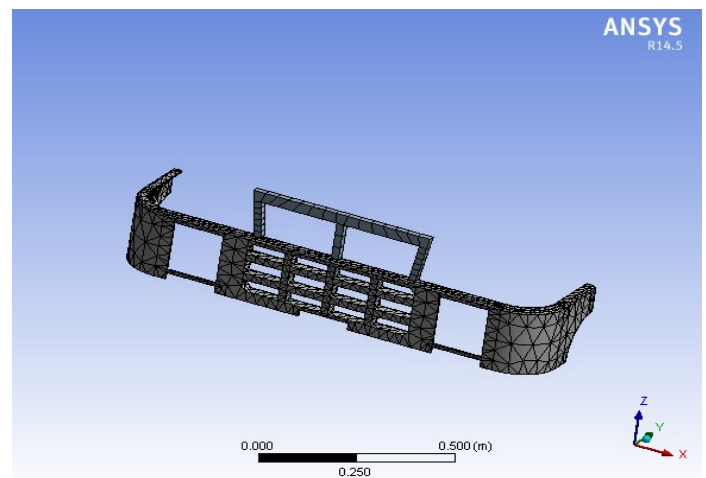
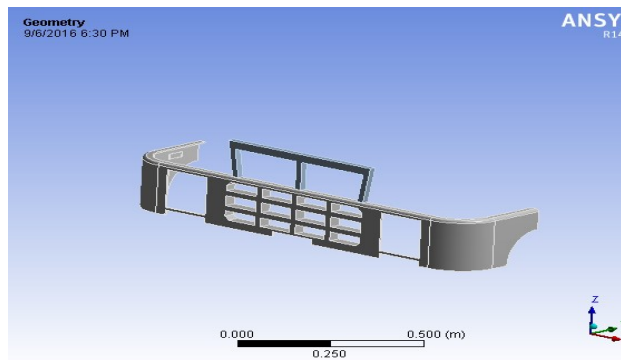
Model ansys files

Original model

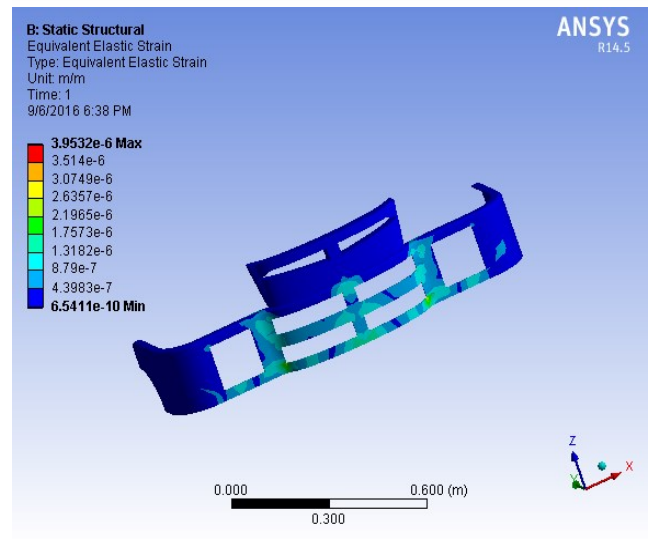
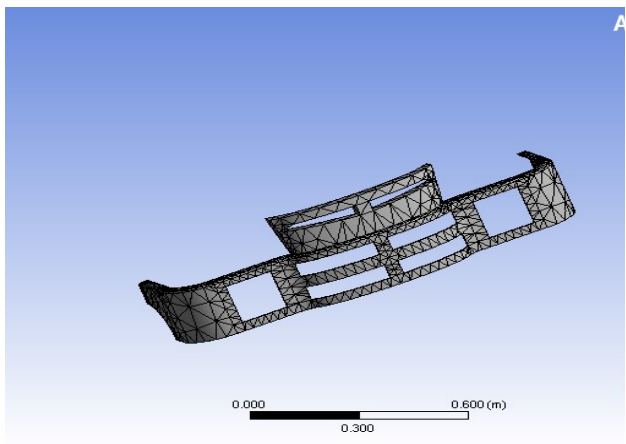
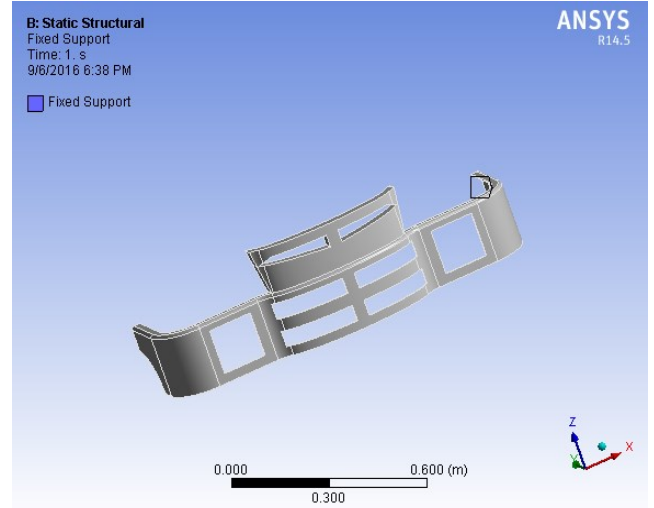
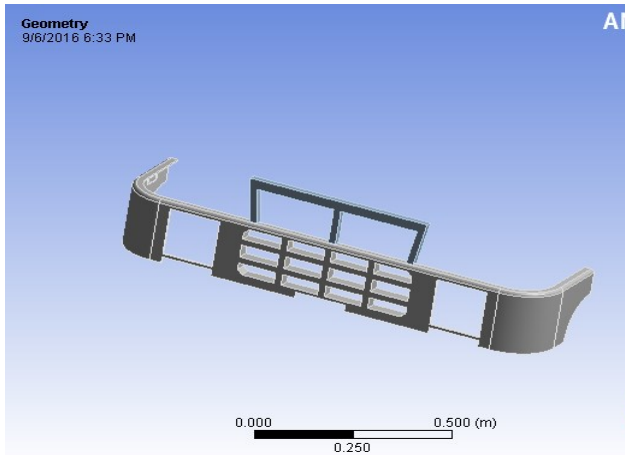
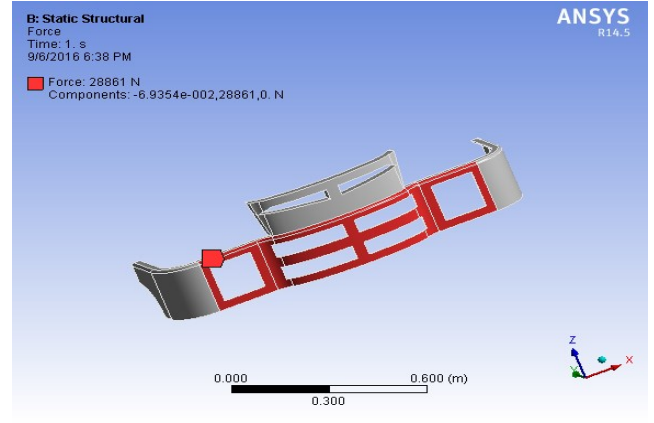
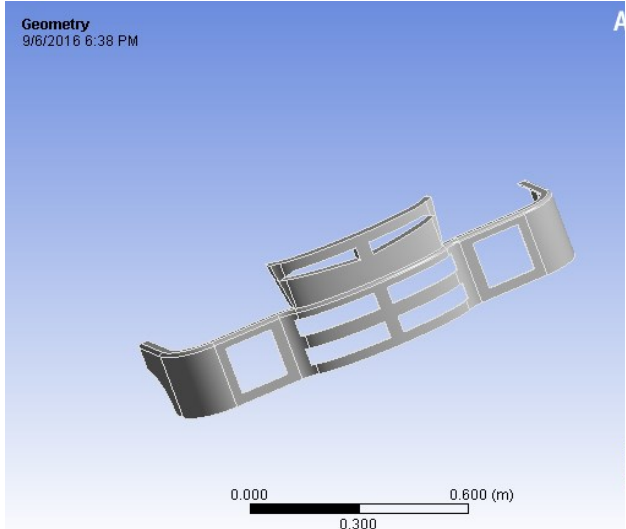
Abs plastic maireial

