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DESIGN AND ANALYSIS OF TWO WHEELER BIKE CHASIS

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Abstract: The chassis frame forms the backbone of a vehicle, its principal function is to safely carry the maximum load for all designed operating conditions. The main carriage system of a vehicle is its chassis. The chassis acts as a framework on which components like the engine and transmission are installed. There is a frame, suspension, wheels, and brakes on a two-wheeler. The two-wheeler's overall style is primarily determined by the chassis. Steel is a common chassis material for two-wheelers since it is dense and hefty in weight. There are a variety of alternative materials that can be utilised for chassis since they are lightweight and strong, such as aluminium alloys, titanium, carbon fiber, and magnesium. This research involved modelling a the two-wheeler chassis frame using CATIA V5 and ANSYS software for structural analysis.

Key Words: Range, Speed, Warheads, Guidance, Variants, Threats, Design, Analysis, Explicit Dynamics, CFD analysis, CATIA V5, ANSYS

I. INTRODUCTION

The main support structure of a motorcycle is its frame. It supports the rider and any passengers or luggage, houses the steering and rear suspension, and supports the engine. The battery and fuel tank are also fastened to the frame. The steering head tube, which supports the pivoting front fork, is located at the front of the frame, while the pivot point for the swingarm suspension motion is located at the back. While some motorcycles employ a single frame, others include a front and rear subframe linked to the engine. Still other motorbikes use the engine as a load-bearing stressed member. The bicycle is a vehicle propelled entirely by human power, from which the motorcycle arose. The first bicycle with cranks and pedals— the forerunners of the contemporary motor—was equipped in 1861 by the French bicycle manufacturer Pierre Michaux and his sons Ernest and Henri. The Michaux family, who had a sizable factory in Bar-le-Duc, France, became the greatest velo manufacturer in Europe as a result of the success of their velocipede. Working with Michaux, L.G. Perreaux created the velo-a- vapeur, a steam-powered motorcycle engine that was patentable in 1868. Over the course of the following 30 years, a number of inventors built upon these creations, and in 1901 a Swedish immigrant to the United States named Carl Hedstrom created the first modern motorbike.

Clasification of bike chasis

1.Backbone fram
2.single cradle frame
3.Double Cradle Motor Cycle Frame
4.Perimeter Frame
5.Trellis Frame

perimeter frame bike chasis

Among the high-performance sports bikes, it is the frame type that is utilised the most frequently. The Twin-Spar frame is another name for the perimeter frame. It is one of the most widely used options for fast sports bikes. This frame type was created usingstudy based on motorcycling competition. It implies that if you attach a bike's steering head to its swing- arm as closely as you can, the rigidity of the bike will be greatly increased. The beams connect the swing-arm to the steering head. They should be more lightweight without sacrificing rigidity. The two beams extend for the swing-arm pivot and encircle the engine.Twin-spar frames were previously composed of steel. However, lightweight aluminium is used in practically all contemporary perimeter frameworks. Performance bikes are popular with this style of motorcycle frame.

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II. LITERATURE SURVEY

Raut, Abhijeet R., and A.

D. Shirbhate” "DESIGN AND ANSYS OF TO WHEELAR COMPOSITE CHASIS FRAME”
The chassis frame is a vehicle's skeleton. The main carriage system of a vehicle is its chassis. There is a frame, suspension, wheels, and brakes on a two- wheeler. Steel is a common chassis material for two- wheelers. Steel makes the chassis frame heavy, which raises the vehicle's overall weight. Today's automotive sectors are focused on weight reduction because it has a significant impact on vehicle fuel efficiency. Composite materials offer an excellent answer to this issue. The goal of this work is to evaluate the studies that have been done on the design and analysis of various automobile parts using composite materials.

Konada, N. K., & Suman,

K. N. S ,”ANALYSIS ON TOWHEELAR CHASISS FROM OF E BIKE SUBJECTED TO STATIC AND IMPACT LOADS ”

In order to regulate gaseous fuel emissions and avoid releasing any dangerous gases into the atmosphere, the automotive industry will develop electrified vehicles in the future. In this study, an effort was made to compare the performance of two wheeled electric bikes manufactured of AISI-1020 material to that of alternative frame materials made of carbon fibre epoxy, grey cast iron, titanium alloy, aluminium alloy, and titanium alloy. Solid work is used to model the Yamaha R15's frame before it is imported into Ansys. The frame was subjected to a load of 1500 N for the static study, and a velocity of 27.7 m/s in the X direction for the impact analysis.

