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Modeling And 3d Printing Of 2-Wheeler Frame

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Abstract: A two-wheeler's frame is a crucial component since it supports the weight of the bike. It must therefore be robust enough to withstand stressors such as shock, twist, vibration, and others. Different kinds of failure in vehicle chassis are caused by both static and dynamic loading moments. Natural frequency, damping, and mode shapes are examples of intrinsic structural characteristics that can be discovered through 3D printing experiments. The aim of this research is to extend the lifespan of two-wheeler bike chassis by the use of 3D printing experiments. Our goal is to lessen the impact of these vibrations because, although undesirable, vibration cannot be completely eliminated.

***Index Terms* – To improve the life of frame.**

1. INTRODUCTION

1 1.1 Function of frame:

The main function of the frame is to support the chassis and its components. To insure positioning of all the Woking components of the frame. To give a rigid foundation for the whole vehicle.

Important function of the frame is to resists static and dynamic loads acting on the vehicle

Fig. 1 2-wheeler frame

1.2 Different Types of Two-Wheeler frame

1. Single Cradle frame

The single cradle frame is one of the simplest designs, featuring a single, nontube tube running from the headstock to the swingarm pivot. It is cost-effective and provides excellent stability, making it a favored choice for entry-level motorcycles.

2. Double Cradle frame

The double-cradle frame is more complex than the single-cradle. It features two separate sections that frame the engine, offering enhanced strength and stability. This design is generally set up in classic and sportfisherman motorcycles.

3. Perimeter Frame Chassis

The perimeter frame chassis, also known as a binary-spar frame, is characterized by a border-like structure that wraps around the engine. This type of designed frame provides a balance between strength and weight, making it suitable for general bikes.

4. Monocoque frame

Monocoque frame uses the body itself as the frame. It is less weight and provides exceptional rigidity. This design is frequently seen in high-performance motorcycles and sports bikes.

5. Trellis Frame Chassis

Trellis frame chassis features a network of tubes welded together to form a lattice-like structure. It offers a unique blend of strength and flexibility, makes it a demand choice among the bike enthusiasts.

6. Backbone Frame Chassis

The backbone frame, as the name suggests, has a single, large backbone that connects the headstock to the swingarm point. It is known for its simplicity and cost-effectiveness, making it suitable for commuter bikes.

2 2.1 Factors Impacting frame Design

Several factors impact include the design of a two-wheeler frame, including the intended use of the vehicle, rider preferences on the vehicle, and manufacturing constraints. Manufacturers precisely consider these factors to produce a frame that meets the asked performance and handling characteristics.

2.3 Performance and Handling

The type of frame a two-wheeler employs has a profound impact on its performance and running. For case, sports motor often feature border frame for their a dexterity and responsiveness, while sportfisherman bikes prioritize stability with double cradle frame.

2.4 Safety Considerations

A well-designed frame also contributes to rider safety. It affects the bike's stability during pushes and its capability to absorb shocks from road defects. Understanding the frame type can help riders make informed choices about their safety on the road.

2.5 Choosing the Right frame

opting the right frame for a two-wheeler depends on individual preferences and conditions. Riders looking for a comfortable, long-distance lift may conclude for a double cradle, while those seeking an adrenaline rush might lean toward a trellis frame.

2.6 Maintenance and Upkeep

Different frame types may brat varying situation of conservation. It's essential for riders to understand the conservation requirements of their chosen frame to ensure the life and ruing of their two-wheelers.

2. FORCES ACTING AN THE FRAME OF A VEHICLE

Different forces act on a vehicle whether it is stationary or moving, and these forces must be countered for the vehicle to be handled smoothly and effectively.

. The following list of forces is applied to the vehicle's frame.

Vertical bending: Vertical bending: Vertical bending is the force that a perpendicular load applies to a machine. The weight of the body and the seated passengers inside the car are supported by this force.

Longitudinal torsion: As illustrated in the illustration, a vehicle experiences longitudinal torsion when one wheel is raised and the other wheels are positioned accordingly. This produces a torsional effect by tending to twist the frame.

Lateral bending: When the car is turning, or more accurately, when it is cornering, the frame bends laterally. The frame is prone to indirect bending due to the centrifugal force operating on it.

