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ASSESSMENT OF MINE VENTILATION SYSTEM RELIABILITY USING RANDOM SIMULATION METHOD

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Abstract

A mine ventilation system provides a fresh air flow to the underground workings in a coal mine. Such sufficient air volume can dilute and remove noxious gases (typically NO_x, SO_2, CH_4, CO_2 and CO) and maintain a suitable working environment for coal miners. On the other hand, a poor ventilation system often leads to serious consequences such as mine gas explosions, production loss or higher operational costs. Hence, the functions of mine ventilation system are very important for an underground mining system. This paper presents a reliability assessment approach for evaluating the mine ventilation system based on a random simulation method, Monte-Carlo Simulation (MCS). In detail, the first step of this method is to finish probabilistic descriptions of the mine ventilation network. Then, the criteria of successful conditions are defined. Finally, the Monte-Carlo Simulation (MCS) method is used for performing the reliability assessment. By using this assessment approach, the random characteristics in the system can be well considered. Hence, the results are more accurate and reliable. In addition, the risk evaluation for the mine main fan is also approached by the Monte-Carlo Simulation (MCS) method. Two important problems, the yearly percentage of loss time due to fan repairing and yearly breakdown times, are answered. Through the paper, a case study has been shown and investigated to demonstrate the assessment procedure for a mine ventilation system with using the MCS method.

Key words: mine ventilation system, Monte-Carlo Simulation (MCS), reliability assessment

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