IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)
e-ISSN: 2278-1684,p-ISSN: 2320-334X
PP. 35-37
www.iosrjournals.org

Design and Analysis of Wheel Hub

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Abstract: *In this project various methodologies adopted by present researcher for analysis of Mahindra TUV wheel hub and upright assembly with main objective of analysis and optimization of the vehicle. This review will assist researchers working in the field of development of the structural design and mass reduction of vehicle through optimization methods conducted by FEA software viz. Catia V5 R20 and Ansys (workbench 16). The review includes key areas of researches as shape optimization, static load analysis and fatigue load analysis using FEA. This literature progressively discusses about the research methodology, software and the outcomes of the discussed researches and is intended to give a brief variety of the researches carried out on the wheel hub and upright assembly*

I. Introduction

Wheel & upright assembly is the important part of vehicle suspension system. Upright is also called as knuckle. Hub & upright assembly are support to vertical weight of the vehicle. Hub is important part of wheel assembly system .It is used to transfer the motion vehicle into wheel. Maximum Speed for the sport car. The Designer keeps as the key factor. Design the vehicle of the minimum weight and maximum stresses ability. Weight & Mass reduction can be reduced by such method of material selection, Optimum design analysis system. Hub are Transfer the whole weight of the vehicle into wheel. Hub are usually attached to motor by closely sliding over and locking into engagement with their shaft, transferring torque from the motor, through hub & wheel.

II. Present Work

The automotive suspension a steering upright is that part which contain the wheel hub or spindle & attaches to the suspension component, variously is known as steering knuckle, spindle, upright or hub. Wheels are normally attached to hubs via the wheels face or its centre. The wheel is attached through fastener To hub due to the good strength &can easily removed for servicing. Wheels are normally attached to the motor by closely sliding over and locking into engagement with their shaft transferring torque from the motor through the hub & to the wheel. Present TUV hub made from mild steel and design.

2.1) Previous Researches

Razak et al [1], carried out analysis for lightweight and optimized design of steering knuckle using aluminum 6061-t5 alloy (yield strength 276mpa).that conclude alloy to be best material for the component due to better physical and mechanical properties.

Dyapa and shenoy [2],carried out model analysis using upsprung mass to improve dynamic of the vehicle. the conclude that the steel upright can definitely replace aluminum without affecting the performance.

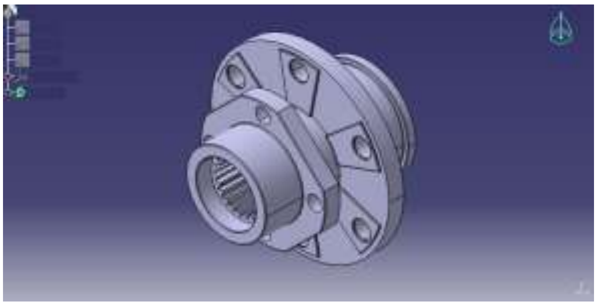

Fig 1. -catia model of TUV wheel hub.

III. Experimental Work

In this experiment the adding the composite material [carbon fiber (2%)+Kevlar(0.8)] in stainless steel material and make hub model. analysis the both present mild steel hub and stainless steel hub.

3.1) Experimental Process & Result.

1) Design the present wheel hub of TUV Mahindra.
2) Analysis the design wheel hub.
3) Changes the material & add composite material.
4) Analysis of changing material wheel hub.
5) Compare two analysis results and manufacture hub by best material result.

3.2) Result of Analysis

Table II A) Mild Steel Material (Analysis Test Result)

Sr No	Test Name	Result
1	Deformation	0.0068168 mm
2	Maximum Shear Stress	55.549 Mpa
3	Maximum Principal Stress	125.9 Mpa
4	Equivalent (von-Mises)Stress	104.61 Mpa

