

The Structural Analysis Two Wheels Marco Commentator

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ABSTRACT:

The two-wheeler chassis consists of the frame, suspension, wheels and brakes. The chassis truly sets the overall style of the two-wheeler. Automotive chassis is the main carriage systems of a vehicle. The frame serves as a skeleton upon which parts like gearbox and engine are mounted. It can be made of steel, aluminum or an alloy. It is essential that the frame should not buckle on uneven road surfaces and that any distortions which may occur should not be transmitted to the body. The frame must therefore be torsion resistant. The aim of the project is to model a frame using 3D modeling software Pro/Engineer. To validate the strength of a frame, Structural analysis is done by applying the wheel forces. In this analysis ultimate stress limit for the model is determined. Analysis is done for frame using four materials alloy steel, aluminum alloy A360, magnesium and carbon fiber reinforced polymer to verify the best material for frame. Model analysis is also done to determine different mode shapes for number of modes. Analysis is done in ANSYS software.

INTRODUCTION

Motorcycle Chasis

The motorcycle chassis consists of the frame, suspension, wheels and brakes. Each of these components is described briefly below.

Frame Motorcycles have a frame made of steel, aluminum or an alloy. The frame consists mostly of hollow tubes and serves as a skeleton on which components like the gearbox and engine are mounted.

Suspension The frame also serves as a support for the suspension system, a collection of springs and shock absorbers that helps keep the wheels in contact with the road and cushions the rider from bumps and jolts.

Wheels Motorcycle wheels are generally aluminum or steel rims with spokes, although some models introduced since the 1970s offer cast wheels. Cast wheels allow the bikes to use tubeless tires, which, unlike

traditional pneumatic tires, don't have an inner tube to hold the compressed air.

Brakes The front and rear wheels on a motorcycle each have a brake. The rider activates the front brake with a hand lever on the right grip, the rear brake with the right foot pedal. Drum brakes were common until the 1970s, but most motorcycles today rely on the superior performance of disc brake.

SUSPENSION FRAMES A Motorcycle suspension frame System consists of a spring coupled to a viscous damping element, a piston, in a cylinder filled with oil. Categories of suspension frames

1. Single cradle frame. The single cradle is the simplest type of motorcycle frame, and looks similar to the first ever motorcycle frames.

2. Double cradle frame. Double cradle frames are descended from single cradle frames. They consist of two cradles that support the engine one either side.

3. Backbone frame. Far from the most desirable frame around, the backbone frame comprises a single, wide main beam from which the engine is suspended



Fig: Back bone Frame

4. Perimeter frame. Motorcycle racing research has shown that major advantages are to be gained in terms of rigidity by joining the steering head to the swing arm in

as short a distance as possible. Flexure and torsion are dramatically reduced. This is the concept behind the perimeter frame



Fig: Perimeter Frame

5. Trellis frame. The trellis frame rivals the aluminum perimeter frame for rigidity and weight. A favorite of Italian and European

manufacturers it has proved a great success in racing and competition



Fig: Trellis Frame

COMPUTER AIDED DESIGN (CAD)

Computer-aided design (CAD), also known as computeraided design and drafting (CADD), is the use of computer technology for the process of design and design documentation. Computer Aided Drafting describes the process of drafting with a computer. CADD software, or environments, provides the user With input-tools for the purpose of streamlining design processes; drafting, documentation, and manufacturing processes. CAD is mainly used for detailed engineering of 3D models and/or 2D drawings of physical components, but it is also used throughout the engineering process from conceptual design and layout of products, through strength and dynamic analysis of assemblies to definition of manufacturing methods of components. It can also be used to design objects.

PRO/ENGINEER: Pro/ENGINEER Wildfire is the standard in 3D product design, featuring industry-leading

productivity tools that promote best practices in design while ensuring compliance with your industry and company standards. Integrated Pro/ENGINEER CAD/CAM/CAE solutions allow you to design faster than ever, while maximizing innovation and quality to ultimately create exceptional products. **DIFFERENT MODULES IN PRO/ENGINEER** Part design Assembly Drawing

CONCLUSION: In our project we have modelled a suspension frame used in two-wheeler. Modelling is done in Pro/Engineer. We have done structural and modal analysis on suspension frame using four materials Steel, Aluminium Alloy A360, Magnesium and carbon fiber reinforced polymer to validate our design. By observing the results, for all the materials the stress values are less than their respective permissible yield stress values. So our design is safe. By comparing the results for four materials,

stress obtained is same and displacement is less for carbon fiber reinforced polymer than other three materials. So we conclude that for our design, CFRP is better material for suspension frame.

Future scope: By using the carbon fiber reinforced polymer we can suitably prepare the model. As the material has less density compared to the another materials used for manufacturing of chassis and frame, this is the best suited for our process of manufacturing, and can with stand very high loads Using carbon fiber reinforced polymer frequently in the up coming days we can reduce the cost of manufacturing of frame. Carbon fiber-reinforced polymers (CFRPs) have an almost infinite service lifetime when protected from the sun, and, unlike steel alloys, have no endurance limit when exposed to cyclic loading.

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