

Identification of the oversized material in hydraulic hammer crushing process based on 3D data analysis

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Fragmentation through crushing is a widespread technique in mining, typically utilized to achieve aggregates with the preferred particle size or as an initial step in the fragmentation process prior to grinding to extract valuable minerals from ores. Both crushing and grinding consume significant amounts of energy, the efficiency of which is being increasingly scrutinized.

Crushing is often a multi-stage operation, involving a series of crushers that work in tandem along the technological line to grind the material to the required fraction. During the presented experiments material had to be crushed by the hydraulic hammer to fit through the screen of a 40x40 centimeters square shape, after which it is transported for further processing. The focus of presented research is set on identification of the particles that would be considered as the oversized material as it is a crucial task in the crushing hammer automation process.

Authors propose a method based on the analysis of 3D data obtained from a laser scanner, recorded on one of the crushing sites in KGHM Polkowice-Sieroszowice mine. The difficulties of measurement are multiplied by the necessity of performing the scan from just a single scan station, which was forced by the safety concerns. Segmented but incomplete 3D data was processed by finding the geometric features that prevent the material from going through the screen. Proposed algorithm was able to correctly classify oversized rocks based on the available data.