Effect of mesh parameters on spring damper assembly

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ABSTRACT

Element Analysis is a method to predict how a model will react to real world forces and other physical effects. It shows whether the product will break, wear out or work the way it was designed. The spring damper assembly is a part of suspension system which is cylindrical in shape. The spring permit the wheels to rise up to absorb jolts in the road. While dampers avert bouncing of the vehicle. This reduces jolting of the vehicle various mechanical links keep the wheel in line. The spring damper assembly is modeled in CREO and analyzed in ANSYS. Results of ANSYS shows how different meshing method can affect the final results which include stress, strain and deformation

Keywords: *Spring and Damper Assembly, Mesh, Creo, Ansys, Analysis.*

1. INTRODUCTION

The main objective of paper is to show how mesh size affects the Stress, Strain Deformation factor. What is meshing and Why it is important? Meshing is also known as mesh generation. Meshing generates a two-dimensional and three-dimensional grid. It divides complex geometries into elements that can be used to discretize a domain. We do this process of the components because mesh partitions space into elements or cells or zones over which the equations can be solved, which then approximates the solution over the larger domain.

2. MATERIAL

The ingenious values of an object can be underlined by the chosen material. Therefore, the right selection of materials and manufacturing processes is important.

Stainless Steel	
Density	8000 kg/m^3
Young's Modulus	190 GPa
Poisson's Ratio	0.275
Compressive Yield Strength	207 MPa
Tensile Yield Strength	215 MPa

Alloy Steel	
Density	8,050 kg/m^3
Young's Modulus	190GPa
Poisson's Ratio	0.270
Tensile Yield Strength	655 MPa

FORCE

The forces acting on a spring when mounted vertically are Compression and tension. They are subjected to shear stress acting perpendicular to the axis of the spring if they are mounted inclined. Due to vibration and sudden deflection when running over a bump, the damper is subjected to fatigue and shock impact load.

3. TYPES OF SPRING AND DAMPERS

1] SPRINGS: In this model Coil Spring is used.

a) **Coil Springs:** Coil springs are commonly used in vehicle suspension. When the vehicle is loaded, the coil spring allows it to bounce less. High performance cars can absorb bumps and have low body roll because coil spring suspension is used in them. In off-road vehicles they are used because of their range of travel they allow at the wheel, this reduces the jolting in the off-road vehicle's.

b) **Leaf Springs**

c) **Torsion Bars**

d) **Air Springs**

2] **Dampers:** In this mode monotube damper is used.

a) **Mono tube damper:** This design uses a single cylinder split by a floating divider into oil and gas chambers. To create damping force the shaft pushes the piston in the cylinder. Oil is metered through a shim stack on the shaft side of the piston during compression. In rebound, shim stacks on the face of the piston control flow. During compression to compensate for the oil displaced by the shaft gas mainly nitrogen, in the chamber is squeezed.

