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SAFETY EVALUATION OF CAVERNS FOR GAS STORAGE IN BEDDED ROCK SALT FORMATION LOCATED CLOSE TO A TECTONIC FAULT

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Abstract

Rock salt resources of China are distributed mainly in graben or half-graben basins, where many tectonic faults usually exist. Serious challenges are encountered for the safety of caverns used as underground gas storage close to a fault. Tests have been carried out to determine the mechanical and permeability parameters of Jintan rock salt samples obtained from the target formation where the caverns will be located. 3D numerical geomechanical models have been developed based on these parameters, Jintan salt mine formation characteristics, and the tectonic fault distribution. Effects of fault dip angle and distance between fault and adjacent cavern on the safety of an adjacent cavern are discussed. The design parameters of a cavern close to a fault in Jintan salt mine are optimized. To verify the safety of a cavern with optimized dimensions, deformation, plastic zone, safety factor (SF), equivalent strain (ES), and seepage pressure are used as the assessment indexes. Results show that the cavern with optimized dimensions close to a fault can satisfy the safety requirement over the entire design life-time, and has a reasonable safety margin. The distance between the cavern and the adjacent vertical fault in Jintan salt mine should be no less than two times the maximum cavern diameter. The thickness of rock salt between cavern roof and bottom and horizontal fault should be no less than 40 m.

Key words: gas storage, salt cavern, fault, 3D geomechanical model, safety evaluation

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