ISSN: 2582-7219

International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Impact Factor: 8.206 **Volume 8, Issue 3, March 2025**

© 2025 IJMRSET | Volume 8, Issue 3, March 2025| DOI: 10.15680/IJMRSET.2025.0803335

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Design and Analysis on After Life of Car Typre using Ansys

Dr K.Ariyanayagam , Mr S.Rakesh , M.Jamal Mohideen,S Mukesh Kanna, M.A.Mohideen, B.Jeyanth Jashwin

Assistant Professor, Department of Mechanical, Francis Xavier Engineering College, Tirunelveli, Tamil Nadu, India

UG Student, Department of Mechanical, Francis Xavier Engineering College, Tirunelveli, Tamil Nadu, India

ABSTRACT : Once the conventionl tyres are torn out the material of the tyre becomes wastage and over years so much of wastage may produce due to the automobile tyres. In order to overcome these, non-pneumatic () tyres are introduced in which the design is simple and durable. No air inside the tyres which makes it to stick to the surface for a little and gives more grip for the vehicle.
The main thing in the tyres is the rubber or the material. The profile adds the stiffness to the tyres.

I. INTRODUCTION

For more than 100 years, cars have been rolling along on cushions of air encased in rubber. From time to time, we get used to certain products and we may not be able to make changes for years or years. This is where the story of progress begins. Several tire companies began trying to manufacture non-pneumatic tyres such as Michelin and Bridgestone, but none of the designs led to the production of consumer goods. The tire pressure system has better results than one might think. First, there are important security benefits. The use of tyres eliminates the possibility of tyres falling and can reduce road hazards. Even in conditions like the military, the use of non-pneumatic tyres has a significant impact on safety. tyres are military vehicles and are often explosive. If this vehicle uses tyres, this is not the case.

The use of this type of tire also has environmental benefits. Ventilated tyres do not need to be discarded and replaced in the same way as flat tyres, as they are not damaged and legible. This will reduce the size of the trash. I think it's very important to keep researching more and developing windless tyres. This type of innovation works very well with various engineering principles and requires engineers everywhere to adopt it. Cars are things. People use it every day, so improving its quality will affect the lives of many people. Therefore, I think studying a subject like this is very valuable, especially for those of us who are new to engineering. For topics that make sense, we can see that what we do is different.

II. PROBLEM IDENTIFICATION

The Common Problem Identified In Pneumatic Tyre:
Since the car is the only point of contact on the road, the main cause of the problems encountered is probably related to the tyres. It is important to know the signs of Tyre problems so that you can fix or fix it. Replace the vehicle immediately after discovering the problem to ensure that your vehicle is always safe to drive.
Our Munster Tyre team has compiled guidelines for the most common Tyre problems that drivers may encounter.
Over Inflation:
Over-inflated tyres cannot work safely because the more tyres are inflated, the more difficult it is for them to maintain contact with the road surface and impart.

III. COMPUTER AIDED DESIGN

Computer-aided design (CAD) is defined as the application of computers and graphics software to aid or enhance the product design from conceptualization to documentation. CAD is most commonly associated with the use of an

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

interactive computer graphics system, referred to as a CAD system. Computer-aided design systems are powerful tools and in the mechanical design and geometric modelling of products and components.

IV. FINITE ELEMENT ANALYSIS

The finite element method is a numerical method that can solve continuous mechanical problems with acceptable accuracy to engineers. The finite element method is a mathematical modeling tool that can discretize continuous regions using structural blocks called finite elements. At the same time transfer other nodes. This process includes finite element modeling and finite element analysis. In displacement-based FEM, the stiffness of the entire structure (part or assembly) is determined by the stiffness of each element. Apply loads and constraints to nodes, and use matrix methods and numerical methods to solve simultaneous equations. Therefore, the finite element method is a numerical method for solving ordinary differential equilibrium equations. Starting from simple linear static stress and heat transfer analysis, various popular software (including Cosmos, NASTRAN, ANSYS and NISA) can be used to successfully analyze complex models of nonlinear fluid flow and dynamic events on a personal computer. Three steps in finite element calculation.

Modeling
Mesh the model
Analysis

V. STRUCTURAL ANALYSIS

Structural analysis is probably the most common application of FEM. The term "structure" includes not only technical structures such as bridges and buildings, but also aircraft and mechanical maritime structures and mechanical structures such as ships, zeros, airplanes, and fuselages. Parts such as pistons, machine parts and tools. The following are the seven types of structural analysis available in the ANSYS product line:

Static analysis
Modal analysis
Harmonic analysis
Transient dynamics analysis
Spectrum analysis
Buckling analysis

VI. MESH GENERATION

Discretize the geometry to form a network of elements and nodes. This means that the structure is divided into small subdomains in which numerical simulations of constitutive equations can be created. The grid design depends on the following.

