

Figure 11: Von mises stress distribution with compressive load at crank end and piston pin end is restrained

3. Load applied at Piston pin end in tension and crank end is constrained.

Von mises stress

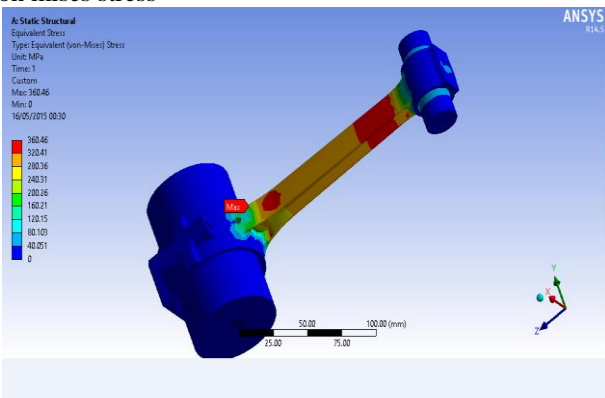


Figure 12: Von mises stress distribution with tensile load at piston pin and crank pin end is restrained

4. Load applied at Piston pin end in compression and crank end is constrained.

Von mises stress

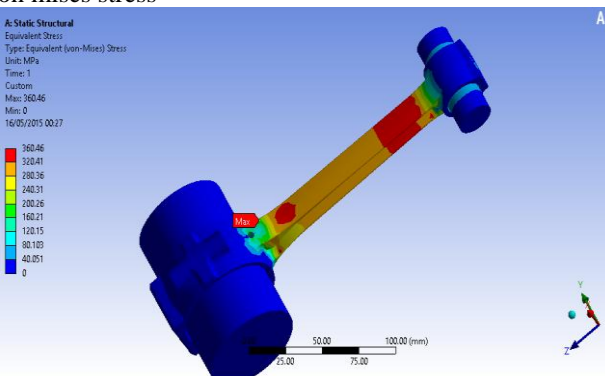


Figure 13: Von mises stress distribution with compressive load at piston pin end and crank pin end is restrained

5. Calculation

1. Weight of AISI4340 Steel =Volume × Density
 =0.85380 × 10⁻⁴ × 7850
 =0.670233Kg

2. Weight of Aluminum 7068 Alloy=Volume × Density
 =0.85380x10⁻⁴x2850

=0.24333Kg

3. Weight of Titanium alloy

Weight of aluminum part of connecting rod

= Volume × Density
 =0.27872 × 10⁻⁴ × 2850
 =0.0794352Kg

Weight of Titanium alloy part of connecting rod

= Volume × Density
 =0.57514 × 10⁻⁴ × 4430
 =0.25471kg

Total weight=0.794352+0.2591=0.3342222

Reduction in weight in Titanium alloy vs Alloy Steel=0.336011kg

4 For axial loading at Crank End and piston pin end.

- 4.1 Max equivalent stresses for AISI4340 Steel=183.49mpa
- 4.2 Max equivalent stress for Aluminum 7068 Alloy=231.89mpa
- 4.3 Max equivalent stress for Titanium alloy=358.58mpa

6. Conclusion

By checking and comparing the results of materials in finalizing the results are shown in below

- 1)ANSYS Equivalent stress for the Titanium alloy is greater than the AISI4340 alloy steel.
- 2)The weight of the Titanium alloy material is less than the existing AISI 4340 alloy steel material.
- 3)When compared to both of the materials, Titanium alloy have more load carrying capacity than AISI4340 alloy steel also with reduced weight.

References

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