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Design and Transient Thermal Analysis of Honey Comb Chassis

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ABSTRACT

Chassis is a French term and was initially usedto denote the frame parts or Basic Structure of the vehicle. It is the back boneof the vehicle. A vehicle without body is called Chassis. The components ofthe vehicle like Power plant, Transmission System, Axles, Wheels and Tyres,Suspension, Controlling Systems like Braking, steering etc., and also electricalsystem parts are mounted on the Chassis frame. It is the main mounting for allthe components including the body. So, it is also called as Carrying Unit.

Main components of chassis are

1.Frame 2. Engine or power plant 3.Clutch 4.Gear box 5.propeller shaft 6. Differential 7.U-Joint.

Chassis frames are mainly divided into three types 1. Conventional frame 2. Integral frame 3. Semi integral frame. Mainly these frames are used to carry load of the passengers or goods carried in the body, to support the load of the body, engine, gear box etc., To withstand the forces caused due to the sudden braking orAcceleration, To withstand the stresses caused due to the bad road condition, To withstand centrifugal force while cornering.

Due to the above chassis, HONEY COMB CHASSIS are differently fabricated presently days. In our project, we are going to do the transient thermal analysis on honey comb chassis. In this project we are going to collect data We are conducting thermal analysis for the existing material structural steel and aluminum alloy material. for finding the which material is good at thermal conditions and compared the heat flux of both the materials of the chassis.

CATIA software is used for the modeling and assembly. Ansys is used for the analysis.

1. INTRODUCTION

The chassis forms the main structure of the modern automobile. A large number of designs in pressed-steel frame form a skeleton on which the engine, wheels, axle assemblies, transmission, steering mechanism, brakes, and suspension members are mounted. During the manufacturing process the body is flexibly bolted to the chassis.

This combination of the body and frame performs a variety of functions. It absorbs the reactions from the movements of the engine and axle, receives the reaction forces of the wheels in

acceleration and braking, absorbs aerodynamic wind forces and road shocks through the suspension, and absorbs the major energy of impact in the event of an accident.

1.2 LAYOUT OF CHASSIS AND ITS MAIN COMPONENTS:

The following main components of the Chassis are

1. Frame: it is made up of long two members called side members riveted together with the help of number of cross members.

2. Engine or Power plant: It provides the source of power

3. Clutch: It connects and disconnects the power from the engine flywheel to the transmission system.

4. Gear Box

5. U Joint

6. Propeller Shaft

7. Differential

1.3 FUNCTIONS OF THE CHASSIS FRAME:

1. To carry load of the passengers or goods carried in the body.

2. To support the load of the body, engine, gear box etc.,

3. To withstand the forces caused due to the sudden braking or acceleration

4. To withstand the stresses caused due to the bad road condition.

5. To withstand centrifugal force while cornering

1.4TYPES OF CHASSIS FRAMES:

There are three types of frames

1. Conventional frame

2. Integral frame

3. Semi-integral frame

1. **Conventional frame**: It has two long side members and 5 to 6 cross-members joined together with the help of rivets and bolts. The frame sections are used generally.

a. Channel Section - Good resistance to bending

b. Tabular Section - Good resistance to Torsion

c. Box Section - Good resistance to both bending and Torsion

2. **Integral Frame**: This frame is used now days in most of the cars and buses. There is no frame and all the assembly units are attached to the body. All the functions of the frame carried out by

the body itself. Due to elimination of long frame it is cheaper and due to less weight most economical also. Only disadvantage is repairing is difficult.

1.5FRAMELESS OR INTEGRAL FRAME CHASSIS

Body-on-frame is an automobile construction method. Mounting a separate body to a rigid frame that supports the drive train was the original method of building automobiles, and its use continues to this day. The original frames were made of wood (commonly ash), but steel ladder frames became common in the 1930s. It is technically not comparable to newer monologuedesigns; almost no modern vehicle uses it (other than trucks).

Advantages

- Easier to design, build and modify (less of an issue now that Computer-Assisted Design (CAD) is commonplace, but still an advantage for coach-built vehicles).
- Quieter, because the stresses do not pass into the body, which is isolated from the frame with rubber pads around the attachment bolts. Less significant lately, but earlier bodies would squeak and rattle, ever more as they rusted, lubricants drained, and fasteners loosened. Isolated bodies had a lesser degree of these modes of aging.

Disadvantages

- Heavier than uni-body - lower performance and/or higher fuel consumption.
- Far less resistant to torsional flexing (flexing of the whole car in corners) - compromising handling and road grip.
- Structurally poor utilization of material.

