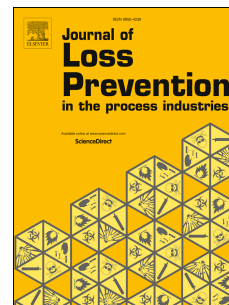


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Experimental Study on the Effect of Explosion Suppression in Low-concentration Gas Transportation

Runzhi Li^{1,*}, Rongjun Si¹, Ke Gao^{2,3}, Xinxin Qin¹, Liangxiu Wen^{2,3}

1. Fire and Explosion Prevention Research Branch, China Coal Technology and Engineering
Group Chongqing Research Institute, Chongqing 400037, China

2. College of Safety Science and Engineering, Liaoning Technical University, Liaoning, Huludao
125105, China

3. Key Laboratory of Mine Thermo-motive Disaster and Prevention, Ministry of Education,
Huludao 125105, China

Abstract: Safety issues are of particular importance in low-concentration gas delivery. The gas explosion propagation rule and the effects of an active powder-spraying explosion-suppression device on a gas explosion in a pipeline were experimentally studied by using an experimental system with $\Phi 500$ mm pipeline explosion suppression. The research demonstrates the gas explosion pressure and flame propagation law that were obtained in the 500-mm pipe. In combination with the action time of the active powder-spraying explosion-suppression device, its installation position in the gas transmission pipeline was determined. The active powder-spraying explosion-suppression device exhibits a clear inhibitory effect on the flame and explosion pressure of a gas explosion in the pipeline, and the inhibitory effect varies with the amount of suppressant used. Under experimental conditions, a 10-kg explosion-suppression agent can successfully suppress the explosion flame, while the explosion pressure will be greatly attenuated. The conclusions provide an important theoretical basis for effectively suppressing a gas explosion in the low-concentration gas transportation process.

Keywords: low concentration gas transportation; gas explosion; maximum explosion pressure; flame propagation velocity; explosion suppression effect

1. Introduction

Gas is a type of high-quality energy. In China, more than 70% of gas extraction, with less than 30% of gas concentration, belongs to low concentrations of the gas extraction range (Xue et al., 2008). Therefore, the low concentration of gas in this paper is a gas with methane concentration of less than 30%, and the residual components are mainly air. Because the gas concentration in this part may be within the explosion limit, the risk of explosion exists during the processes of transportation, utilisation, and emission. In order to improve the safety of low-concentration gas pipeline transportation, the China State Administration on work safety promulgated the "AQ 1076-2009 coal mine low concentration gas pipeline transportation safety system design standard", with the aim of installing explosion-suppression and explosion-resistant devices in the low-concentration gas transmission pipeline.

The active powder-spraying explosion-suppression device is important safety equipment for the transportation, utilisation, and evacuation of the low-concentration gas pipeline. Active

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