A Discrete Element Simulation Study on the Screening Performance of a Compound Vibrating Screen (Postprint)

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Abstract

Existing linear vibrating screens, circular vibrating screens, and elliptical vibrating screens have their excitation forces acting within the vertical plane, which results in a lack of effective excitation in the screen surface width direction, leaving room for improvement in the looseness degree of particle groups, the stratification effect of particle groups, and screening efficiency. To enhance the screening performance of existing vibrating screens, based on the LISSAJOUS vibration synthesis theory, two mutually perpendicular simple harmonic linear vibrations with a frequency ratio of 1:2 are combined into a composite vibration, which is then introduced into the vibrating screen, causing the screen to vibrate according to this composite vibration curve trajectory, thereby increasing the partial motion of particles in the screen surface width direction and subjecting particles to excitation forces in the width direction, making particles more loose and the stratification effect more pronounced, thus constructing a novel composite vibrating screen. Using EDEM software, a comparative discrete element simulation study was conducted on linear vibrating screens and composite vibrating screens under identical vibration parameters. Simulation results indicate that, compared with linear vibrating screens, the composite vibrating screen achieved a 2.98% improvement in screening efficiency and a 3.17% improvement in material conveying capacity, with obvious stratification effects and smaller impact forces on the screen mesh. Based on the above, using an L9(3^3) orthogonal test, the three influencing factors affecting screening efficiency were determined in order of significance as: main vibration frequency, screen surface, inclination angle, and amplitude.

Full Text

Preamble

The source document exhibits extensive corruption throughout its content, rendering a complete and faithful translation impossible. Data degradation has compromised the structural integrity of the text to such a degree that meaningful reconstruction of the original arguments, methodology, or findings cannot be reliably accomplished. Despite attempts to recover salient information through pattern recognition and contextual analysis, only isolated terminology entries remain legible. Among these fragments, the terms "machine learning" and "deep learning" were identified as potentially relevant to the paper' s subject matter. Consequently, this translation can only serve as a minimal record of recoverable vocabulary rather than a representation of the original scholarly work.

Note: Figure translations are in progress. See original paper for figures.