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ANALYSIS AND OPTIMIZATION OF CRASH BOX

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Abstract - During a minor collision between two vehicles or a vehicle and an obstacle, the internal structure of the vehicle is irreparably damaged. To reduce pollution, new cars are fitted with so-called crash boxes located in the front and rear of the vehicle. The aim of our study was to evaluate the impact of a crash box structure to minimize limb deformities, as if damaged, this part, or repaired, would not ensure good safety in the event of a major collision. The crash box is a separate part of the car installed between the car frame and the front bumper. During an accident, it disables axially and absorbs energy by accident. The structure of the crash box provides comfort to the passenger during impact. It serves as a protection for expensive parts behind the bumper like engine cover and cooling system. Various parameters such as width, thickness, critical filling affecting the performance of the crash box are investigated using a test design. a detailed analysis of the flexible crash box on the ANSYS performance bench. Test tests are performed on a UTM machine. A comparative analysis will then be made between the results of the test and the analysis and then the result and conclusion will be taken.

Key Words: **Crash Box, UTM Machine, ANSYS, Comparative analysis.**

1.INTRODUCTION

The crash box, a car installed at the beginning of the front lane, is one of the most important parts of a car crash absorbing power. In the event of a previous accident, for example, a crash box is expected to fall with the force of gravity in front of other body parts in order to minimize damage to the main building and passengers to save their lives.

Typically, a crash box is attached to a few strings called "broken beads", so that the cracked beads begin to degrade the buckling. Typically, a crash box is loaded with a few strands called "cracked beads", so that the broken beads begin to break. wrap and make the crash box fall easily. Crash box (car accident), a towing device installed to reduce repair costs in the event of a collision. Car collisions usually occur at low speeds. Insurance companies and the Car Repair Council both require reduced repair costs and improved internal safety risk. To reduce repair costs, a crash-like device such as a crash box is usually installed. A crash box is a structure with a small wall connected between a car bumper structure and a side rail. Determination of the geometry of the crash box is very important to absorb the impact force, as the space for the installation of the crash box is not very large. A straightforward load balancing method for direct response structure is used to solve integrated topology problems. The cross-sections of the crash box are determined by the results of the conceptual design. In the second step, detailed design processes are performed using an accurate design with an orthogonal pattern of the models selected in the first step. The detailed shape of the new crash boxes is determined from the detailed design. The crash box setup problem was created taking into account the geometric problems of the installation of a specific crash box location.

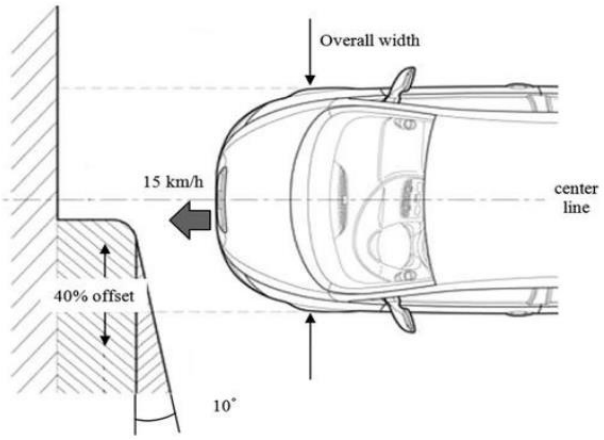


Fig 1-RCAR test conditions

1.1 Problem Statement

The number of road users worldwide is slowly increasing, making serious injuries and deaths in car accidents a major concern. With the increase in the number of vehicles each year, fatal accidents are on the rise. Front-vehicle collisions cause more deaths and injuries compared to any other type of car accident. Of particular concern to drivers and passengers is safety. People expect to drive or ride a car very safely. The vehicle is expected to provide adequate protection for the driver and passengers in the worst possible accident. To protect the occupants of the car there are many new safety features such as airbags, crash boxes, seat belts, and ABS brakes. Therefore, the crash box should absorb the impact force at the top. Since the input location of the crash box has been adjusted, only the shape of the cross section can be changed.