Front and rear loading: The vehicle's frame is subject to forces when it is abruptly accelerated or when thickets are applied. The forces acting on the frame are directed towards the front side during breaking and the rear side during acceleration.

Impact loads: The frame collapses or loses shape when the vehicle collides with a solid object. Impact loads are the term for these kinds of unanticipated loads. This also indicates that there has been an accident involving the car.

Overloading: Once more, overloading is a kind of perpendicular load brought on by the vehicle's excess weight.

3. INTRODUCTION OF 3D PRINTING

WHAT IS 3D PRINTING?

Using a layering technique, 3D printing uses computer-aided design to create three-dimensional items. Occasionally, as part of a plan to enhance substance fabrication, 3D printing involves stacking materials such as plastics, composites, or biomaterials to create objects with varying dimensions, strictness, colour, and shape.

Fig 2 3d printer

The significance of 3D Printers

Three-dimensional printers are a promising instrument for the manufacturing industry of the future because of their speed, accuracy, and versatility. Rapid-fire.
prototyping is achieved through the employment of an enormous number of 3D printers.

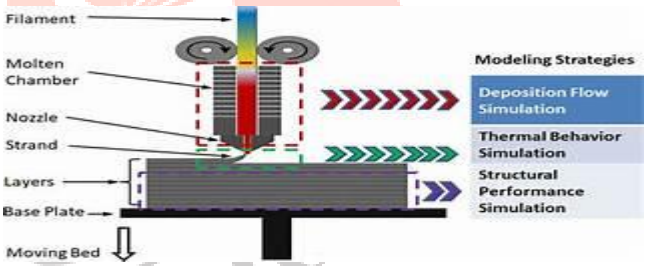
Today, businesses all over the world use 3D printers to create prototypes in a matter of hours as opposed to squandering months of time and maybe millions of dollars on research and development. Some companies even assert that using 3D printers for prototyping reduces costs and speeds up the process by five times compared to using traditional R&D methods.

A role for 3D printers can be played in almost any sector. They are employed for purposes other than prototyping. Finished product printing is being entrusted to 3D printers. In reality, the building sector uses

Types of 3D printing methods

Several manufacturing technologies that create pieces one at a time are included in the phrase "3D printing." Each has a different method for forming metal and plastic components. They might also differ in terms of durability, surface quality, choice of materials, speed, and cost of manufacture. There exist many 3D printing techniques, such as:

Fig. 3 fused deposition method



- ➢ SLA, or stereolithography
- ➢ SLS, or selective laser sintering

The Fused Deposition Modelling (FDM) method

- ➢ DLP, or Digital Light Process
- ➢ Jet Fusion (Multi Jet)
- ➢ Poly-Jet
- ➢ Metal Laser Direct Sintering

The Method of 3D Printing

Eventually, the 3D printer will take control after the object has finished modelling and slicing. In the direct 3D printing technique, the printer functions essentially like a conventional inkjet printer. A snoot moves back and forth, assigning a polymer similar to wax or plastic layer by layer, remaining till that layer dries, and adding the next location. To create a three-dimensional item, hundreds or thousands of 2D printouts are essentially layered on top of each other.

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4. METHODOLGY

- ➢ PROBLEM SATEMENT
- ➢ SLOVING THE PROBLEM TO OVERCOMR IT
- ➢ CREATING THE CAD MODEL AND EXTRACTION. STL FILE (SOLIDWORKS 2021)
- ➢ SLICING (ULTIMAKER CURA SLICING SOFTWARE)
- ➢ 3D PRING
- ➢ RESULT

5. LITERATURE REVIEW

C. R. Sireesha, D. Jawaharlal, and C. H. Neeraja demonstrated a suspension outline that is used on a bike. In Pro/Engineer, demonstrations are conducted. In order to approve our strategy, they conducted auxiliary and modular inquiry on suspension outline using four materials: steel, carbon fibre strengthened polymer, aluminium alloy A360, and magnesium. Observing the results, we can see that the anxiety values for each material are lower than their respective permitted yield stretch values. In summary, the outline was secured at the end. Compared to the other three materials, the carbon fibre fortified polymer showed less uprooting and the same stretch obtained. Therefore, when it comes to configuration, CFRP is a preferable material for the suspension outline.[1]