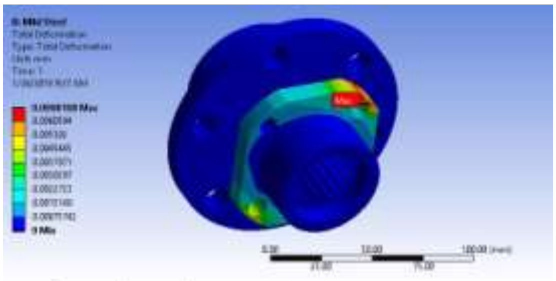

Fig.2. Deformation Analysis Result

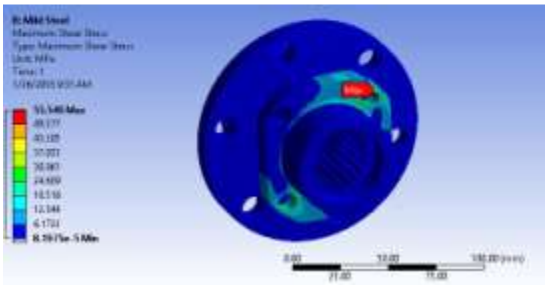

Fig.3. Maximum Shear stress Analysis Result

Fig.4. Maximum Principle Stress Analysis Result

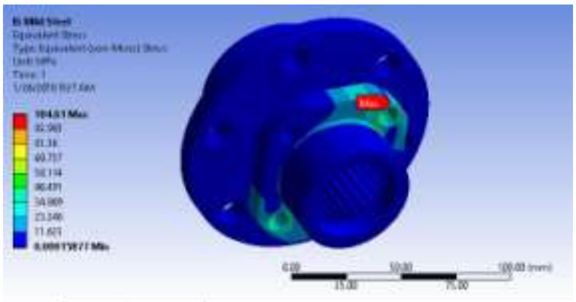

Fig.5. Equivalent(von-misses) stress Analysis Result

Table II B) Stainless steel with composite Material (Analysis Test Result)

Sr No	Test Name	Result
1	Deformation	0.0070774 mm
2	Maximum Shear Stress	55.735 Mpa
3	Maximum Principal Stress	126.44 Mpa
4	Equivalent (von-Mises)Stress	104.61 Mpa

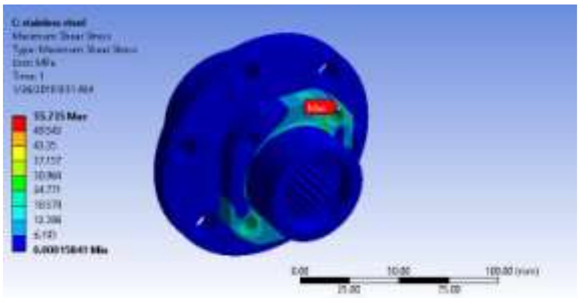

Fig.6. Deformation Analysis Result

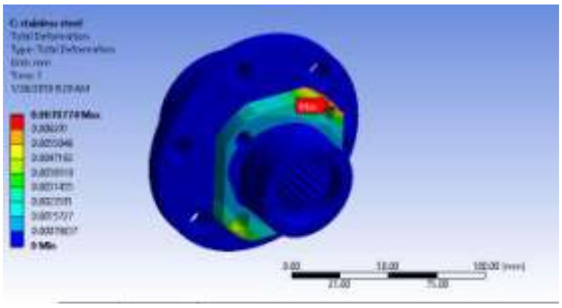

Fig.7. Maximum Shear stress Analysis Result

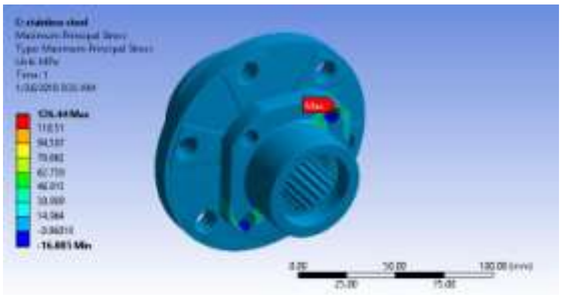

Fig.8. Maximum Principle Stress Analysis Result

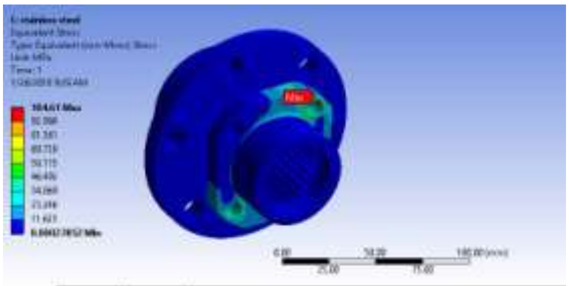

Fig.9. Equivalent(von-misses) stress Analysis Result

IV. Conclusion

1) Adding composite material on the stainless steel (carbon fibre+kevlar), result are increase the stress capacity of wheel hub model.
2) Also increase the one-mises stress & shear stress of wheel hub model.
3) Reduce upspring mass by using or adding composite material for manufacturing the wheel hub.

Acknowledgement

I give immense pleasure to present paper on "design and analysis of wheel hub" prepare this paper no of hand helped directly and indirectly therefore it become my duty to express my gratitude towards them.

I would to take this opportunity to express my sincere gratitude to my project guide Dr N K Nath &co-guide Dr S.B.Satpal for this guidance support and encouragement.he valuable encouraged me to take sincere effect for enhancing quality of paper

I like to convey my gratitude to a Dr A.B Auti, Director JSPM, NTC and Dr J.S Gawande, HOD, Mechanical Engineering and entire staff of Mechanical Engineering Department Of their valuable guidance and co-operation.

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