1.7 DESIGN GOALS
CHASSIS AND BODY STRUCTURE

The vehicle design starts up with conceptual studies to define size, number and location of undriven and drive axles, type of suspension, engine power, transmission, tire size and axle reduction ratio, cab size and auxiliary equipment. The selected configuration has to be suitable for the consideredtransportation tasks and should match the existingproduction line. Either new vehicle type is generated or a certainimprovement over existing types has to be achieved. Because of the fierce competition, and advancedtechnology in engineering, manufacturing and service and strenuous work is required to be successful.

Having defined the general configuration of a vehicle, let us now concentration the main structural components. The most important function of the "backbone" is supporting and distributing the loads originating from

- payload including its vessels
- axles with their fixtures
- coupling device
- drive train
- truck cabin including top sleeper/windshield
- inertia forces
- forced deformation
- special servicefunctionslike cab tilt mechanism, cargo handling
- equipment a.s.o

In additionto the primary structural functions, the chassis has to incorporateaccessories, optional and special equipment like hydraulics, andelectrical wiring andpiping systems.

Altogether, space is very limited and sometimes only small cross section dimensions are usable for the main structure.

BUS STRUCTURE

Only in the first years of bus body design, a flexible truck chassis was used together with non-structural body elements of wood and canvas resulting in the true chassis designs a contrary to the integral body design. Today, even if a channel beam chassis is used together with properly designed floor cross-members, sidewall and roof structure, a fully integral structure is achieved.

Advantages of a channel beam bus chassis are simplicity of design, fully equipped drivable vehicle, heavy duty suspension and study load introduction members. The bus body as a whole is a light weight, stiff structure, however significant distortion of the overall stiffness occurs at the doors and

Other large openings sheared formation at the doors is up to 10 times greater than for comparable sidewall sections. Most of the bus bodies on the European continent are fully welded tubular steel structures having similar stiffness properties. However, there are differences in the local design of welded joints with respect to dimensions, shape and application of additional stiffeners. Therefore different fatigue life performanceis achieved.

1.11CHASSIS PARTS

Different chassis parts together comprise of automobile chassis. The different types of automobile chassis parts comprise of control arm, pitman arm, ball joint, stabilizer link, tie rod end, rack end and many other auto parts. On the basis

of their functions, the automotive chassis parts are sub divided into:

- Chassis Brackets
- Chassis Cross member

1.12CHASSIS FIXINGS

Chassis fixings function as automotive fasteners used for connecting automobile chassis. These fixings hold together the varied parts of the vehicle chassis. High strength stainless steel is the most commonly used material for manufacturing chassis fixings. Besides being rust and corrosion resistance, stainless steel chassis fixings also offer desired durability.

CAR CHASSIS CONSTRUCTION

Chassis have to be stiff enough so that they withstand the forces applied to them. This is point really important in the suspension settings. If the chassis bends a little the car in not going to behave as expected (as linear) because the ride is being modified, in short, the suspension settings are modified. However, you can not make the chassis completely stiff. That would cause it to be brittle. There will start to appear weak points and it would end breaking throw the weakest. So you need to reach a point where it is neither too stiff nor too weak.

1. VEHICLE CHASSIS DESIGNS

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In general, a ladder-frame chassis is a crude, heavy structure that does not really provide a good platform for building a vehicle on. But why, then, did the design last so long - the chassis on the right is from a '60s Land Rover, and is pretty much identical to the

LITERATURE SURVEY

STATIC LOAD ANALYSIS OF TATA SUPER ACE CHASSIS AND ITS VERIFICATION

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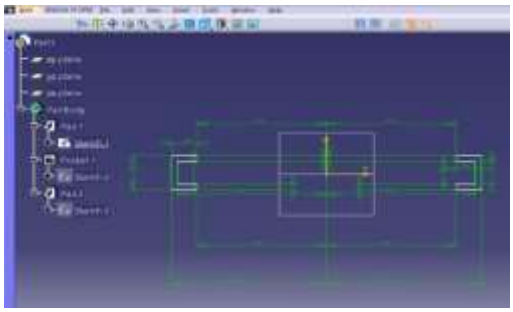
Abstract— automotive chassis can be considered as the backbone of any vehicle. Chassis is tasked at holding all the essential components of the vehicle like engine, suspension, gearbox, braking system, propeller shaft, differential etc. To sustain various loads under different working conditions it should be robust in design. Moreover chassis should be stiff and strong enough to resist severe twisting and bending moments to which it is subjected to. This paper presents the static load analysis (excluding damping and inertia effects) of the chassis of TATA super ace using ansys workbench and its verification using solid mechanics.

