A robust cost-effectiveness assessment of passive AMD treatment

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Abstract

Managing the environmental effects of mining is a determinant of the scientific, social, and regulatory acceptability of each mining operation and the industry in general. One aspect of this is that mining companies are expected to mitigate and avoid negative environmental externalities as part of standard business practice, which can be a significant part of the overall mining cost. Hence, the cost-effectiveness of environmental mine site design and operation is an important area of research.

Acid mine drainage (AMD) is an environmental impact from a number of New Zealand's coal mines. Many current and legacy mine sites require treatment long after operations have ceased. Passive AMD treatment systems have been trialled at various sites in New Zealand as an alternative to more common active treatment systems. Published studies about the efficacy of passive and active AMD treatment systems generally focus on the efficiency of chemical reactions, but do not explicitly consider the financial aspects of either system. Capital and operational costs differ between active and passive systems, particularly when treatment costs are spread over decades, and economic considerations co-determine the best option for AMD treatment.

In this paper, we collect geochemical data and cost data from a number of coal mines in New Zealand. A number of these sites have a passive treatment system, and the remainder use active treatment for AMD. The cost data for these systems can be used to estimate the cost of installing and operating the most likely alternative system, and to calculate cost-effectiveness ratios of AMD treatment options at each site. We then test the ratios for fluctuations in acidity, water flow, and for a range of costs and discount rates.

Our approach refines analysis of cost-effective AMD treatment, and illustrates how additional insights can be gained to inform economic decisions about mine design and management.