DESIGN AND ANALYSIS OF FRONT AXLE FOR HEAVY COMMERCIAL VEHICLE

Barnala Satyanarayana, Master of Technology, Department of Mechanical Engineering, SVR Engineering College, Nandyal.

Amarnath Reddy, Assistant Professor, Faculty Of Engineering & technology Department of Mechanical Engineering , SVR Engineering College, Nandyal.

P. Hussain, Associate Professor & HOD, Faculty Of Engineering & technology Department of Mechanical Engineering , SVR Engineering College, Nandyal.

ABSTRACT

Front hub conveys the heaviness of forward portion of the Automobile, just as encourages controlling and ingests stuns because of street surface varieties. The front pivot is intended to send the heaviness of the Automobile front the spring to the front wheels, turning both ways as required. So legitimate plan of front hub shaft is incredibly essential. The paper manages plan and investigation of front pivot. A similar investigation with assistance of FE results were contrasted and systematic plan. For this particular vehicle – use has been made of its gross weight, payload cap, slow down force used to discover the law stresses and redirection in the bar. In CAD programming and analysis in ANSYS programming, the resulting advance front pivot was demonstrated.

1. INTRODUCTION

A car industry is one of the significant and key segments of the Indian economy. The car business incorporates of car segment, auto segments and incorporates business vehicles, traveler vehicles, multi-utility vehicles, bikes, three wheelers and related automobile parts. The requests on the car originator expanded and adjusted quickly, first to meet framework security needs and later to decrease weight in order to fulfill mileage and vehicle execution prerequisites. Motor area critical to give more noteworthy soundness and wellbeing at high speeds by bringing down the focal point of gravity of the street vehicles; the total community segment of the pivot is dropper.

Front axles are exposed to both bowing and shear stresses. In the static condition, the hub may be considered as shaft upheld vertically upward at the finishes (at the focuses of the spring cushions

Under the dynamic conditions, vertical bowing second is expanded because of street harshness. It is extremely difficult to locate the break proliferation in a limited time frame along those lines. So it is important to join limited component system. During the procedure on vehicle, street surface anomaly causes cyclic vacillation of weights on the hub, which is the fundamental burden conveying part. Subsequently it is important to ensure whether the hub opposes against the exhaustion disappointment for an anticipated help life. Hub encounters totally various burdens various way, basically twisting burden or vertical radiating because of check

weight and payload, twist, because of drive force, cornering load and slowing down burden.

Front hub will encounter a 3G load condition when the vehicle goes on the knock. Performing physical test for vertical radiating weakness load is costly and tedious. So there is a need for building FE models which may essentially reenact these heaps and can foresee the conduct. Despite the fact that the FEA produce genuinely precise outcomes, arrangement exactness vigorously relies upon precision of info conditions and in general displaying philosophy used to speak to the real material science of issue. Along these lines approval of FEA model is of most extreme significance. Commonly FEA model is approved by connecting FEA results.

2. LITERATURE REVIEW

MT250D Mitsubishi Tractor with 25hp force is a little horticulture farm truck which is utilized to do light rural activities. So as to do go mud romping activities, a front mounted mechanical scoop with complete weight 400kg that including water powered hardware for instance the heaviness of pressure driven chamber was included the front of the farm truck and hence, the static load on the front pivot lodging was expanded. In this investigation, to do displaying of lodging, Solid Works programming (Version2010) was utilized. So as to utilize limited component technique for static and dynamic investigation, Cosmos Works Software (Version 2010) was utilized. Limited component investigation results demonstrated that the most extreme worry of 238.84MPa is applied on the upper lodging. As indicated by Von-Misses hypothesis, the estimation of most extreme applied pressure and reasonable pressure, the security factor of 1.05 was gotten which is not exactly the necessary worth. The initial four characteristic frequencies of lodging were found as 678.54, 720.29, 908.78 and 1877 Hz, individually. The got factor of wellbeing is low and clearly this worth declines under powerful stacking states of field activity. The current investigation plainly demonstrates that the front hub lodging of MT250D Mitsubishi work vehicle isn't sufficiently able to be mounted on a farm truck. There is a need to enhance the current plan of the front hub lodging, in the event that we need to utilize a mechanical scoop.