N. Sefa Kuralay and Cicek Karaoglu conducted a restricted component analysis of a vehicle structure. The study showed that increasing the side portion thickness can reduce weights on the joint ranges, however be aware that the overall body weight increases. Using adjacent plates alone in the joint area can further increase the thickness of the side portions. In this way, the enormous weight of the skeleton shape is avoided. Mohamad Tarmizi Bin Arbain used 3Dmodel in November 2008 to address certain component inquiry concerns related to the exploratory analysis of the auto skeleton. A lot of research has been done on the exhibiting technique using both computational and test modular investigation.[2]

The validity of the suggested method is shown by a correlation between the modular parameters from the trial and recreation. Next, use a straightforward material sort investigation to do a computational anxiety evaluation in order to identify the auto frame's anxiety fixation point.[3]

Using FEM, Karaoglu and Kuralay looked at a stretch study of a truck skeleton with bolted joints. Numerical results showed that by locally increasing the side part thickness, weights as an afterthought portion can be reduced. Fermer et al. used MSC/fatigue to investigate the Volvo S80 Bi-Fuel's weakness life. Conle and Chu conducted research on the adjacent anxiety-strain method and tiredness examination in complex traffic systems. Ferreira et al. have investigated the fundamental improvement of auto parts related to solidity problems.[4]

Filho Et. Al have explored and enhanced an undercarriage outline for a rough terrain vehicle with the fitting dynamic and basic conduct.[5]

In July 2011, Yaşar Kahraman, Kutay Yilmazçoban, and his team made some progress towards body improvement using limited examination. His main goal was to reduce the body's weight, so he used three different thicknesses: 4 mm, 5 mm, and 6 mm. After conducting further research, he concluded that the 4 mm thickness was superior because it caused less anxiety and moved the body more effectively than the other two thicknesses.[6]

6. PROBLEM SATEMENT

Traditional 2-wheeler frames are generally made from steel, aluminum and other good strength material. Generally, the joints are joined by using welding processes and the finishing is done by traditional styles. These methods are impacting the frame life due to change in its properties and structure of the material. Due to this change in properties, the strength of the material at welded region will decreases and may decrease the resistance of corrosion. From the engine and the movements in the vehicle the vibrations will be produced, so this makes the frame to break at the joints due to increase in stresses.

7. SLOVING THE PROBLEM

To overcome form the problem is by using the 3D Printer in manufacturing the frame. The 3d printer prints the frame in layer by layer without any joints. Ther no welding techniques are be not used in this method. To prevent the vibrations in the frame designing has been done with a extra over joints at the meeting point of angled joints.

8. DESIGN OF 2-WHEELER FRAME

Presentation Solid Works

The primary solution for item achievement is CATIA. It takes care of all the associations' assembly. CATIA has connections to a diverse range of industries, including hardware, shipbuilding, automobiles, mechanical equipment, and goods procurement. These days, anything from a plane to clothing and decorations may be outlined using CATIA. With the ability and breadth to handle the entire item development process, CATIA provides a comprehensive foundation for item developing, from initial determination to item in-benefit. It shortens improvement cycles and promotes the reuse of item outline data, which aids in accelerating efforts to respond to market demands.

An intelligent foundation for computer-aided design and manufacturing is called Solid Works. The standard building outline and drafting skills seen in today's assembly organisations are computerised by the CAD capabilities. Modern machine instruments that use the CatiaV5 R16 configuration model to represent the finished product can be programmed with NC thanks to the capabilities of the CAM. The "applications" of typical skills are divided into solid works capacities. Solid Works Gateway is a necessary programme that supports these applications.

It is possible to produce a 3-D demonstration in Solid Works by using three workbenches: sketcher, exhibiting, and get together. The 2-wheeler frame is completely modelled in the figures (4 to 10) below.