The geometry of the structure.
Analysis type, ie static, dynamic, thermal or nonlinear
Boundary conditions
Loads
Required results

VII. MESH THE MODEL

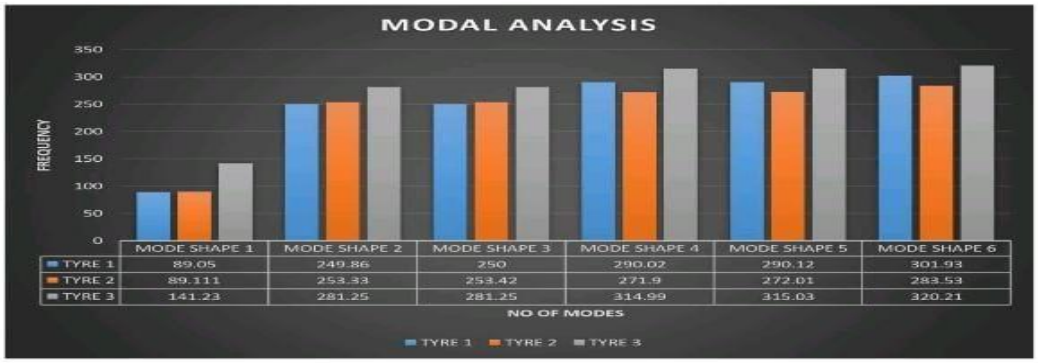
Meshing involves three main steps:
Set the element attributes and material properties
Set mesh controls
Generate the mesh Elements attributes
Before meshing the model, elements attributes should be specified based on the
material, analysis and also on the required results. The elements used in this analysis are explained in the following sub-topics.
Minimal assumptions are used in arriving at the slope of nonlinear force- displacement relationship, i.e., element target stiffness hence; they are also called consistent formulations.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

5.5.1 Modal Analysis graph



Graph:5.5 Bar Graph.

VIII. CONCLUSION

Use of air-less tyre eliminates disadvantages faced by pneumatic tyres. Air-less tyre provides uniform adhesion and uniform wear while absence of air. The tyres need not to be replaced very often and if it wears out and needed to be replaced the outer band of the tyre is replaced which saves material in manufacturing point of view. In pneumatic tyres, there was a high possibility of the flatten which can cause more number of accidents. Using tyres it's an outsized impact on safety. If the vehicles with tyres are used then one needn't worry about safety. Another benefit is that they're going to be reused and earlier tyres go flat and wish to be thrown away so there was the need for the event of tyres. Driving these vehicles reduces mind-stress. In this work there dimensional model of tyre with different spoke structures are generated and finite element analysis is carried out. From the FEA results of different structures, the tyre with honeycomb structure is replaced with fill of material structure proves to be more durable than other structures and the conventional tyre.

The NPT based on honeycomb structure is replaced with fill of material spokes can be used to replace a conventional pneumatic tyre since they provide uniform traction and wear as that of conventional tyre and also it offers good strength, fatigue life (endurance limit), reliability and reduces the overall weight and cost than the conventional pneumatic tyre.

REFERENCES

[1]. A.Kwon. (2012) Design Spotlight: The Tyre. Gear Patrol (Online article) http://gearpatrol.com/2012/05/24/design-spotlight-the--tyre/ p. 1
[2]. E.Grabianowski. (2011). How the Tweel Tyre Works How Stuff Works (Online article) http://auto.howstuffworks.com/tweel--tyre.htm p. 2
[3]. D.Sherman. (2012). Tech Dept.: The Latest on the Tyre-and-Wheel Combo Car and Driver (Online article) http://www.caranddriver.com/features/tech-dept-the-latest-on- the--tyre-and-wheel-combo-tech-dept p. 1
[4]. B.Mattmiller. (2008). Tyre Project May Prove a Lifesaver in Military Combat. University of Wisconsin News Archive (Online article). http://www.engr.wisc.edu/news/archive/2008/Jul08.html p. 1
[5]. Tyre Project SciTech Industries (2012). (Video) http://vimeo.com/41741265 [6]. Goodyear's Prototype Non-pneumatic Lunar Tyre Unexplained-ysteries.com (Online article) http://www.unexplained mysteries.com/forum/index.php?showtopic=69787&st=150
[7]. M. Mazzoni (2011). Bridgestone Debuts Car Tyre Earth911.com (Online article) http://earth911.com/news/2011/12/06/bridgestone-debuts--car-tyre/ [8]. http://curiosity.discovery.com/question/downside-with-tweel--tyres
[9]. Kwame Opam on November 18, 2013http://www.theverge.com/2013/11/18/5117710/polaris-latest-atv-has-- tyres-that-can-withstand-50-caliber
[10]. Mohammad Fazelpoue "A comparison of design approaches to meso-structure development". ASME journal paper DETC 2013-12295, 2013, doi: 10.115/ DETC 2013- 12295.
[11]. A.M. Aboul-Yazid., "Effect of spokes structure on characteristics performance of non-Pneumatic tyres," ISSN: 2180-1606 Volume 11, pp. 2212-2223, January-June 2015. [12]. Bert Bras., "Life-cycle environmental impact of

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Michelin tweel tyre for passenger vehicles" SAE International Journal 2011-01-0093, 2011, doi: 10.4271/2011-01-0093. [13]. Pajtas, S., "Polyurethane non-pneumatic tyres technology-development and testing history," SAE Technical Paper 900763, 1990, doi: 10.4271/900763.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com