IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

State Level Conference – AITCON 2K24

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 11, Special Issue 1, March 2024

Design, Manufacture And Analysis Of Wheel Hub

Rohit B Pawar[1], Sajid M Tamboli[2], Swati V Koli[3], Arati S Jadhav[4], Abhishek D Bhise[5]

Academic Coordinator, Mechanical Department, SPA, Atpadi India[1]

Lecturer, Mechanical Department, SPA, Atpadi, India[2-5]

Abstract: In this method various method captured by present researcher for analysis of Mahindra TUV wheel hub and total main objective of analysis and make fully preferred vehicle. This research develop the structure design and mass reduction of vehicle through method conducted by FEA software via,catia v5,ansys(work bench16).In this literature discusses about research methodology ,outcome about discussed researches and planning to brief variety of researches out on the wheel hub and upright assembly.

Keywords: Mahindra TUV ,FEA software ,catia v5 and ansys (workbench16).

I. INTRODUCTION

Wheel and upright assembly are two important part of the vehicle suspension system .hub is supported to vertical weight of the vehicle hub is the main part of the wheel assembly . It is used to transfer the motion vehicle into wheel ,designer keep as the key factor ,design the vehicle of the minimum weight and maximum stresses capability. Hub through the all weight to vehicle into wheels .weight and mass reduction can be reduced by method of material selection and optimum design analysis system. The function of wheel hub vehicle is also the recovery of braking energy .during the braking process kinetic energy of the vehicle is transferred to the motor through the wheel. Wheel hubs application is also used to attach lifting arms, release doors and pulleys to motor shafts, etc. Wheels are mounted on to hubs via the wheels face or it's Centre. The wheel is attached through fasteners for easily removed for storage or servicing and hub is good strength. Hubs are typically attached to the motors by closely sliding over and locking in to engagement with their shafts transferring torque from the motor, through the hub and to the wheel. Here the manufacturing hub must be capable of rigidly supporting it's contribute of he total weight of a vehicle without fail during its expected life span. If the hub geometry and material selection are too low in quality, then it will break assembly which cannot be repaired after the failure.

1.2 The Wheel Hub Function- The Wheel Hub, in most applications the centre of a wheel, or other rotation components. The Hub mainly used to attach a bearing which allows the wheel to rotate around an axle. The bolt and attachment for the wheel is a part of the Wheel Hub. Wheel Hub's located at a driven axle of the car transfer torque from the driveline to the wheel. The Wheel Hub's on the rallycross car is equal due to cost reduction and the fact that the car is four-wheel-driven. The current assembled Wheel Hub with upright, which is a part of the suspension that attaches the Hub

II. PRESENT WORK

The automotive suspension a steering upright is the part of which contain the wheel hub or spindle & attaches to suspension components known as steering ,knuckle ,spindle ,upright or hub.wheel are normally attached to hubs via the wheels face on its Centre. The wheel is attached through fastener to hub due to good strength and can easily remove servicing.

Wheel are normally attached to the motor by closely sliding over and locking into engaged with their shaft transferring torque from the motor through the hub and to the wheel, present TUV hub made from mild steel material.

2.1 Previous research-

Razok of[1],carried out analysis for light weight and optimized design of steering knuckle aluminum 6061-ts alloy that conducted alloy to be best material for the compact due to transfer physical and mechanical property.

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

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

State Level Conference – AITCON 2K24

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 11, Special Issue 1, March 2024