A hub is a focal shaft for a turning wheel. On wheeled vehicles, the pivot might be fixed to the wheels, turning with them, or fixed to its environmental factors, with the wheels pivoting around the hub. The axles serve to communicate driving force to the wheel, just as to keep up the situation of the wheels comparative with one another and to the vehicle body. The axles in a framework should likewise bear the heaviness of the vehicle in addition to any load. The front pivot pillar is one of the significant pieces of vehicle suspension framework. It houses the directing get together also. Around 35 to 40percent of the complete vehicle weight is taken up by the front pivot. Subsequently appropriate plan of the front hub shaft is amazingly essential. In present exploration work plan of the front hub of hefty business vehicle were finished. The methodology in this undertaking has been separated into two stages. In the initial step, front pivot was planned in CATIA V5 programming later the model is brought into ANSYS for results. In the subsequent advance, the model is doled out with two unique materials and the examination results for both the

materials are contrasted with finish up a reasonable material for a Front pivot producing.

3. METHODOLOGY

. The methodology in this paper has been isolated into two stages. In the initial step explanatory strategy used to configuration front hub. For this, the vehicle determinations, its gross weight and payload limit so as to discover the burdens and avoidance inside the pillar has been utilized. In the subsequent advance front pivot were demonstrated in Pro-e. The lowlife model was comprehended in ANSYS programming framework. The FE results were contrasted and explanatory plan.

Systematic plan need to discover end arrangements with helping framework boundary inputs. The second at segment, twisting burdens and standard pressure is straightforwardly identified with the quality. Presently the above anxieties are determined by utilizing following framework info's and equation,.

4. SYSTEM PARAMETERS

PARAMETER	UNIT	VALUE
FAW	Kg	3250
GVW	Kg	9500
Dynamic Radius (R)	mm	408
Front Track (Lt)	mm	1834
Distance of section (La)	mm	397.5
Wheel Base (L)	mm	4530
Unsprung mass of F.A. (Mfa)	mm	385.2
Weight of Wheel Rim + Tire + Tube (Wt)	Kg	110
Braking Torque/Wheel	Kg-mm	356592

5. ANALYTICAL DESIGN

Consequently right plan of the front hub shaft is extremely basic. The methodology in this paper has been isolated into two stages. In the initial step explanatory strategy used to configuration front hub. For this, the vehicle determinations, its gross weight and payload limit so as to discover the burdens and avoidance inside the pillar has been utilized. In the subsequent advance front pivot were demonstrated in Pro-e. The lowlife model was comprehended in ANSYS programming framework. The FE results were contrasted and explanatory plan.

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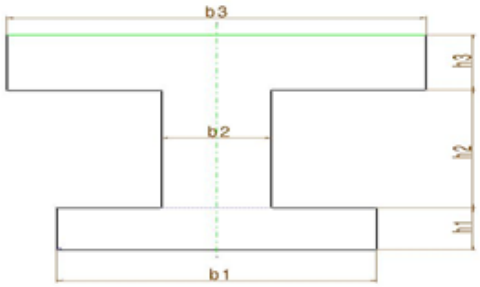


Axle I-section

Cross segment of front hub bar is appeared in Figure 3, for computing bowing burdens, tensional pressure and rule pressure an incentive by considering I area measurements, As b1= 68, b2=14, b3= 78, h1= 22, h2= 48, h3=22

Moment at Section	M	1118602.55	Kg-mm
Max. Bending Stress	Fb Max	20.2101	Kg//mm²
Total Bending Stress	Fb	25.5280	Kg/mm²
Torsional Stress	Fs	3.80367	Kg/mm²
Principle Stresses	Fp	26.08269	Kg/mm²

Analytical Calculation Results

In proposed configuration work consider material 27C15 for assembling front hub bar, material 27C15 having better for producing and having great effect load supporting property. Underneath table gives some framework boundaries and modulus of flexibility of material 27C15.

Front Axle Weight	W	3500	Kg
Length (Kingpin center to spring pad center hole)	a	397.5	mm
Front Track	L	1834	mm
Modulus of Elasticity	E	2.1x10^4	N/mm²
Moment of Inertia	I	4178009.47	mm4

System parameters table for deflection

According to framework inputs count for avoidance as,,

Vertical diversion at spring cushion

$Yc=Wa^2 (3L-4a) / 6EI$

Yc=7.845mm

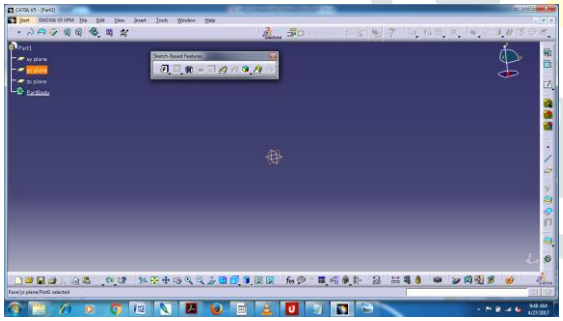
Deflection at center of beam (max deflection)

