# Design description

Engineering

Stress distribution in a spanner/wrench Stress distribution analysis is a necessity in any structure or part being utilized to perform a given task. Majorly, inherent material properties have an influence on stress distribution. Stress itself is the internal distribution of force per unit area (pressure) within a body reacting to applied forces which may cause deformation or strain within the body. The distribution of the forces within spanners determine the efficiency of the spanner and are dependent on the shape and design of the spanner. In this case, two designs are explored and their stress distribution, associated with the design analyzed. A spanner or wrench is a hand tool used to provide grip and mechanical advantage in applying torque to turn objects such as nuts and bolts. The figures below show the designs and the explanations thereunder.

Original design stress distribution

Figure 1 (a) Figure 1 (b)

In the original design shown in the above diagrams, the design is shown in figure 1 (a) and the stress distribution in figure 1 (b). Stress is concentrated around the grip edges, and at the ring end of the wrench. There is also concentration of von misses stress along the axis of the wrench. From the figure 1 (b), the red color shows regions that are heavily stressed whereas the blue color indicates regions with minimal stress. From the summary at the top left the same figure indicates the extent to which the von misses stresses are distributed within the wrench body.

Modified design stress distribution

Figure 2 (a) Figure 2 (b)

In the modified design, shown in the diagram above, the over stressing of the same region is eliminated. Stress is redistributed and is only excess at the collar of the wrench. In this design, stress has been managed well and is uniform almost throughout the entire figure. The contours show the von misses stress distribution.

It is therefore true that shape of the object, affects a body’s stress distribution and the above examples clearly dictate this.

References

Zienkiewiez O. C and Campbell J. S (1973), shape optimization and sequential linear programming

Morris A. J. (1982), Foundations of structural optimization: a unified approach.