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Mechanical Design using 2-D Mohr's Circle and the Weibull Distribution

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Abstract: In this paper we present the mechanical element design analysis by using an AISI 1040 steel with yield strength of S_y=352 MPa. The designed element is exposed to a bidirectional load. The applied load generates torsion, bending and tension stresses. These stresses could generate deformation. From these stresses by using the Mohr circle approach, the corresponding minimal stress (σ_{min}), maximal stress (σ_{max}) and the maximal shear stress (τ_{max}) are determined. Then based on (σ_{max}) and on the Von Mises Theory, the safety factor (SF) was determined. However, although the found SF index is higher than one (SF>1), because it does not represent the reliability (R(t)) of the designed element, then based on σ_{min}, σ_{max} and τ_{max}, the Weibull distribution analysis was used to determine the designed R(t) index. An application is also presented.

Keywords: Mechanical design, 2D-Mohr's circle, Von Mises Theory, Weibull distribution.