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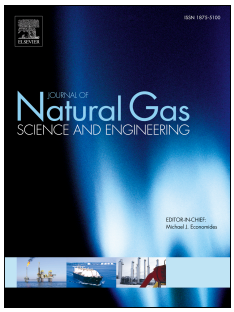

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Mechanism and application of pulse hydraulic fracturing in improving drainage of coalbed methane

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Abstract: Traditional hydraulic fracturing (THF) has become an effective stimulation method for the extraction of coalbed methane (CBM) and has attained many remarkable achievements in the application. However, certain problems, such as greater water pressure, larger volume of fracturing equipment, and a stricter sealing requirement, have gradually arisen in the field application. To improve the application situation, a newly developed technology of pulse hydraulic fracturing (PHF) is proposed to enhance CBM drainage via accumulating the damages in the reservoirs and weakening the rock strength by exciting oscillation from pulsating water pressure. Comparison of fracture behaviors between PHF and THF at various side-pressure ratios was executed using numerical software of PFC^{2D}; the results demonstrated that the fracture pressures required for PHF, which induced more cracks and a larger fracturing region, were all lower than those for THF. Additionally, the field application of PHF was performed for the $N_2$706 floor roadway with crossing holes in the Daxing coal mine, Liaoning Province, China. The results demonstrated that (a) all of the fracturing holes for PHF had lower fracture pressure than the calculated initiation pressure by THF, which is consistent with the simulation results; (b) the drainage parameter values of holes made via PHF, such as drainage concentration and drainage pure volume, were generally greater than those of THF. All of the simulation and application results expressed that PHF had greater superiority than THF in the application of CBM recovery based on the features of lower fracturing pressure and more cracks generation. A large amount of accumulated damage produced by PHF could greatly destroy the integrality of coal, which induced much micro-cracks generation, significantly weakening the strength of the reservoir; thus, more complicated fracture networks would be formed under a lower water pressure. Moreover, the proportion of mesopores

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