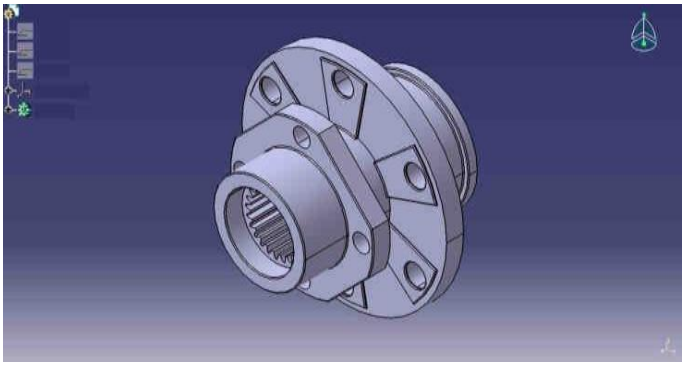

Fig 1.Catia Model of TUV Wheel Hub

III. EXPERIMENTAL WORK

In this experiment the adding composite material [carbon fibere (2%)+kerlar(0.8%)] is stainless steel material and hub model. after adding this composite material analysis the both present mild steel hub and stainless steel hub.

3.1) Experimental processes-

1) Design the present wheel hub of TUV Mahindra
2) Analysis the wheel hub
3) Change the material and add the composite material .
4) Analysis of changing material wheel hub
5) Compare two results.

3.2) Result of analysis

Table I A] Mild steel material

Sr.No	Test name	Result
1	Performances	0.0067616 mm
2	Maximum shear stress	55.589 Mpa
3	Maximum principle stresses	125.54 Mpa
4	Equivalent stresses	106.61 Mpa

Table II B] Stainless steel material with composite material

Sr.No	Test name	Result
1	Performances	0.00707422 mm
2	Maximum shear stress	55.855 Mpa
3	Maximum principle stresses	126.68 Mpa
4	Equivalent stresses	106.61 Mpa

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

State Level Conference – AITCON 2K24

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 11, Special Issue 1, March 2024

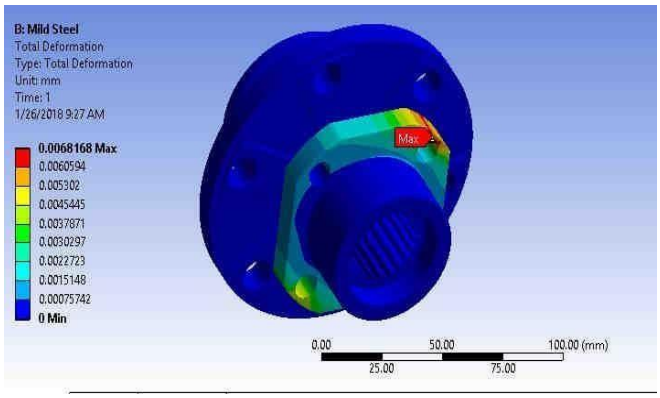

Fig. 2.Deformation Analysis Result

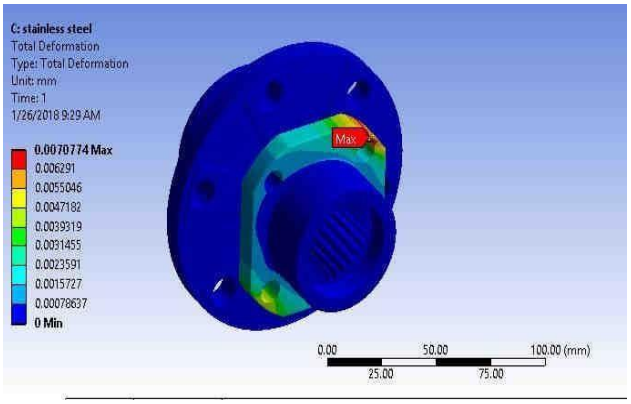

Fig.3.Deformation Analysis Result

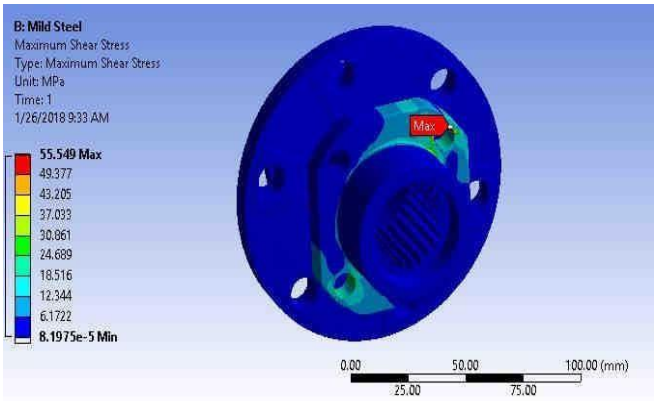

Fig.4.Maximum Shear Stress Analysis Result (Mild Steel)