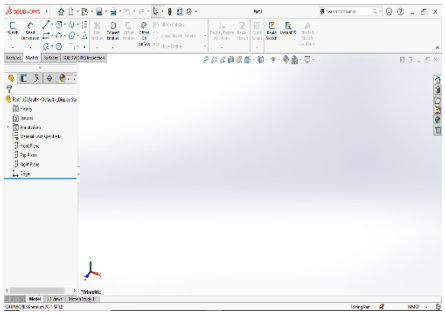

Fig 4. Part design module

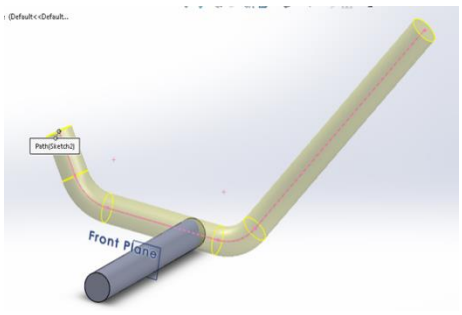

Fig 5. Left Plate for the chassis

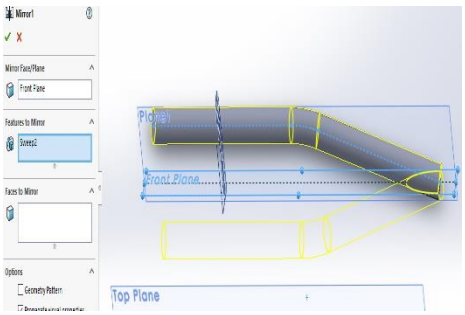

Fig.6 Front plate for the chassis

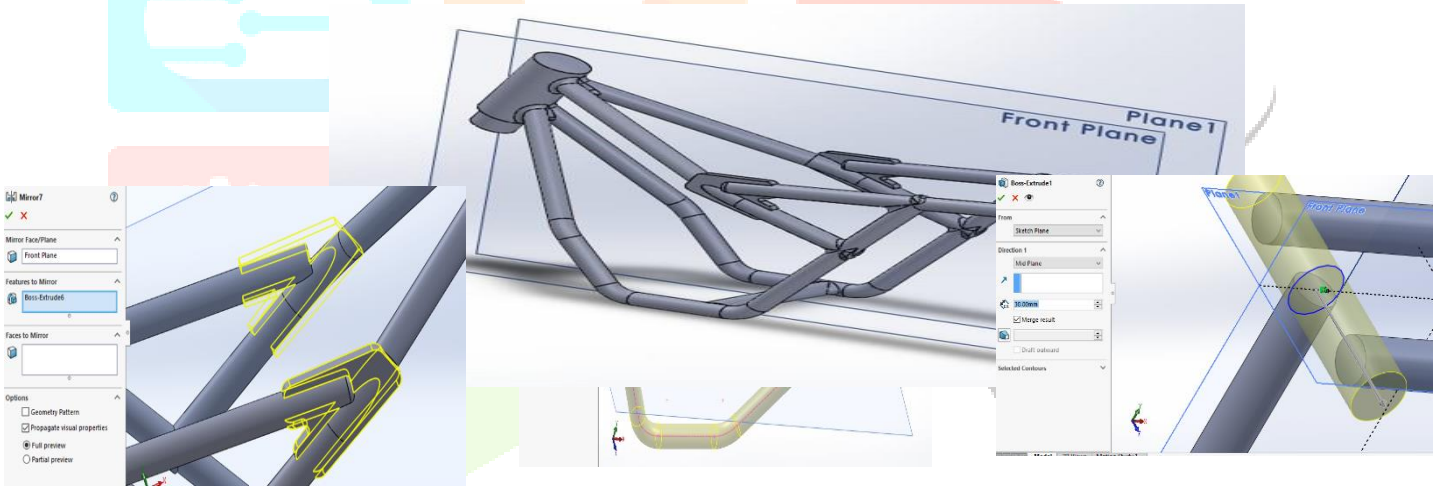

Fig.7 Middle stiffer plate for the chassis

Fig.8 Bore for handle for the chassis

Fig.9 Holder rear the chassis

Fig.10 Final chassis

9.PRINTING OF 2-WHEELER FRAME

After the completing the 3d model of 2-wheeler frame going to the 3d printing. Save as .stl file format. Open the flash forge software and import the 2-wheeler frame file. Adjust and modify the printing parameters like scale and add support structures to the model at the weaker sections and save the file in the fused deposition modelling. fdm format. Now the 3d printer comes into play and stars printing according to our needs. The below figures (11 to 14) shows the conversion of 3d model to final product by using the 3d printer.

