

The influence of atmospheric pressure changes on gas sampling in mine closed fire zone

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ABSTRACT

Analysis of the gas composition changes is the most important basis for evaluating the state of the closed fire zone. Considering the periodic fluctuation of the ground atmospheric pressure, the gas components within a certain distance in the closed fire wall are affected by the air leakage, where the real state of the fire zone cannot be truly reflected. Based on the annual atmospheric pressure hourly data recorded in six regional meteorological monitoring stations in Shanxi Province, China, the daily periodicity, annual periodicity, fluctuation amplitude, and pressure change rate of atmospheric pressure change were statistically analysed. Besides, a functional relationship was established between periodic fluctuations in atmospheric pressure and gas migration in a closed fire zone. The influence of the rules of ground atmospheric pressure on the sampling method of the closed fire zone, the sampling timing and the shortest buried depth of the sampling pipe were also analysed and discussed. The results show that: (1) The daily periodicity of atmospheric pressure is irregular, but the distribution of atmospheric pressure trough and peak value is regular in every day. (2) Periodic variation of atmospheric pressure lead to periodic expansion and contraction of gas in closed fire area. Therefore, to obtain the real gas in fire zone, the gas sampling tube should be buried in the closed wall for at least 30 m to avoid interference from air leakage. (3) When conducting gas analysis in a closed fire zone, a continuous sampling analysis facility should be used to perform a closed fire zone gas analysis for proper combustion state analysis.

Key words: closed fire zone; changes of atmospheric pressure; periodic fluctuation; gas sampling