Dynamic on-bench loading location optimisation of explosive trucks for short-term mine planning

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# ABSTRACT

The mining industry is progressing steadily toward operation optimisation, with drill-and-blast operations presenting significant challenges in this transition. Many mining processes still require optimisation especially for mine sites with a substantial geographic spread. One such process, which consumes substantial time and resources, involves traveling distance for charging blast holes using Mobile Processing Units (MPUs) and re-loading MPUs at facilities which may not be in proximity to the charging location. This study introduces an innovative programming tool designed to optimise the number of MPUs and their routes within a pit, taking into account factors such as explosive types and MPU capacities based on the provided mine plan inputs. Additionally, the tool employs a Genetic Algorithm (GA) and satellite road networking mapping to determine the optimal on-bench loading locations for multiple pits, minimising travel distances between MPUs, pits, on-bench loading areas, and magazines. The tool was tested over four 6-month parts of the mine plan for Fortescue, demonstrating significant reductions in travel distances, thus providing the potential to minimise operational costs.