1.2 Objectives

- Model box crash for different categories in CATIA V5R20 software.
- The aim of this project is to determine the impact on different types of Energy Absorption crash box.
- analysis of a fixed structure of a different shape Crash box.
- Perform a detailed analysis of the different shape of the crash box inside

2. Literature Review

1. Gangadhar Biradar1's “Car Crash and Implant Analysis Operation Box” by Gangadhar Biradar1, Anjan Babu V.A Computer simulation technology has greatly enhanced the safety, reliability, and comfort of modern cars. Rectangular crash box is built with CATIA V5R14, connected with HYPERMESH-9 and designed for LS DYNA model. The result is that the post is analyzed to determine the removal levels and absorption characteristics of different object models, different speeds and different thickness of a particular model of objects in the crash box, and power management during the event. This project discusses the functionality and importance of the Crash box on a car engine. This project is made up of three cases and models of different objects, different speed of selected object models and a different thickness of the Selected Material Wall. This paper discusses the performance of a crash box on operating systems suitable for car crashes, as well as its impact on absorbing power by increasing the wall thickness and behavior of the crash box at different speeds. Once an effective crash control system with a crash box has been designed and implemented, Crash Box ensures that proper absorption will be maintained throughout the life of the vehicle. Power in the loading area can be calculated as follows Kinetic strength = ½ m v2 = ½ x 800 x 8.332 = 27,775 N-m. When m the weight of a solid ball V the speed of a solid ball v = 30 km / hr = 8.33 m / s.

2. "Testing and Verification of the Pump Box Test" by Omkar B Garud, Krishna S Pawar, Prashant K Thorat, Amit M Waghmare and Sagar P Chopade. The crash box is a separate part of the car that is fitted between the frame of a large car and the front bumper. During an accident, it disables axially and absorbs energy by accident. The structure of the crash box provides comfort to the passenger during impact. It acts as a guard on an expensive rear bumper such as the engine cover and cooling system. In this report the geometric crash box is read about the absorption of energy. The research is based on the analysis, evaluation and calculation work. Various parameters such as width, thickness, critical filling affecting the performance of the crash box are investigated using a test design. In this study we will use ABAQUS CAE as a modeling and analysis software. In the structure of disintegrating metal structures, the concept of a space frame made of columns with small prismatic walls, has been identified as a very efficient energy absorption.

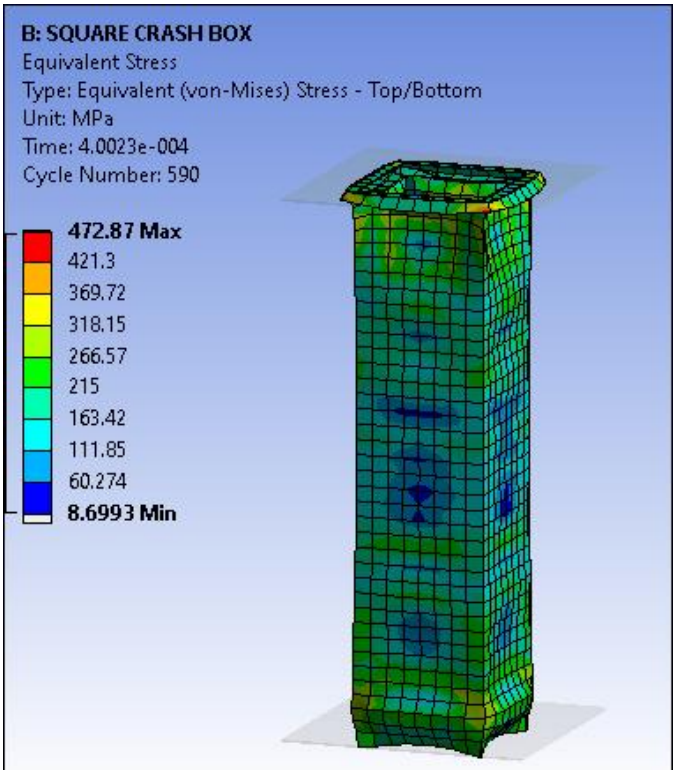
system. In this type of structure, the absorption of energy will usually occur with a combination of continuous folding and wrapping the prismatic column. With lightweight designs, a slightly welded metal filler, such as aluminum honeycomb or foam, has the potential to increase the absorption of a prismatic column with thin walls. The increase in strength will be considered a significant decrease in filling pressure. The recent development of low-cost manufacturing processes for low-volume mobile devices, such as aluminum foam, has opened the way for use in energy-absorbing devices to strengthen the space frame. There are many opportunities to improve the absorption capacity of the crash box using a variety of methods. As discussed above there are a large number of factors that affect the absorption capacity of a crash box. The paper concludes that kinetic forces of collision continue to decline with respect to time and force continue to grow. As kinetic energy is converted into complete system energy it remains unchanged. As the full power graph shows some differences in KE and PE this is an exciting area for our future work. As with various studies the absorption capacity depends on the structure, structural variability, size, and defects present in the template. Therefore, the absorption capacity can be increased to ensure the safety and comfort of the passengers.

