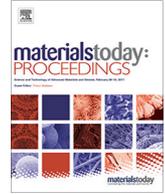




Contents lists available at ScienceDirect

## Materials Today: Proceedings

journal homepage: [www.elsevier.com/locate/matpr](http://www.elsevier.com/locate/matpr)

## Mechanical strength study of Off-Road vehicle chassis body materials

Kaushalendra Kumar Dubey\*, Bhaskar Pathak, Bhuvan Kumar Singh, Pranav Rathore, Shourya Raghav Singh Yadav

Galgotias University, Greater Noida 203201, India

### ARTICLE INFO

#### Article history:

Received 30 March 2021

Received in revised form 8 April 2021

Accepted 10 April 2021

Available online xxxx

#### Keywords:

Features materials off-road vehicle

Tubular chassis framework

Roll cage

Mechanical strength

ANSYS model

Impact test

### ABSTRACT

The design and development of vehicle chassis is essential part of automobile production sector because the vehicle self-weight and entire external load (including passenger weight) are built on the chassis frame. The chassis is a significant integral part of the vehicle. The design and development of Off-road vehicle (ORV) are to be influenced by design criteria, its material selection, and components convenience. This paper is covering the material behaviour study of ORV chassis in terms of mechanical strength, durability, fatigue, etc. The result of proposed work is get the best techniques to build the safest roll cage (RC) as per material selection, designing, ergonomics, manufacturability and different parameters that have to be kept in intellect whereas planning an off-road vehicle. This venture will accomplish an off-road vehicle that looks aggressive and at the same time keeps the driver and other crucial constituents like motor, powertrain etc. unharmed interior of the RC. The 22 commercial engineering materials have been investigated for chassis development, mainly AISI 4130 material is most popular due to high tensile strength in all available materials. The ANSYS model of tubular chassis frame has been demonstrated in terms of front, side and rare impact load according to SAE vehicle development norms.

© 2021 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the 3rd International Conference on Futuristic Trends in Materials and Manufacturing.

## 1. Introduction

Off road vehicle is shaped to race and steer on different terrains. ORV is designed in such a way that it can endure off-roading terrains. In off-terrain circumstances, the vehicle bears dynamic loads and all that is sustained through the chassis frame. Chassis frame bears every mountings and assembly, so it is expected from an ORV chassis frame to sustain both static and dynamic loads. The selection of materials for chassis greatly depends on the high tensile strength and material light weight. The majority of manufacturers favour lightweight, cost-effective, safe, and recyclable materials.

## 2. Engineering materials for ORV chassis body.

The high tensile strength and light weight, chassis frame work is often made of steel and aluminum alloy-based engineering materials. Several scientific and technical developments have been

carried out, and significant research works in a broad variety of engineering content reviews are available. Shiva Krishna J et al. have selected the material among AISI 1018, AISI 1020, AISI 4130 and Cross-Section of the material for the manufacturing of Chassis and Roll-Cage. They used SolidWorks 3D modelling software for designing of chassis and used Ansys workbench for analysis of it [1]. Ketha Jaya Sandeep have selected material between AISI 1018 & AISI 4130, Cross-section Determination, Design Consideration and Ergonomics. For Design, SolidWorks 2018 is used and for Analysis FINITE ELEMENT METHOD (FEM) is used [2]. Shubham S. Kapadne et al. discuss how FEA and Ansys for simulation can be used for stress analysis of the RC. CATIA software is used to build 3D parts [3]. According to Kodavanti V R S N Murthy et al the material Selection for the vehicle's skeleton based on the FOS and Stress produced, the condition of the land and track on which the ATV is needed to operate, and the allotments provided for other subsystem components to be mounted on the RC. Frame Design by including calculations of Moment of Inertia, Bending Strength, Bending Stiffness, the FEA which includes Front Impact, Rear Impact, Side Impact, Rollover Analysis, Torsional Analysis and these Analysis are being performed on Ansys APDL 19.2 [4]. Market usability, Ergonomics, Safety, Components expense, Serviceability,

\* Corresponding author.

E-mail address: [kaushalendra.dubey@galgotiasuniversity.edu.in](mailto:kaushalendra.dubey@galgotiasuniversity.edu.in) (K. Kumar Dubey).

<https://doi.org/10.1016/j.matpr.2021.04.147>

2214-7853/© 2021 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the 3rd International Conference on Futuristic Trends in Materials and Manufacturing.