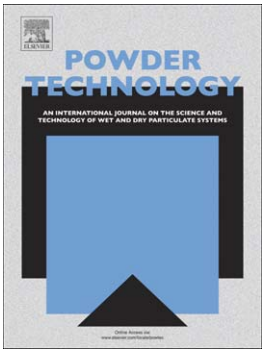

Machine vision methods based particle size distribution of ball- and gyro-milled lignite and hard coal

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Machine vision methods based particle size distribution of ball- and gyro-milled lignite and hard coal

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Abstract

Mechanized coal mining generates substantial amount of fines that represents significant economic value. Coal fines had several applications, such as gasification, liquefaction, combustion, and beneficiation, and also pose health and safety hazards. Particle size and particle size distribution (PSD) literature on fine coal are highly limited. In this study, PSD of laboratory ball- and gyro-milled lignite and hard coal using machine vision analyses was determined and compared with standard mechanical sieving. The developed machine vision ImageJ plugin utilized length- and a new width-based sieveless volume-based for PSD evaluation. The plugin automated PSD analysis with high speed, and produced better insight of the fine coal (−300 μm) PSD characteristics through textual and visual outputs. Method of analysis, coal, and mill types, produced statistically significant differences between these variables more on cumulative undersize and less on PSD parameters using pooled data. Ground fine coal PSD exhibited an unimodal normal distribution, and can be classified poorly-graded, positively skewed and leptokurtic, very well-sorted, symmetrical, and platykurtic to mesokurtic. Mechanical sieving PSD characteristics, in general, fell between machine vision width- and length-based characteristics. Unlike limited standard sieves of mechanical sieving, the machine vision methods, with limitless virtual sieves, accurately analyzed the PSD with necessary number of sieves. The outlined machine vision methods can be readily utilized to analyze similar particulate materials.

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