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INTRODUCTION TO CAD

Computer-aided design (**CAD**), also known as **computer-aided 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, provide the user with input-tools for the purpose of streamlining design processes; drafting, documentation, and manufacturing processes. CADD output is often in the form of electronic files for print or machining operations.

The development of CADD-based software is in direct correlation with the processes it seeks to economize; industry-based software (construction, manufacturing, etc.) typically uses vector-based (linear) environments whereas graphic-based software utilizes raster-based (pixelated) environments.

The main modules are

Part Design
Assembly
Drawing

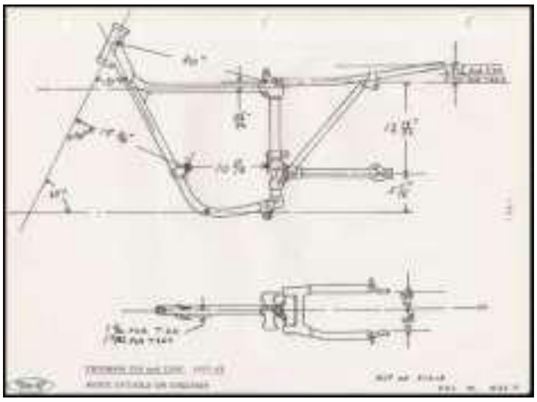

Fig-1 BIKE Models

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PERIMETER FRAME:

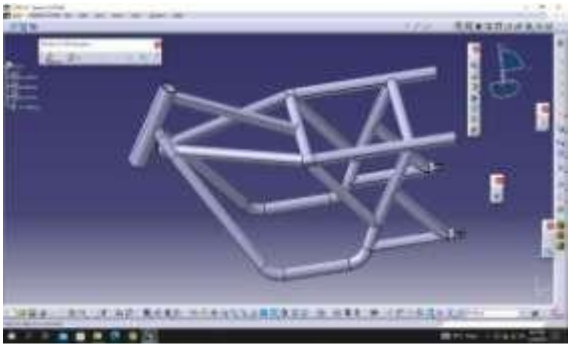

Fig-2 Three dimensional vew

INTRODUCTION TO FEA

Finite element analysis (FEA) is a fairly recent discipline crossing the boundaries of mathematics, physics, engineering and computer science. The method has wide application and enjoys extensive utilization in the structural, thermal and fluid analysis areas.

The finite element method is comprised of three major phases: (1) **pre-processing**, in which the analyst develops a finite element mesh to divide the subject geometry into subdomains for mathematical analysis, and applies material properties and boundary conditions, (2) **solution**, during which the program derives the governing matrix equations from the model and solves for the primary quantities, and (3) **post-processing**, in which the analyst checks the validity of the solution, examines the values of primary quantities (such as displacements and stresses), and derives and examines additional quantities (such as specialized stresses and error indicators).

STATIC STRACTURAL ANLYSIS

Structures that are subject to this kind of analysis include all those that must bear loads. Structural analysis is the process of determining how loads affect physical structures and their components. For the purpose of calculating a structure's deformations, internal forces, stresses, support responses, accelerations, and stability, structural analysis uses methods from the domains of applied mechanics, materials science, and applied mathematics.

The analysis' findings are utilised to confirm a structure's suitability for usage, frequently displacing physical examinations. So, a crucial component of the engineering design of structures is structural analysis. We'll use ANASYS to do analysis on the following motorcycle chassis. In order to undertake structural analysis, we must take a few factors into account

STRUCTURAL ANALYSIS OF TWO WHEELER BIKE FRAME

Explicit Dynamics bike frame at minimum load condition(70kg)