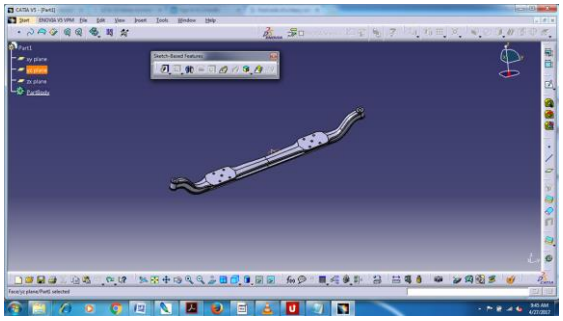
$Ymax=Wa (3L^2-4a^2) / 24EI$

Yc=11.93 mm

6. RESULTS AND DISCUSSION

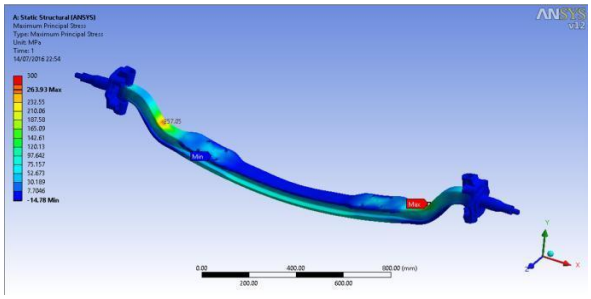
6.1 CATIA DESIGNS



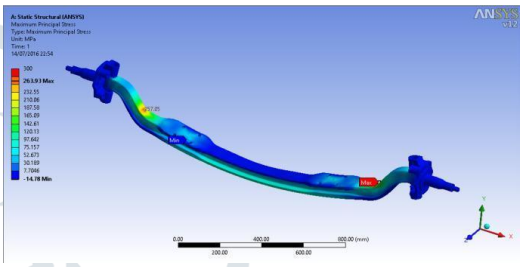


front axle beam

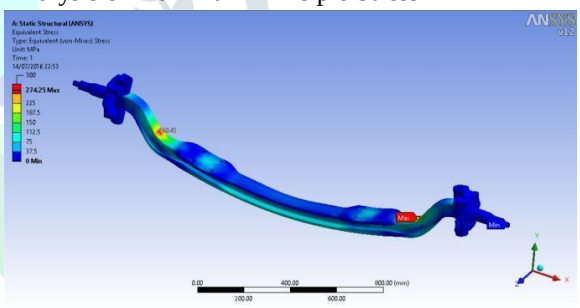
6.2 HARMONIC ANALYSIS

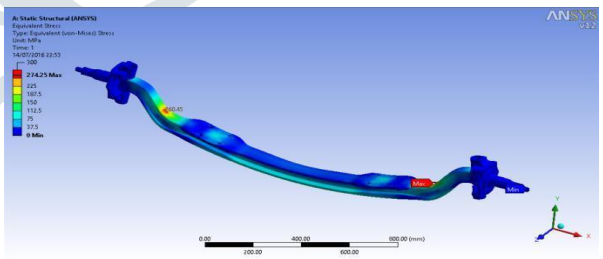


Analysis

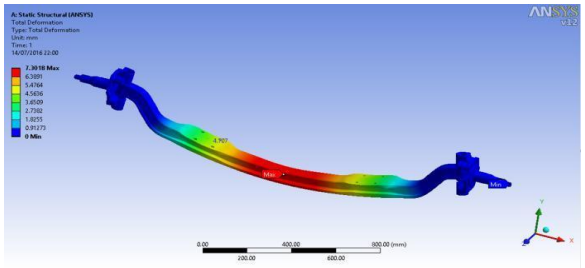


Analysis of Maximum Principle Stress





Investigation of proportional (Von-mises) stress



Examination of all out twisting

7. Conclusion

From the above outcomes appeared, plainly the greatest diversion in front hub is 11.93 for 27C15 materials, thus, that 27C15 is better material for assembling of pivot. Additionally in the current paper we have set up a palatable co connection between hand computations done diagnostically and the FEA results. The avoidance in the FEA gave the certainty that the limit conditions for shaft are effectively reenacted. Relationship between's pressure results from explanatory count and from FEA guarantees that the work size and demonstrating approach utilized for the part were very much characterized. At long last we had the option to convey a safe and approve configuration to suit the prerequisites.

8. References

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