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Design and Analysis of Disengage-Able Anti-Roll Bar

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Abstract - An anti-roll bar (roll bar, anti-sway bar, sway bar, stabilizer bar) is a part of numerous machine dormancy that helps reduce the body roll of a vehicle during fast cornering or over road irregularities. It connects contrary wheels through short switch arms linked by a torsion spring. A sway bar increases the suspense's roll stiffness of the vehicle. It's a U-shaped essence bar.
Design of a disengage-able Anti-roll bar is mandatory with appropriate material selection. In the present work, the design process is accomplished by Solid Works with respect to rubber bushing position and meshing and analysis. The methodology consists of generating good quality mesh and applying forces and moments for different types of loads occurring on the disengage-able Anti-roll bar and analyzing their effect on the disengage-able Anti-roll bar.

KEYWORDS -: ANTI-ROLL BAR, ANSYS, ANALYSIS, SOLID WORKS.

1. Introduction

One of the suspension elements is the anti-roll bar or sway bar that improves the comfort, and stability or fixing of the car with the road and controls the rollover of the car. The anti-roll bar usually connects the one-axle wheel with the other side of the wheel. The anti-roll bar holds one wheel against another wheel, i.e., when riding on an uneven road, and one- wheel lifts on unevenness- the other wheel stays on a position road, inhibiting the movement of the contrary wheel. Designing the anti-roll bar is veritably important for its geometric parameters, which determine its severity, and from the stiffness- the comfort or stability of the automobile. The stabilizer is usually made of spring steel, but in order to reduce its mass, the development of stabilizer production from carbon fiber and Aluminum has been adopted by some companies.

1.1 Problem Statement:

To reduce the stress induced on the Anti-Roll bar and avoid it from breakage we decided to build the disengage-able Anti-Roll bar.
To avoid huge load impact on the anti-roll bar while cornering or on heavy road conditions.
To Prevent the breaking or damage of the anti-roll bar.

1.2 Objectives:

The main objective of this project is to achieve the best suitable design for the Disengage-able Anti-roll bar.
To study the effect of clamping position on the Disengage-able Anti-roll bar and decide the perfect clamping position for the required roll stiffness.
We are also trying to reduce the cost of material.

2. Working

- Step 1: In the first step we use a Rocker switch DPDT (Double pole Double throw), DPDT switch is frequently used for the simultaneous switching of two independent signals that should work in tandem.
- Step 2: This switch will allow the electrical energy from 12V Battery to the DC motor, which will convert the electric energy to mechanical energy and the screw that is connected to the DC motor will start rotating
- Step 3: The nuts are connected to the coupler via forks. When, the screw will start rotating in a fixed place, the nuts are going to travel along the screw. It will allow the coupler to move side-wise and make the bar Engage & Disengage.

3. Material selection

Selected material: ASTM (American Society for Testing and Materials) A106 Grade B.

Table 1 Material comparison

Material	Structural Steel	ASTM A106B
Density	7850 Kg/m3	7850 Kg/m3
Tensile Yield Strength	350 MPa	415 MPa
Elasticity	210 GPa	190GPa - 210GPa
Poisson ratio	0.28	0.30

ASTM A106B does not compromise in strength & build quality unlike structural steel.

Inner Diameter of Coupler	22.5mm

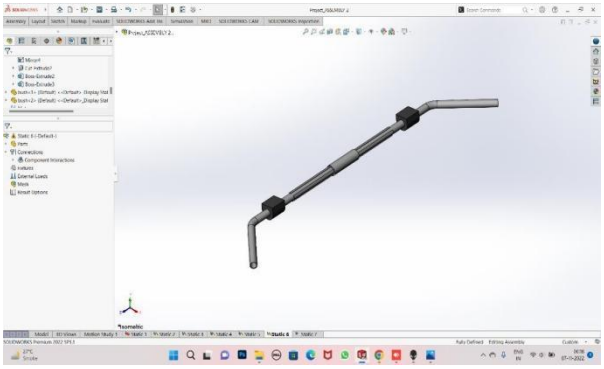

Fig.4.1 Cad model of Dis-engageable Anti-roll bar

4. Modeling and Analysis

Modeling:

Table 2 Dimensions of Dis-engageable Anti-roll bar and Coupler

Specification	Values
Type of cross section	Hollow cross-section
Full length of the bar	1680mm
Arm Length	300mm
Coupler length	100mm
Outer Diameter of Anti Roll Bar	24mm
Inner Diameter of Anti Roll Bar	16mm
Bending angle of Anti-roll Bar Arm	135º
Outer Diameter of Coupler	37mm
Inner Diameter of Coupler's teeth	28mm

