The 2024 World Congress on
Advances in Civil, Environmental, & Materials Research (ACEM24)
19-22, August, 2024, The K hotel, Seoul, Korea

Effect of standoff distance and abrasive particle size on granite drilling performance using abrasive waterjet

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ABSTRACT

Recently, infrastructure shortages have occurred due to overpopulation in urban areas, and the need for underground space development is emerging. An abrasive waterjet technology has the advantages of low noise and low vibration. This method is suitable for developing underground spaces in urban areas vulnerable to noise and vibration problems. The jet emitted from an abrasive waterjet system is dispersed due to air resistance and reaches the target rock. When drilling rock using an abrasive waterjet, the main energy source is the kinetic energy of the abrasive particles. This energy varies depending on the abrasive particle size and the standoff distance from the target rock. In this study, the jet dispersion characteristics in air according to the abrasive particle size and standoff distance were investigated numerically. Additionally, the effects of abrasive particle size and standoff distance on granite drilling performance were observed through experiments. As a result, we derived the optimal abrasive particle size and standoff distance conditions. These results are expected to show effective drilling performance through efficient equipment operation when excavating rock using an abrasive waterjet.

ACKNOWLEDGMENT

This work was supported by a grant (RS-2023-00245334) funded by Korea of Ministry of Land, Infrastructure and Transport (MOLIT).

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