

عنوان مقاله:

Reliability analysis of a mounted moldboard plow structure using the Monte Carlo simulation method

محل انتشار:

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خلاصه مقاله:

Applying the reliability concept as a new and profitable design approach can optimize the design and manufacturing of tillage machines. In this study, the Monte Carlo method was used to perform reliability analysis on the whole chassis of a moldboard plow. For this, a complete model of a three-bottom moldboard plow was assumed as the limit mode function. Stochastic soil parameters were applied and the interaction forces of the plow with soil were simulated with finite element method (FEM). The desired output was the soil reaction forces on the plow at the most critical plowing speed and depth. Then, by applying the forces obtained from the FEM model and considering Young's modulus of the chassis as a random variable, chassis static analysis was performed in different iterations and the stress concentration at different locations was determined. The probability of failure (Pf) and reliability index (β) of different locations of chassis were calculated. The results of the Monte Carlo simulation showed that the highest Pf occurred in crossbars, standards, braces and, masts with the values of $1, 0.296, 0.165$ and 0.33 , respectively, which indicates the uncertainty of the design in these parts and the needs to strengthen or optimize the aforementioned parts of the moldboard plow chassis.

کلمات کلیدی:

Chassis, Finite element method, Moldboard plow, The Monte Carlo simulation, Reliability

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