

DESIGN AND ANALYSIS OF WAVE SPRING IN MOTORCYCLES**G. KALYANI REDDY**

M. Tech, (KBR Engineering College)
Pagidipally (V), Bhuvanagiri (M), Yadadri
Bhuvanagiri Dist.

Guntukakalyani@Gmail.Com

M. CHAITHANYA

Asst. Prof, Aurora's Technological and
Research Institute
Uppal, Parvathapur

Chaithanyamandadi@Gmail.Com

ABSTRACT:

Among the many sorts of springs, wave springs have pulled in impressive consideration this sort of long and dependable wellspring of enduring toughness and significant adequacy than rest of the springs. A systematic model for stamped ring wave springs is proposed, Because of the specific state of the spring in the unreformed arrangement, the heap redirection bend is observed to be considerably bilinear in character. A comparative however less articulated conduct is shown likewise by the connection amongst stack and inner anxieties. The expository outcomes are contrasted with before hypothetical discoveries and are appeared to connect well with exploratory estimations. Wave springs are utilized to decrease the tallness of the spring and to create a similar end impact end that of a curl spring. The wave spring application on suspension framework is made. Suspension is the term given to the arrangement of springs, safeguards and linkages that interfaces a vehicle to its haggles relative movement between the two. In this venture we will build up a wave spring which can be supplant the curl spring in display vehicles and test it utilizing Ansys workbench, measurements and different factors are taken from past papers and works, for configuration reason we will utilize Catia v5r20.

KEY WORDS: *wave spring shock absorbers suspension system Catia v5r20*

1.0 INTRODUCTION:

Wave spring peak to peak wave springs work as a heap bearing gadget, using a bowing minute as opposed to depending on torsion. Giving an indistinguishable power and redirection from customary springs,

wave spring innovation eliminates material utilization by up to half, leaving a light-weight, flexible item that can take care of issues and improve new item plan. Wave springs offer space sparing innovation which can supplant loop springs by utilizing less material and a littler get together size, bringing about generation being more financially savvy. The structure of the wave spring is produced using level spring metal, shaping a multi-loop wave system. This particular game plan makes the spring appropriate for application where low mounting measurement is required, decreasing around half space in stature and length of ordinary round wire springs. We are sure you will find the necessities for your decision of wave spring from our stock list however in the event that you require a particular outline contribution for a wave spring, at that point our specialists are glad to enable you to achieve this determination. Wave springs are uncommon springs normally produced using smoothed wires or strips. The principle preferred standpoint of these springs is that the general length and working tallness of wave springs are essentially not as much as that of standard pressure springs, in this way diminishing the extent of a gathering by as much as half. This additionally diminishes the part weight

and crude material cost of each spring created. Wave springs are utilized as a part of a huge number of uses, from auto air packs, weight valves, orientation, grip drives, equip boxes, family unit applications like sprinkler valves, to try and games and running shoes. In powerful applications, wave springs regularly diminish vibration, lessen wear, and gives a smoother and calmer execution.



FIGURE 1.1 SHOWS MODEL VIEW OF WAVE SPRING

2.0 LITERATURE REVIEW:

K. Michalczyk et al The investigation of elastomeric covering effect on powerful thunderous anxieties esteems in spring is introduced in this paper. It was demonstrated that elastic covering won't perform in attractive way because of its low modulus of versatility in shear.

B. Pyttel , I. Brunner, et al. Long haul exhaustion tests on shot peened helical pressure springs were directed by methods for an extraordinary spring weariness testing machine at 40 Hz. Test springs were made of three diverse spring materials – oil solidified and tempered Si Cr-and Si Cr V- alloyed valve spring steel and stainless steel.

For examination the outcomes for the springs with $d = 1.6$ mm and $d = 3.0$ mm and $P_s = 98\%$ are abridged Except for springs made of the stainless steel wire, the exhaustion quality of springs with $d = 3.0$ mm is higher than for springs with $d = 1.6$ mm. The size impact would suggest higher exhaustion quality for littler wire distances across

Touhid Zarrin-Ghalami, Ali Fatemi Elastomeric segments have wide utilization in numerous ventures. The regular administration stacking for the greater part of these segments is variable adequacy and multiaxial. In this examination a general approach forever forecast of elastomeric parts under these average stacking conditions was produced and represented for a traveler vehicle support mount.