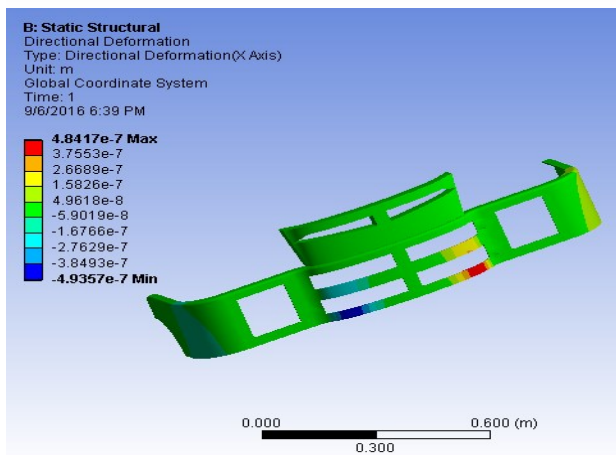
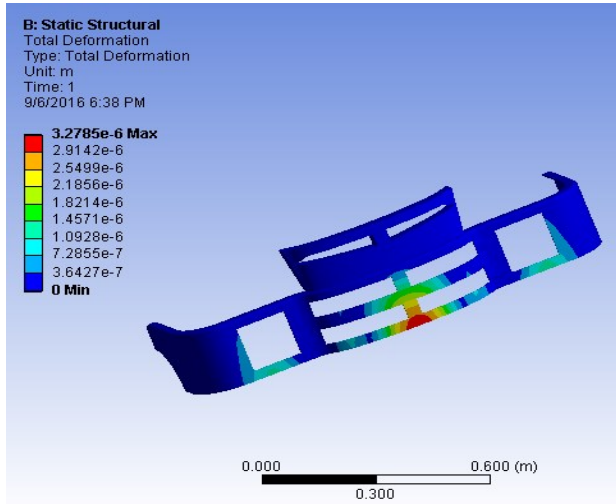


S2 materials



S2 material





CONCLUSION

In our project, we have modelled a car bumper using 3D modelling software Catia.

Analysis is done on the car bumper for different speeds of 90Km/hr, and 120Km/hr. The analysis is done on the car bumper for different materials ABS Plastic and S2 glass epoxy.

Present used material for car bumper is steel. We are replacing with ABS Plastic and S2 glass epoxy. The density of ABS Plastic and S2 is less than that of steel; thereby the overall weight of car bumper is reduced.

By observing the analysis results, the stress values are less for ABS Plastic and S2 than steel. By comparing the results of ABS Plastic and S2, the stress values are less for ABS Plastic than S2.

So we can conclude that using ABS Plastic is better.

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