b) **Twin tube damper**

c) **Internal bypass damper**

d) **Magnetorheological damper**

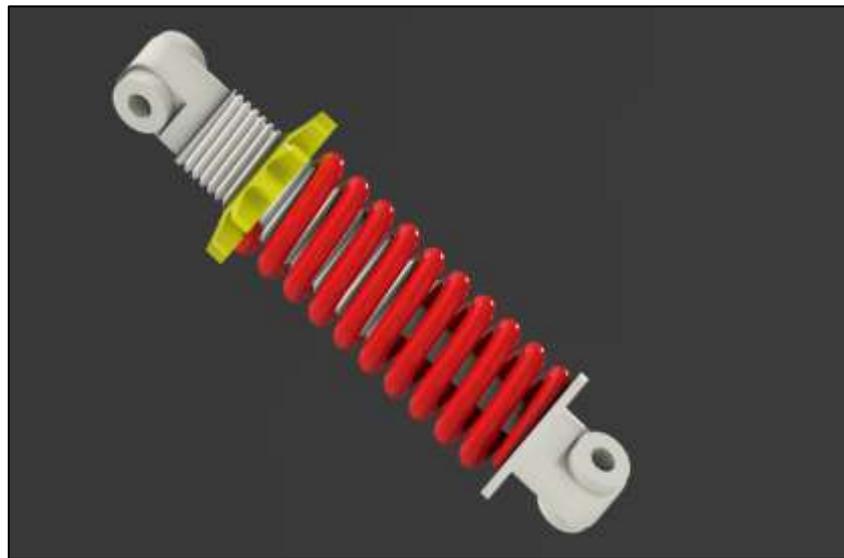e) **Spool valve damper**

f) **Electronically controlled damper**

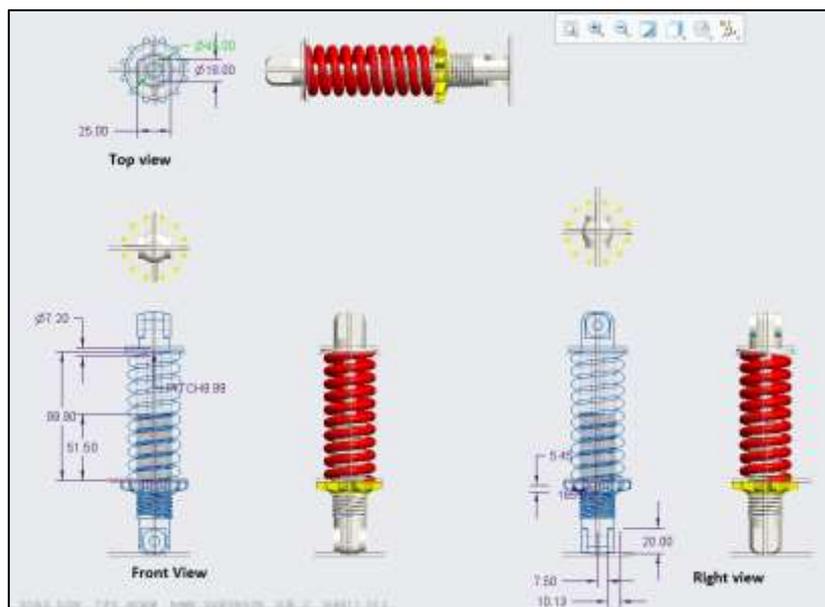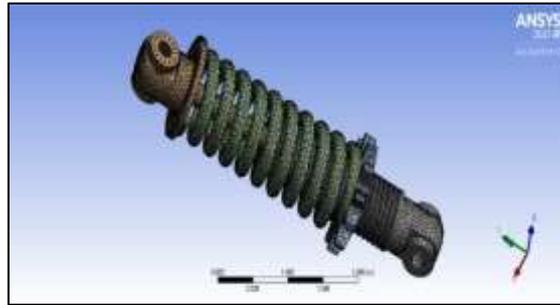## 4. CAD MODEL

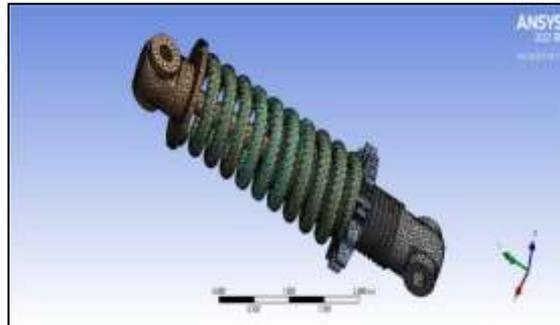Fig. a: Spring damper assembly

Fig. b: Isometric views

5. ANALYSIS

Analysis was done in Ansys Workbench. The main aim of the analysis was to see how mesh size effect the stress, strain and deformation of the model. During analysis a **compression force** of **500N** was applied for different mesh sizes.
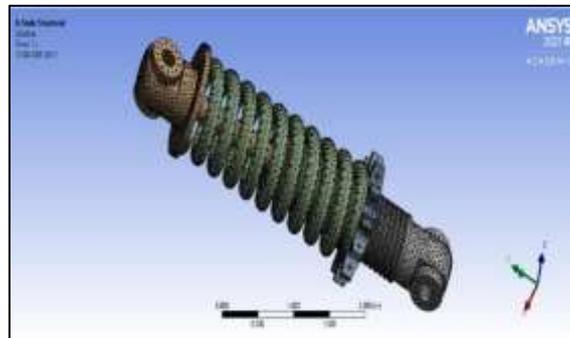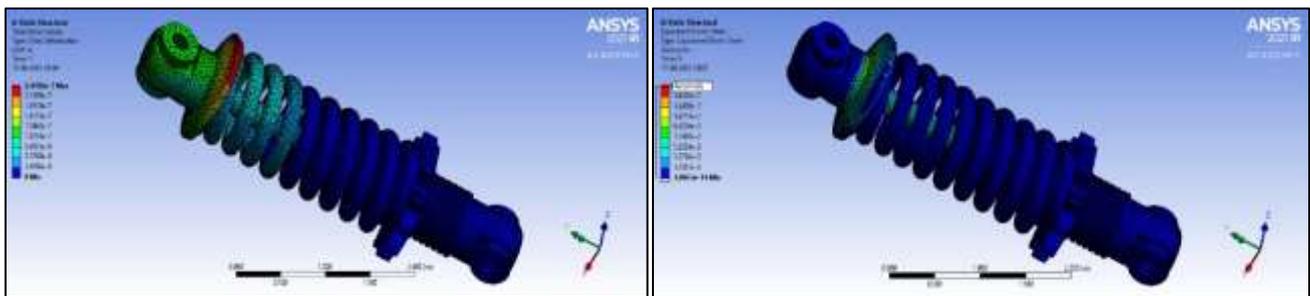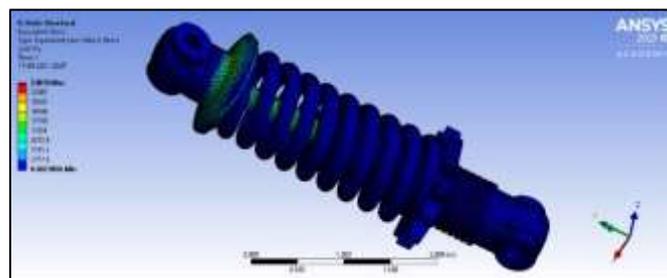
6. MESHED MODEL