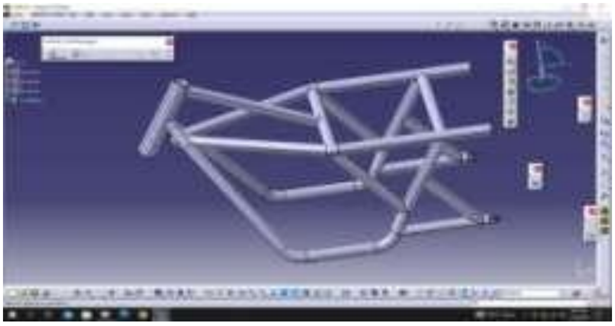

Fig-3 Importing Geometry into Ansys

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Fig-4 Meshing Body

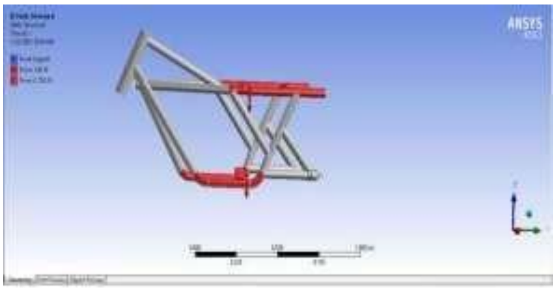

Fig-5 Boundary Conditions

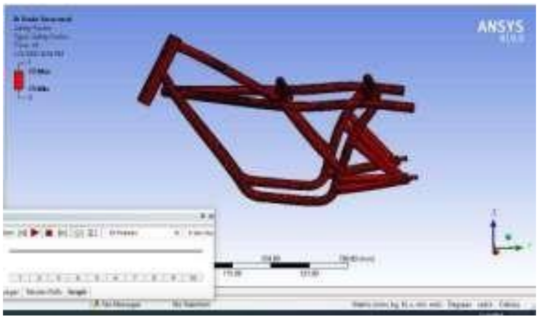

Fig-6safety factor

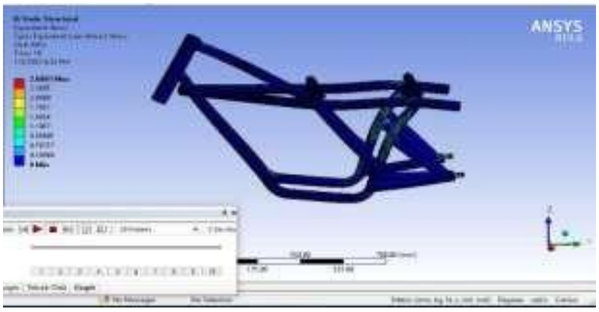

Fig-7static stress

Fig-8total deformation

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Fig-9 reaction forces

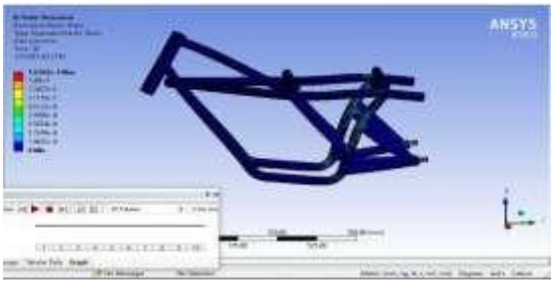

Fig-10 strain

Explicit Dynamics On bike frame maximum load condition(250kg)

Fig-11 boundary conditions

Fig-12 stress

Fig-13 Deformation

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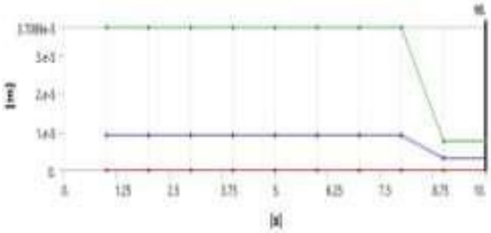
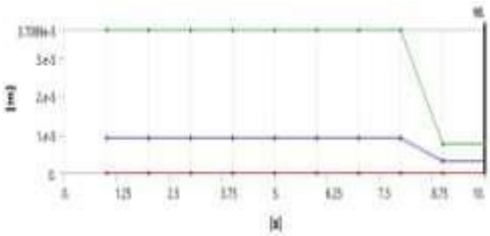
Fig-14 strain

III. RESULTS & DISCUSSIONS

Stress



Total Deformation



PROPETIES	MINIMUM VALUE	MAXIMUM VALU
SAFETY OF FACTOR	4.597	15
STATIC STRESS	1.7921 MPA	1.6614e-0.006 PA
TOTAL	0.206MM	6.76e-0.05

DEFORMATION		M
Reaction forces	3864N	5864N
Strain	5.5874e-5mm/mm	1.046e-0.05 M/M

IV. CONCLUSION

1. Hence, we have designed model successfully in CATIA V5.
2. We have performed design analysis on model using ANASYS SOFTWARE(R19).

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3. Material was selected based on the literature and the loading and shape were analyzed and executed in Ansys. From the analysis results it is inferred that, the steel alloy have passed the factor of Safety and maximum stress value.
4. We are taken this modal manually and the design also assumed manually but it gives accurate values
5. the design and analysis of a bike chassis involve several factors such as the material used, its strength, stiffness, weight
6. The ultimate goal of the design and analysis of a two-wheeler bike chassis is to create a structure that is lightweight, durable, and can handle the forces generatedduring operation without compromising the rider's safety or comfort.
7. The analysis of the bike chassis can be done using various tools such as Finite Element Analysis (FEA) to evaluate the stresses and deformations in the frame.

The final conclusion of the analysis would depend on the specific design and materials used, as well as the intended use of the bike.

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