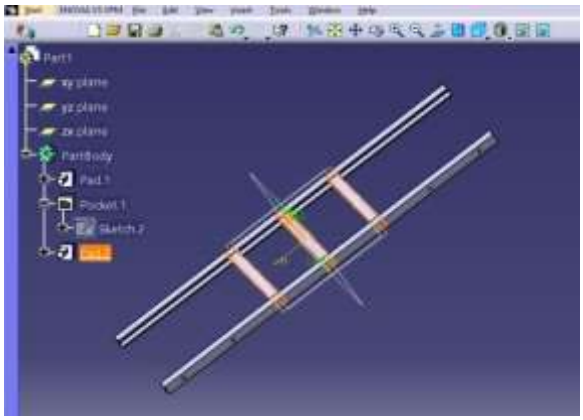
Keywords-FEM, CAD, G.V.W, CATIA

Finally the design, static analysis and its verification using solid mechanics has been successfully Accomplished. The work not only provides an insight into the design and analysis of the chassis but also

Pinpoints the critically stressed points where the Design can be modified for improving the chassis.

HONEY COMB CHASSIS MODEL IN CATIA





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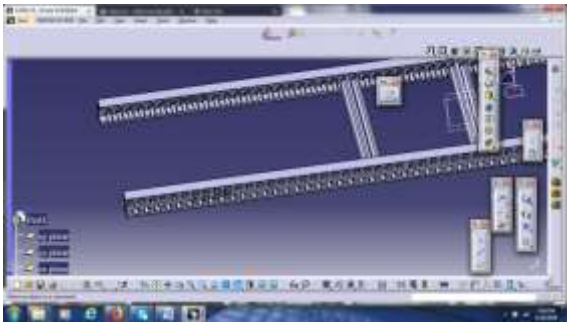
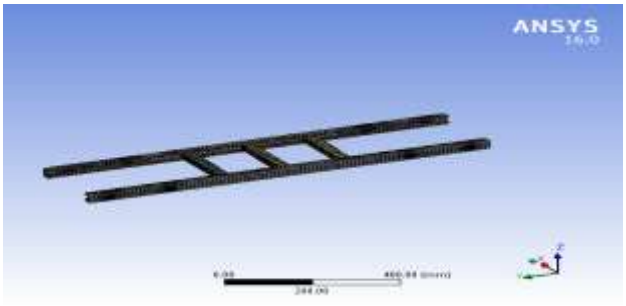
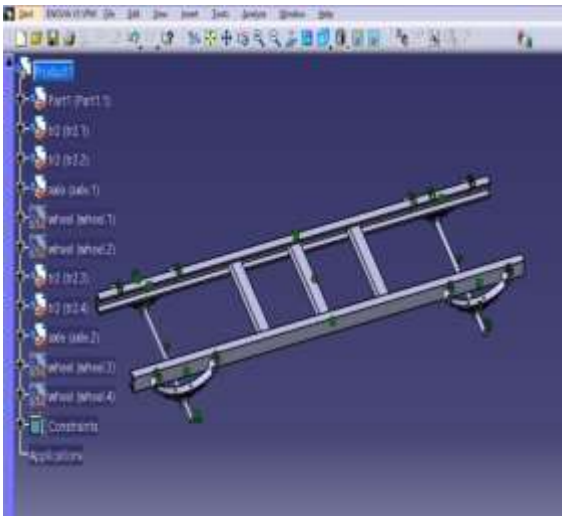
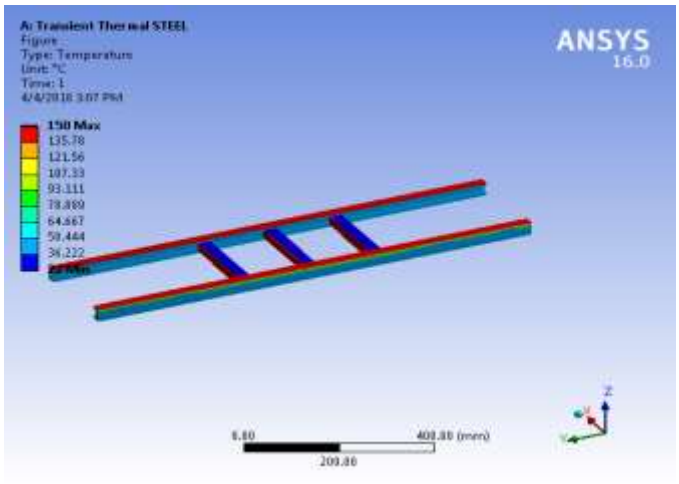