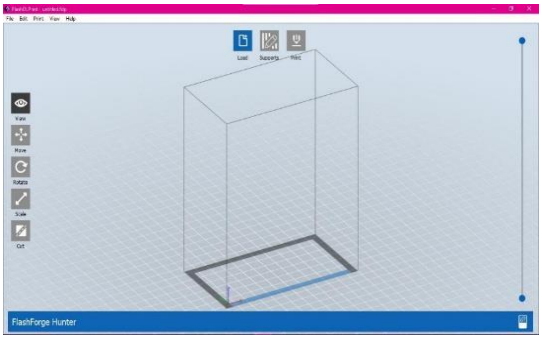

Fig 11Overview of 3D printing software

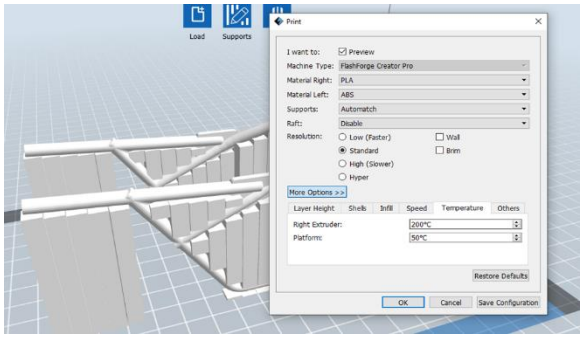

Fig.12 2-wheeler frame body placed on the platform

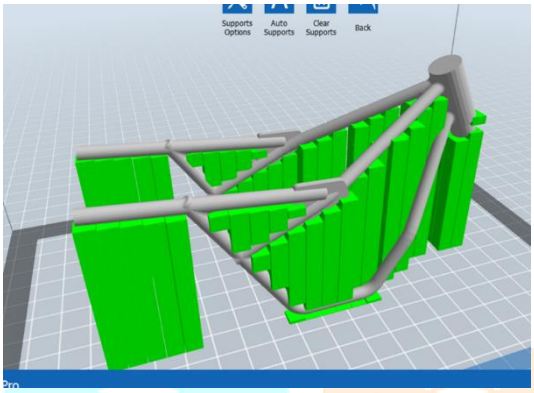

Fig 13 Providing Auto supports to the body

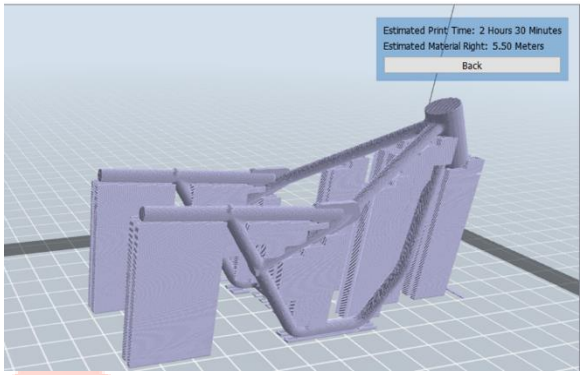

Fig 14 Final estimated print time

11. RESULT

The result of following these steps is a properly designed and prepared 3D model of the 2- wheeler frame, converted to the required file format, configured with suitable support structures, and ready for 3D printing. The model is saved in the appropriate file format (*. svgx or *.fdp) with all the necessary settings adjusted, such as material selection, resolution, layer height, infill density, and fill pattern. The software provides an estimated printing time for the material based on the configured settings. By following these steps, we have successfully prepared the 3D model for printing, ensuring optimal print quality and accuracy.

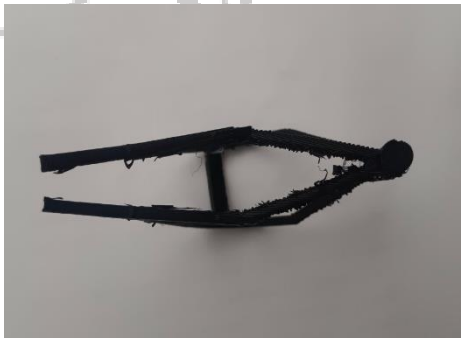

Fig 15 Final design

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