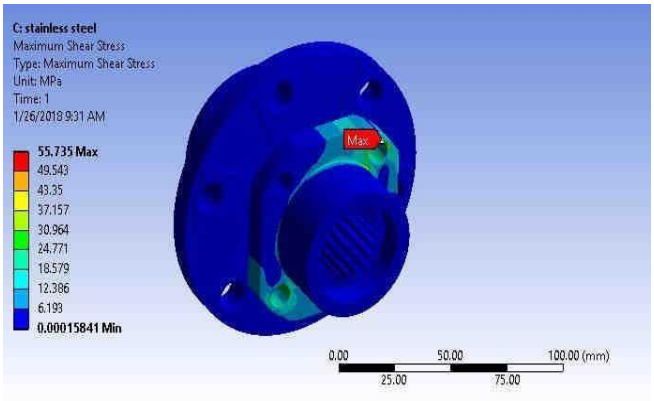

Fig.5.Maximum Shear Stress Analysis Result (Stainless steel)

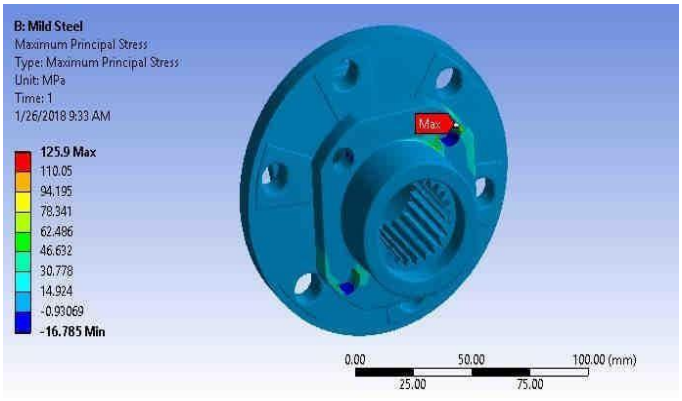

Fig.6.Maximum Principle Stress Analysis Result

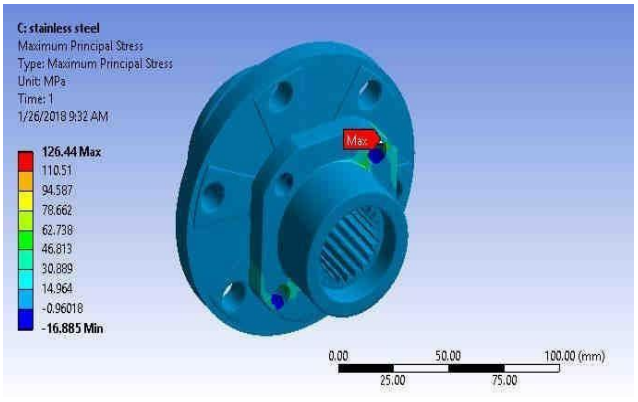

Fig.7.Maximum Principle Stress Analysis Result

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

State Level Conference – AITCON 2K24

Adarsh Institute of Technology & Research Centre, Vita, Maharashtra

Vol. 11, Special Issue 1, March 2024

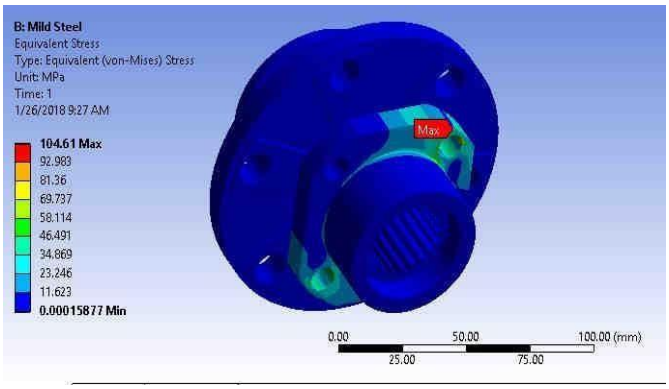

Fig.8.Equivalent (von-Mises) stress Analysis Result

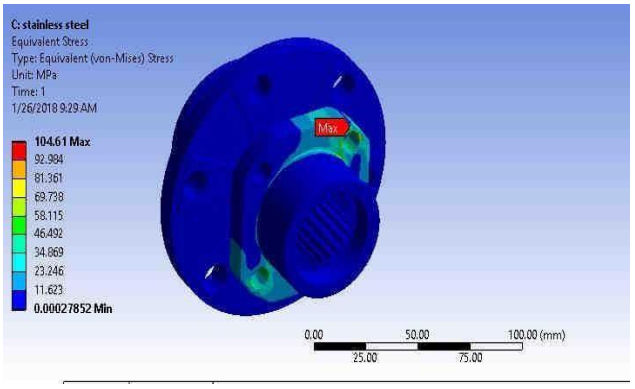

Fig.9.Equivalent (von-Mises) stress Analysis Result

IV. CONCLUSION

1) Adding composite material on the stainless steel (Carbon fibre+Kevlar) result are increasing the stresses capacity of wheel hub
2) Also increases the shear stress
3) Reduce the weight when adding composite material in the wheel hub.

ACKNOWLEDGEMENT

I give immense pleasure to present paper on design and analysis of wheel hub prepare this present work on 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 guide **Mr. Rohit B. Pawar** for this guidance support and encouragement. He valuable encouragement me to take sincere effect for enhancing quality of work.

I like to convey my gratitude to **Mr.Onkar G.Kulkarni**, Principal of Shivaji Polytechnic Atpadi, And **Mr.Prashant S.Gonjari**, HOD, Mechanical Department And entire Staff of Mechanical Engineering Department of their valuable guidance.