Wei Li , Tatsuo Sakai , et al. High cycle weakness (VHCF) properties of a recently grew clean spring steel were tentatively inspected under pivoting twisting and hub stacking. Accordingly, this steel speaks to the duplex S– N property just for surface-initiated disappointment under pivoting twisting, while it speaks to the single S– N property for surface-actuated disappointment and inside inhomogeneous smaller scale structure instigated disappointment under hub stacking.

S.Srikiran has displayed the plan demonstrating and the basic investigation of a wave springs. They did the examination ponder among curl spring and wave spring. This examination makes an endeavor to analyze the outcomes for choosing best material for springs. Investigation on wave springs has been finished by basic mechanics approach and results were

approved contrasted and the curl spring of the safeguard.

A.González Rodríguez, J.M. Chacón, et al. An adjustable immovability actuator made out of two threatening non-coordinate springs is proposed in this paper. The adaptable device includes two arrangements of leaf springs working in bowing conditions under sweeping migrations. A model of the actuator was made and striven for different load cases.

3.0 METHODOLOGY

WAVE SPRING DESIGN GENERAL CONSIDERATIONS

If a spring is intended for static application, ensure that the % worry at working tallness is under 100%. Spring will take a set if subjected to a higher anxiety. If a spring is intended for dynamic application, ensure that the % worry at working stature is under 80%. Spring will take a set if subjected to a higher anxiety. Wave springs operate as load bearing devices. They take up play and compensate for dimensional variations within assemblies.

DESIGN CALCULATIONS AND MATERIALS

Scientific Calculations

Base information

Load counts

Weight of bicycle = 150 Kg

Let weight of 1 individual = 75 Kg

Add up to Weight (Wt.) = Weight of bicycle

+ Weight of 1 people

= 150+75

= 225 Kg

Raise suspension = 65%

65% of 225Kgs = 146 Kg

Considering dynamic burdens it will be twofold

Wt. = 292 Kgs

= 2864 N

For single safeguard weight (W)

= $W/2$

= 2864/2

= 1432 N

For single safeguard weight (W) = $W/2$

= 2864/2

= 1432 N 7353848555

MATERIAL PROPERTIES

Spring steel is a low combination, medium carbon steel with a high return quality. This permits objects made of spring steel to come back to their unique shape in spite of huge bowing or winding

DIN 17221 SPRING STEEL (67SICR5):

DENSITY	7850kg/m ³
TENSILE STRENGTH	1700M pa
YOUNG'S MODULUS	210 Gpa
POISONS RATIO	0.27

MECHANICAL PROPERTIES OF DIN 17221 SPRINGS STEEL

ASTM A228 Spring Steel

Frosty drawn high - rigidity and uniform mechanical properties. Music wire springs are not prescribed for benefit temperatures over 121°C (250°F).

APPLICATIONS:

High quality springs and wire forms subject to high stresses or requiring good fatigue properties.

DENSITY	7850kg/m ³
TENSILE STRENGTH	1590-1760M pa
YOUNG'S MODULUS	208 G pa
POISONS RATIO	0.313

MESHING:

To investigations, the FEM triangular kind of work is utilized for the unbending rib coupling in the ANSYS condition. The quantity of components utilized as a part of this lattice is 71441and the quantity of hubs is 122228.In this procedure normal sort of cross section is done to investigations the procedure. Using the working state of the coupling a relative rotational development between the poles comes into picture thusly.