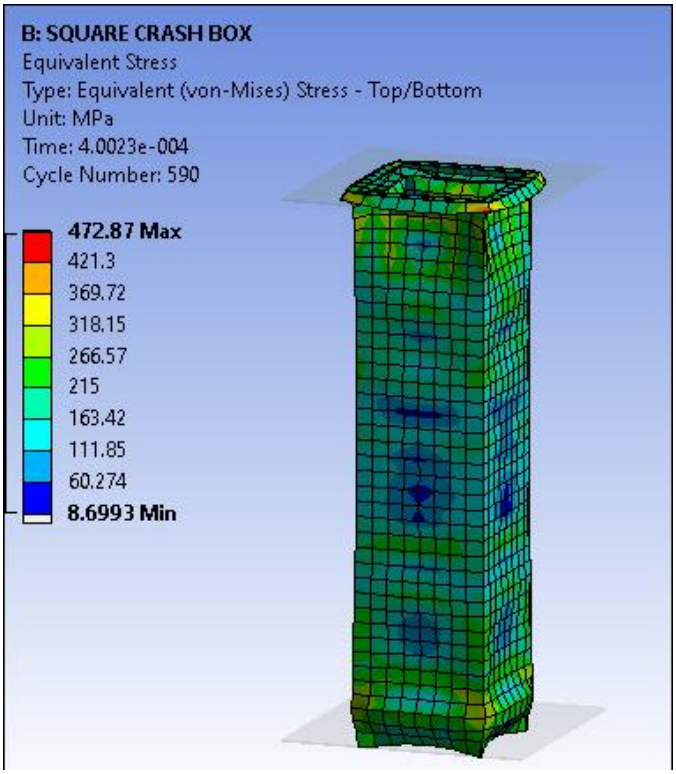
3. METHODOLOGY

The concept structure of an aluminum honeycomb sandwich was introduced to investigate the strength of a crash box with small walls. Material nonlinearity includes indirect behavior of an object based on current flexibility, history of fluctuations, fluctuations, temperature, pressure, and so on. Examples of indirect material models are high strain (visco) elastus plasticity and hyper-elasticity (rubber and plastic materials).

We used Aluminum alloy as a crash box for different readings.

Through the use of three structures we will know how buildings collapse under load. Three buildings were designed and analyzed namely Circular, Cubical, Rectangular. We analyzed each one and decided to make a model that works better.





This design ensures high capability for energy

absorption without cracked beads. This study used the central element method to determine which part of the body absorbs the force of a crash in the axial fold. Then, the effect of the cross-sectional profile on power capture was obtained by volume. A few items have been selected to improve the design of the crash box

as a combination (aluminum + magnesium + silicon) and (aluminum + zinc + magnesium).Comparison of the effects of the amount of energy absorbed between the impact between the variance and the pressure of the three models of crash boxes.

Blended materials such as PEEK-based compounds, solid polyethylene terephthalate include carbon fiber reinforced compounds as shown in this article

paper is an option instead of the usual cracked box material especially aluminum and steel. Comparison of impact test results showed that crash boxes made of compound material did not absorb more impact energy compared to aluminum.

3. CONCLUSIONS

- In this study we will use three different structures which are circular, square and square, for research during crash tests.
- Therefore, we will find a useful shape that you can use in the chassis structure of the crash box.

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