

Call for Research Assistance



Utilisation of Mine Waste in Shotcrete for Underground Support Research Project

Background

In Western Australia, underground mining activities produce a large quantity of mine waste, including mine tailings and mine waste rock, which may lead to environmental problems such as land sterilisation/quarantining. A great deal of land is required for tailings deposition, which often requires the mining company to invest heavily in site maintenance and monitoring. Reusing mine waste, as distinguished from the conventional disposal, is a leading issue for industry.

Shotcrete is widely used for underground mining support. In shotcrete, sand is used as the fine aggregate and accounts for a large proportion of the mix. In remote locations, sand is often trucked in, as local Aeolian sand is unsuitable for shotcrete or construction. This can be a considerable expense.

Previous studies examined the use of mine waste to make a concrete product and found it was effective and efficient to repurpose the material for higher value-added products; but there is little research on using mine waste in shotcrete for

Research aims

- Build an artificial intelligence (AI) model for shotcrete mix design
- Investigate the use of mine site tailings in shotcrete for underground support

underground support. The mix design for shotcrete is more complex than concrete, due to particular requirements. For example, very-early-age strength is required in the shotcrete mix, which is essential for the safe re-entry of sprayers. Furthermore, changes to the components and proportions of the mix can significantly influence shotcrete performance. Some researchers undertook preliminary work on using tailings to replace aggregates in shotcrete. The resultant shotcrete performance did not meet industry requirements, although results showed the potential for improvement. Further study in this highly relevant and topical area is needed.

Industry sponsors are sought for this research project.
For details, email marketing-acg@uwa.edu.au

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Who should be involved?

Mine sites and shotcrete suppliers who are interested in the following aspects:

- Using handy AI models to design a new shotcrete mix
- Reuse of mine tailings
- Reducing shotcrete production costs



Xingjie is the 2019 Emeritus Professor Odwyn Jones PhD Scholarship recipient, courtesy of MRIWA.

Research objectives

The aim of this PhD project is to develop an innovative sustainable solution for mine waste reuse; specifically, to replace sand with mine tailings in the shotcrete mix without affecting the performance of shotcrete in underground support.

The project seeks to:

- Collect data and build an AI model/machine learning to find the most important and sensitive parameters in shotcrete mix design, which may facilitate the design of new shotcrete mixes.
- Conduct experiments and tests on tailings from different mine sites to investigate the feasibility of reusing tailings, instead of sand, in shotcrete, and optimise the mix design of the tailing-based shotcrete.



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ACG Shotcrete Design, Application and Ground Response Seminar 14 March 2021 | Perth, West Australia | Alongside UGOPS 2021

Seminar objective:

This seminar is aimed at site personnel involved in the design, implementation and quality assurance of shotcrete/fibrecrete in mining and civil engineering. The seminar will be presented by practitioners with experience in shotcrete processes who are willing to pass on their knowledge in a general forum.

To register for the ACG Shotcrete Design, Application and Ground Response Seminar, delegates are to contact The AusIMM directly, not the Australian Centre for Geomechanics.

Please visit <http://undergroundoperators.ausimm.com/workshops/>
or email conference@ausimm.com