REFERENCES

[1].Suhaimi,Khalis bin."Design And Fabrication Of An Upright With Brake Caliper Mounting For Formula Versality Race Car" dissertation, april 2011.
[2].Kulkarni,V,R.and Tambe, A.G.;" Optimizationand Finite Element Analysis of Steering Knuckle", Altair Technology Conference, 2013.
[3].Razak I.H.A, Yusop M.Y.M, Yusop M.S.M, Hashim M.,Modeling, Simulation And Optimization Analysis Of Steering Knuckle Component For Race Car, International Journal of Research in Engineering and Technology,Volume: 03 Issue: 11, eISSN: 2319- 1163 — pISSN: 2321-7308, Nov- 2014, Pp.221-225.
[4].Dyapa, Anudeep Reddy and Shenoy,Vishal.,"Design And Analysis Of Upright Of An FIA Related Cruiser Class Solar Electric Vehicle"," International Journal of Engineering Research and Technology (IJERT)", ISSN: 2278-018, oct,2014, Pp.1062-1066.
[5].Gill,Simren.,Hay,Philip.,Mckenna, patrick., and Thibodeau, Philippe;"Final Design" Dalhouse Formula SAE " April 8, 2011.
[6].Song, Chang Yong.and Lee,Jongsoo.,Reliability-Based Design Opti- mization Of Knuckle Component Using Conservative Method Of Moving Least Squares Meta-Models, Probabilistic Engineering Mechanics, vol.26 (2011),Pp. 364-379.
[7].Babu,B., Prabhu,M., Dharmaraj,P. and Sampath,R.,"Stress Analysis On Steering Knuckle Of The Automobile Steering System", IJRET: Inter- national Journal of Research in Engineering and Technology,Vol.3,NO.3, eISSN: 2319-1163 — pISSN: 2321-7308, 2014, Pp .363-366