

Rock Excavation using Abrasive Waterjet

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Rock excavation is necessary for generating underground space. Blasting excavation is broadly used to excavate rock; however, explosive to break rocks induces serious noise and vibration which can damage near-structures or buildings. In addition, blasting excavation generates excavation damage zones (e.g., over-break). The physical, mechanical, and hydraulic properties of this zone are weakened by the blasting impact and stress concentration, which weakening reduces the safety and reliability of the large underground structure and leads to poor fragmentation and high support cost. Abrasive waterjet technology can help us solve these conventional excavation problems because it can achieve a higher accuracy and lower vibration during rock excavation. In addition, abrasive waterjet technology has the advantages of being no heat generated and no mechanical stress, both of which can induce an excavation damage zone. Abrasive waterjets can be applied for rock cutting by itself or for assisting a mechanical excavation. This seminar reviews the characteristics of abrasive waterjet; identifies and optimizes important parameters of abrasive waterjet through laboratory experimental tests; suggests a maximum kinetic energy model which can quantify and predict the performance of abrasive waterjet; and finally presents a practical application for tunnel excavation through field tests.