

Performance Analysis of Surface Goafhole Gas Drainage System and Use of CO Triggers in Goaf Hole Operations for Spontaneous Combustion Risk Management in Australian Coal Mines

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Abstract: This paper focuses on assessing gas drainage performance from vertical surface goafholes in an operating mine with high specific gas emission rates ($\sim 20 \text{ m}^3/\text{t}$). Field monitoring results of gas flow rate and gas composition collected from individual gas drainage holes were analysed. The major challenge of implementing the full potential of goaf drainage system is the perceived risk of spontaneous combustion (sponcom) in goaf using *arbitrary trigger set points*. Although the provenance on the introduction and reasons for the use of CO is unknown, the paper highlights that the current use of CO based trigger action response plan (TARP) for sponcom management leads to the premature closure of goafholes, which largely constrains goafhole gas drainage performance and has a significant bearing on longwall gas management. The CO concentration in gas captured by goafholes is found to be positively correlated with O_2 concentration and negatively correlated with CH_4 . Building upon abundant field measurement data, goaf gas profiles for CO, O_2 , CH_4 and CO_2 concentration were established, which suggest that the increase trend of CO level behind the face is a normal behaviour of goaf closure and would recover to trivial concentration after 300 m deep into the goaf. The paper provides the basis to eliminate or review the use of CO triggers in current surface goaf gas management TARP levels of longwall panels, which has detrimental effect on longwall TG gas management for explosion prevention.

Keywords: goafhole, gas composition, CO, TARP, longwall.