40mm

45mm

50mm

7. RESULT
1] 40 mm:

Deformation	**Strain**

Stress

	Stress(N/mm²)	Strain	Deformation(mm)
Max	0.024819	1.6066e-007	0.00024196
Min	2.1806e-9	1.0909e-014	0
Avg.	0.0014697	8.1429e-009	3.402e-5

2] 45 mm:
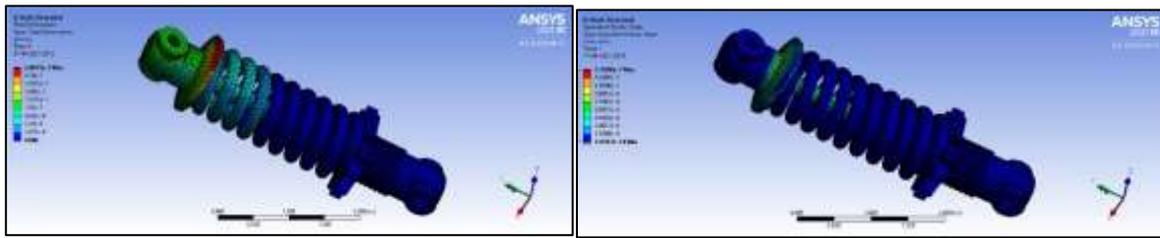
Deformation

Strain
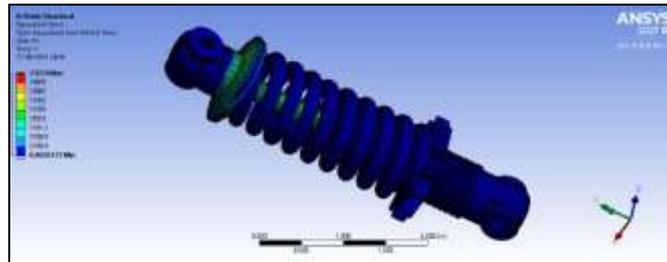
Stress

	Stress(N/mm²)	Strain	Deformation(mm)
Max	0.023224	1.3508e-007	0.00024075
Min	2.0375e-9	1.0187e-014	0
Avg.	0.0015055	8.3904e-007	3.3542e-5

3] 50 mm:
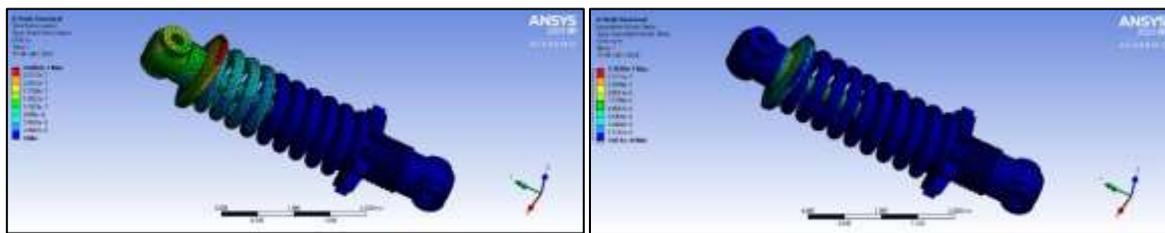
Deformation

Strain
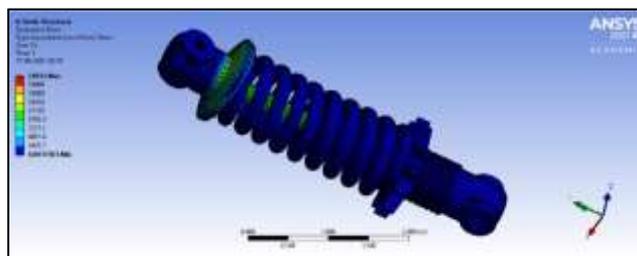
Stress

	Stress(N/mm²)	Strain	Deformation(mm)
Max	0.021831	1.3628e-007	0.00026682
Min	3.1503e-9	1.821e-014	0
Avg.	0.0015004	8.4702e-009	3.155e-5

8. CONCLUSION

Hence the Analysis of Spring and Damper is done and it is seen that how mesh size affect stress, strain and deformation. From this, it is understood if mesh size is small or if the meshing is fine the accuracy is high.

9. REFERENCES

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