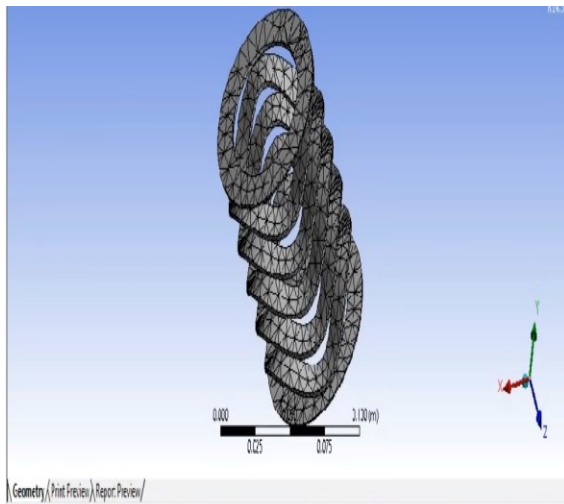


FIGURE 3.1 MESHING MODEL OF WAVE SPRING

4.0 RESULTS

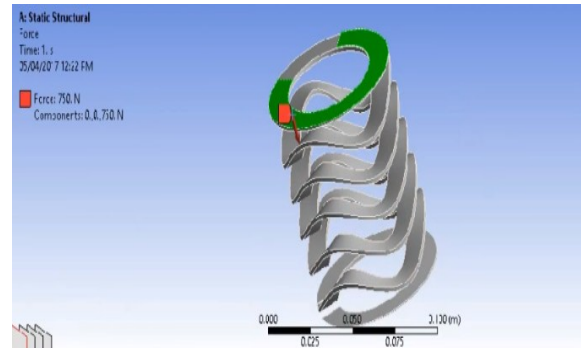


FIG 4.1 BONDARY CONDITIONS OF STRUCTURAL MODE

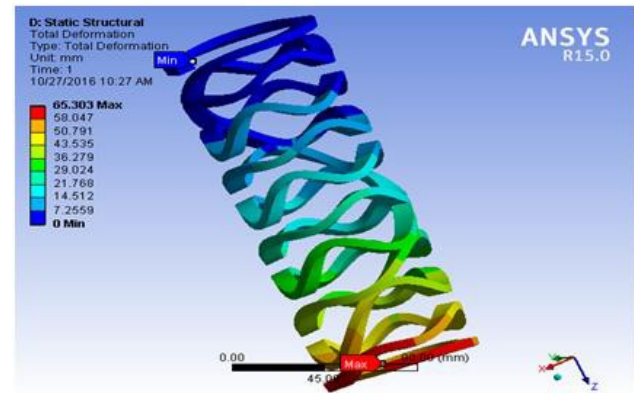


FIGURE 4.2 STRUCTURAL ANALYSIS OF WAVE SPRING MODEL 1 MADE WITH DIN 17221 SPRING STEEL GRADE TOTAL DEFORMATION (MM)

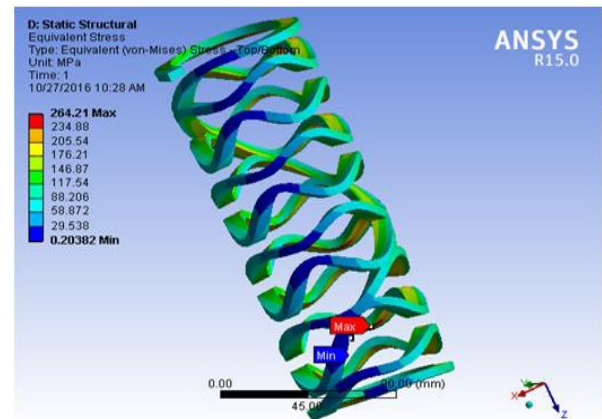
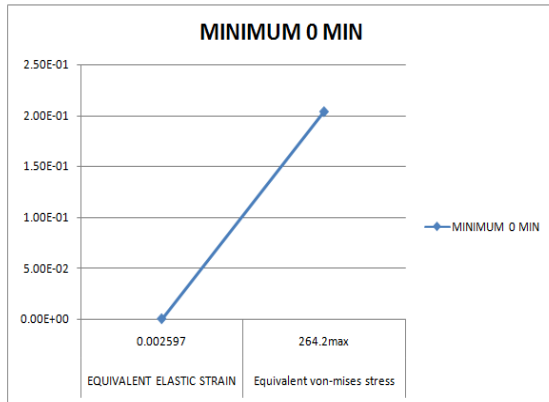


FIGURE 4.3 MODEL ANALYSIS OF WAVE SPRING MODEL 1 MADE WITH DIN 17221 SPRING STEEL GRADE:

