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Weibull Stress/Strength Analysis with Non-Constant Shape Parameter

M Baro-Tijerina, MR Piña-Monarez, and B Villa-Covarrubias

Engineering and Technological Institute
Universidad Autónoma de Ciudad Juárez,
Cd. Juárez, Chih, 32310, México

Corresponding author's Email: al164467@alumnos.uacj.mx

Author Note: Manuel Baro-Tijerina and Baldomero Villa-Covarrubias are doctoral students of the Technological Doctoral Program of the Engineering and Technological Institute at the Universidad Autónoma de Ciudad Juárez. Manuel R. Piña-Monarez is a researcher in the Industrial and Manufacturing Department at the Universidad Autónoma de Ciudad Juárez, México.

Abstract: The paper presents the method to perform the Weibull stress-strength analysis when both the stress and the strength variables follow a Weibull distribution. And because the Weibull distribution does not have the additive property (known as Weibull closure property), then when both the stress and the strength variables present different shape parameter β , the Weibull stress-strength analysis is not defined. Therefore, based on the Weibull/Gumbel relationships and on the log-mean and log-standard deviation of the observed lifetime data, in this paper a common β_c parameter is estimated and used to perform the corresponding Weibull stress/strength analysis. And since the derived β_c parameter can be determined for any feasible pair of stress and strength β values, then the proposed method is always efficient to perform the corresponding stress/strength analysis. Finally, the method efficiency is shown through its application to a set of Weibull data also.

Keywords: Weibull distribution, Normal distribution, Stress-Strength analysis, Gumbel Distribution.