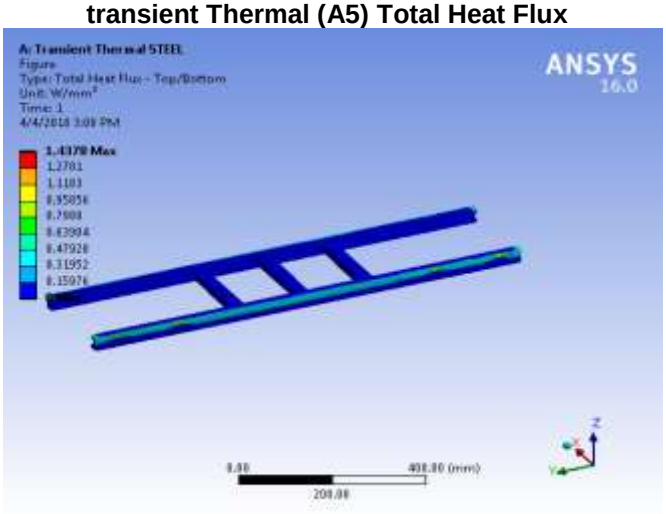
Temperature





ANALYSIS REPORT

transient Thermal (A5) Total Heat Flux



THERMAL ANALYSIS OF HONEY COMB CHASSIS

- Transient Thermal (A5)
  - ▪

- Material Data
  - Structural Steel

Mesh

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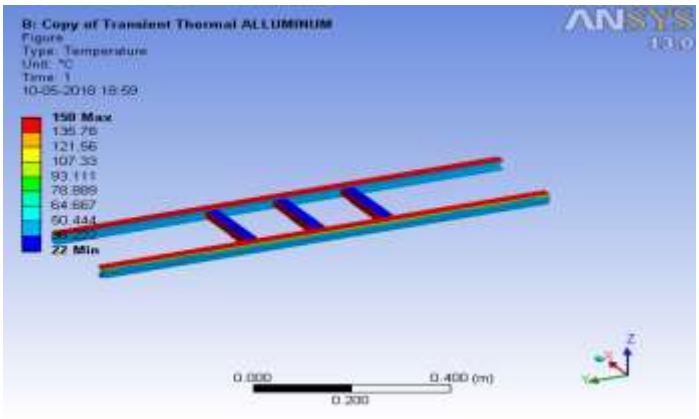
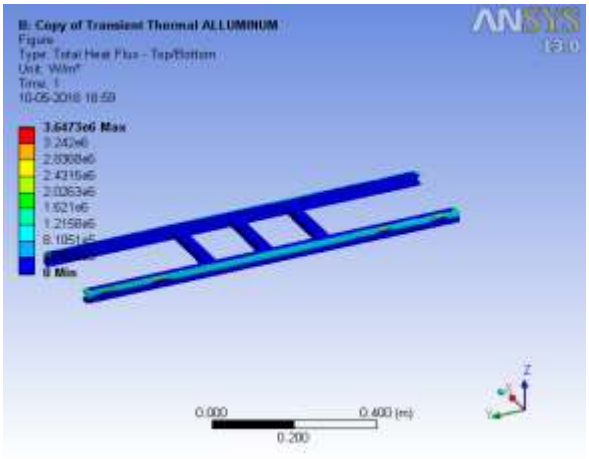
aluminum material





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RESULTS TABLE

MATERIALS	HEAT FLUX (W/MM2)
STEEL	1.437
ALUMINUIM	3.467

CONCLUSION

In our project, we are going to do the transient thermal analysis on honey comb chassis. In this project we are going to collect data .We are conducting thermal analysis for the existing material structural steel and aluminum alloy material. for finding the which material is good at thermal conditions and compared the heat flux of both the materials of the chassis.

According to the thermal analysis the both materials will be good but aluminum is a easily heat and light weight material and it can easily cooled, regarding these materials aluminum is the good at thermal conditions to honey comb chassis.

BIBLIOGRAPHY

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2. HEMANT KUMAR NAYAK, 2NAGENDRA PRASAD, 3 DEEPTY VERMA,4TULSI BISHT.
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