TABLE 4.1 STATIC STRUCTURAL ANALYSES OF WAVE SPRING MINIMUM AND MAXIMUM MOMENTS

Parameters	Maximum	Minimum
Total Deformation	65.303	0 Min
Equivalent Elastic Strain	0.002597	4.2405e-6
Equivalent Von-Misses Stress	264.2max	0.20382

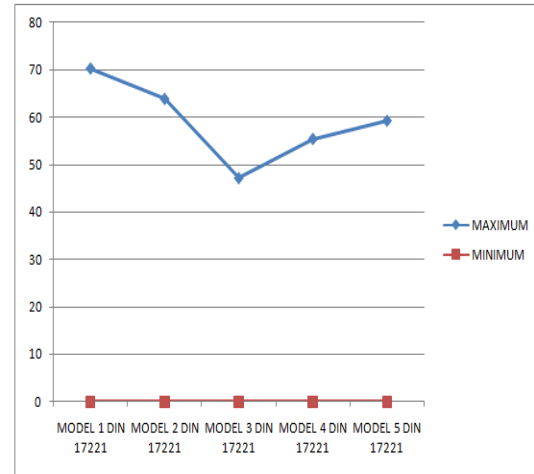


GRAPH 4.1 STATIC STRUCTURAL ANALYSES OF WAVE SPRING MINIMUM AND MAXIMUM MOMENTS

TABLE 4.2 MODEL ANALYSIS OF WAVE SPRING MODEL 1 MADE WITH DIN 17221 SPRING STEEL GRADE

MODELS	MAXIMUM	MINIMUM
MODEL 1 DIN 17221	70.262	0
MODEL 2 DIN 17221	63.864	0
MODEL 3 DIN 17221	47.171	0

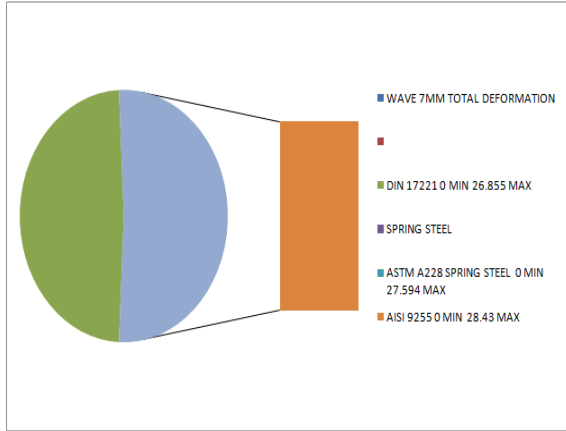
MODEL 4 DIN 17221	55.424	0
MODEL 5 DIN 17221	59.257	0



GRAPH 4.2 WAVE SPRING MODELS 1 MADE WITH DIN 17221 SPRING STEEL GRADE

TABLE 4.3 VOLUMES AND MASS COMPARISON OF VARIOUS MODELS

	BASI C MOD EL	WAV E 5MM	WAV E 6 MM	WAV E 7 MM
VOLU ME (MM ²)	1.93E +05	1.32+ 05	1.59E +05	1.85E +05
MASS (KG)	1.5155	1.037	1.2444	1.4518



GRAPH 4.3 VARIOUS MASS AND MASS COMPARISON AMONG DIFFERENT MODELS.

FUTURE SCOPE:

This examination can be additionally stretched out by performing experimentations and creating appropriate assembling strategies, the above investigation incorporates just rectangular cross segment wave springs, considering different cross areas may likewise help in enhancing the solidness of springs.

CONCLUSIONS

From the outcomes the accompanying conclusions are made:

1. Wave springs have much solidness when contrasted and winding springs
2. Avoidances and stresses can be limited up to 30% utilizing wave springs
3. Up to 20% material can be spared utilizing wave spring
4. Spring life enhances fundamentally Hear there is a requirement for advancement for assembling procedure to assembling method. From the outcomes if ordinary winding spring is supplanted with show 2 (6 mm thick) we can spare upto 20% of

material, 40 % less anxiety and 20 % less diversions

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