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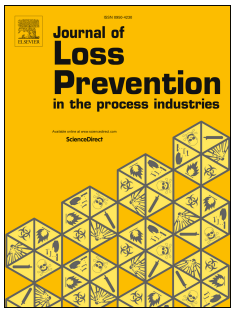

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Experimental Study on the Location of Gas Drainage Pipeline Leak Using Cellular Automata

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Abstract: In recent years, researches on leak detection and location of oil and gas pipeline have attracted considerable attention. A variety of methods have been proposed, including a pipeline-model-based method that predicts pressure distribution along the pipeline and locates the leak through the pressure and flow rate signal on both ends of the pipeline. At present, the most widely used pipeline-model-based methods include the pressure gradient (PG) method and the average friction coefficient (AFC) method. Nevertheless, the pressure gradient PG method which ignores the influences of friction coefficient, temperature, pipe diameter and other factors on the pressure distribution along the pipeline considers the pressure to be linear. The average friction coefficient (AFC) method assumes the friction coefficient and pipe diameter to be constant, yet gas pipeline is nonlinear and complex. Additionally, other uncertain factors such as changes in medium components and working conditions increase the difficulty of accurately describing the pipeline. To solve this problem, this study proposed a cellular automata (CA) model to locate the leak of main gas drainage pipeline. In the cellular automata model, the friction coefficient and diameter change are discretely distributed along the pipeline. The pressure distribution along the pipeline is predicted using flow rate and pressure parameters at both ends of the pipeline. This method assumes a continuous change in the pipeline fluid over time and space, thus improving the location accuracy.

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Key words: cellular automata; gas drainage pipeline; leak location; partial friction coefficient