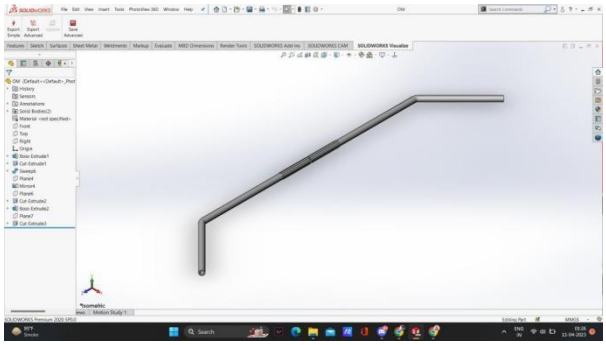

Fig.4.2 Cad model of Anti-roll bar showing disengage position

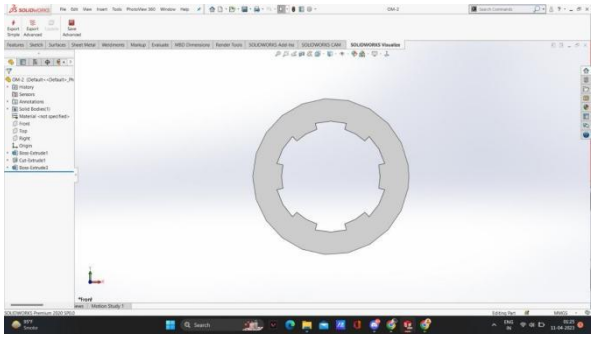

Fig.4.3 Coupler's spline

Analysis:

This image is showing, where the load/force is being applied with its value.

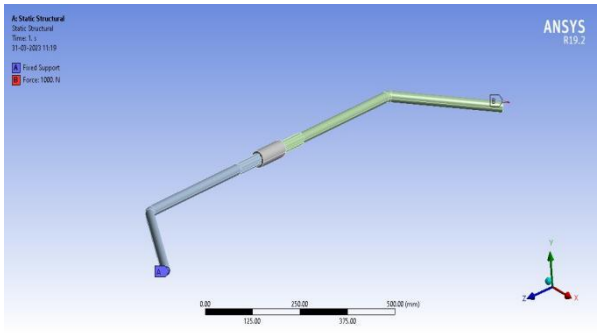

Fig.4.4 1000N force applied on right end

Total Deformation:

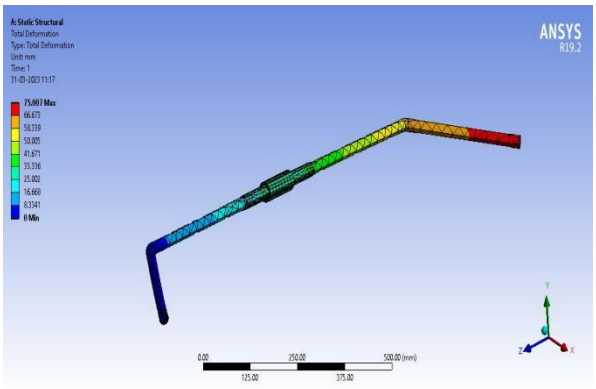

Fig.4.7 Total Deformation

Shear Stress:

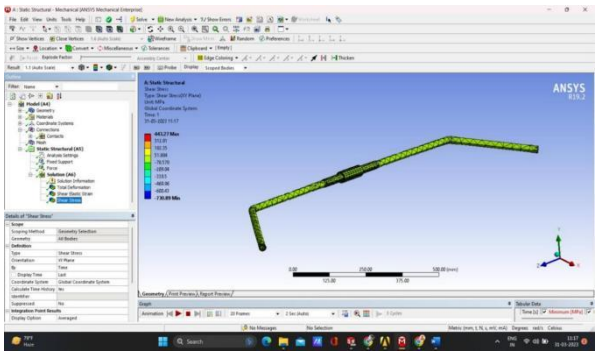

Fig.4.5 Shear Stress

5. Fabrication

Fig.5.1 Fabricated model of Disengage-able Anti-roll bar.

Shear elastic strain:

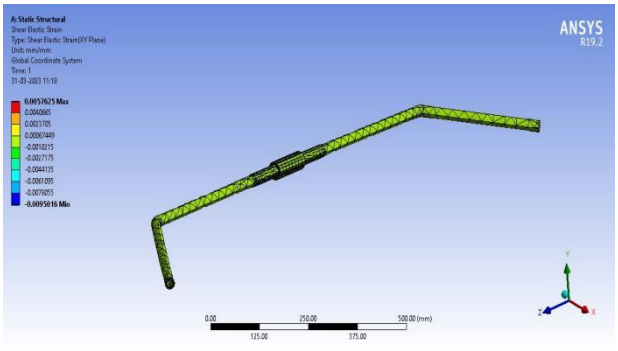

Fig.4.6 shear elastic strain

6. Testing & Result

For testing we applied a certain force on one side of the bar. During the analysis in the ANSYS software we apply the force of 1000N. so in the testing we would try to apply the same amount of force by using weight.

1N = 0.10197 kgf
Hence,
980.665 N = 100 kgf
So, we applied 100 kgf on the one end of a bar.

Fig.6.1 Testing for strength of Anti-roll bar

After applying 100kgf of weight on the Disengage-able Anti-roll bar, the bar does not show any deformation, thus it passed the test.
Hence, we got satisfactory results.

7. Conclusion

This project involved a real-life problem and can provided an immense experience in the field of contemporary performance in vehicle dynamics. In this project we made a Disengage-able Anti-roll bar to increase the traction between the tire and surface in different terrain. To check the strength of this bar it went through several tests and gave us satisfactory results, and thus proving that it can be a high-quality product in the Automobile industry in the near future.
This Concludes that this project is successful.

8. References

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