A review of mining practices for surface support: an international survey

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Abstract

This paper reviews mining practices for surface support and identifies four key areas that need attention. An international survey was conducted as part of the Mining Initiative on Ground Support Systems and Equipment III project from 2017 to 2018. The survey used a standardised, web-based questionnaire adapted for personal computers and smartphones. The survey was distributed globally, with data collected from 58 underground mines with different mining conditions and challenges. The results highlight the challenges with regard to safety and automation of surface support for different rock conditions and the advantages and disadvantages of various machines (face drills versus mechanised dedicated bolters versus semi-mechanised bolters) used to install surface support. The survey also shows the ambiguity in the mining community with regard to productivity of mine support. This paper presents an approach for collecting technical data through an online tool, which is inexpensive and effective.

Keywords: surface support, mesh/screen installation, productivity, qualitative review, mine automation

1 Introduction

The working environment for ground support installation in mines has improved during the last three decades, with an increasing incidence of fully mechanised installations of different ground support elements. Several types of mesh/screen for rock support are available, and a number of different installation procedures are used (Daehnke et al. 2001; Hadjigeorgiou & Potvin 2011; Szwedzicki 2005), from manual installations to procedures using fully mechanised rigs. The sizes of mesh/screen vary; a larger mesh/screen reduces the overlapping areas but is more difficult to handle, resulting in an increased installation time (Daehnke et al. 2001; Hadjigeorgiou & Potvin 2011). A great deal of research has been done to understand the effects on the support elements in laboratory tests (Hadjigeorgiou & Potvin 2011). Recently, field reviews of ground support practices have been performed for specific mines and mining conditions (Chikande & Zvarivadza 2016; Daehnke et al. 2001; Potvin & Hadjigeorgiou 2008; Szwedzicki 2005). Potvin & Wesseloo (2013) highlight issues of design indeterminacy and note the need for a better understanding of dynamic demand on ground support systems. A review of failure events for seismically active mines shows a need to develop new ground support guidelines for deep underground mines (Morissette et al. 2017). For underground mines, the cost of ground support is considerable, and reducing it can help mines reduce their operating costs. For example, at Kristineberg mine, the total cost of consumables for rock support is 50 million Swedish krona per year, which amounts to 14% of the mine’s operating costs (e.g. depreciation) and adds 74 Swedish krona to the unit cost per tonne of ore produced (Haugen 2016).

To select the best mesh/screen for each condition, a worldwide evaluation of the available technology, methods, area of use and the benefits and/or drawbacks is needed. This paper describes an international benchmarking survey of mesh/screen use and installation, conducted within the framework of Mining Initiative on Ground Support Systems and Equipment, its purpose being to gain insight into surface rock support in different parts of the world.
View the full version of this paper at:  https://papers.acg.uwa.edu.au/p/1925_19_Shekhar/

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16. Where is mesh/screen installed?
17. What is the sequence of installation for mesh/screen support in the mine?
18. How many squares of mesh/screen overlap is practised in the mine?
19. How is mesh/screen support installed?
20. What kind of equipment is used for installation of mesh/screen support?
21. Which equipment supplier is used?
22. What kind of rehabilitation practices are done at the mine?
23. How often is mesh/screen checked for damages?
24. What kind of productivity measure do you have for mesh/screen supports?
25. What is the average mesh/screen support productivity for your mine?
26. What are the major productivity issues with handling and installation of mesh/screen support?
27. What are the major safety issues with handling and installation of mesh/screen support?
28. If you wish to receive a short summary of the results of the survey, kindly fill in your email address below.

References