

Natural fractures and their Contributions to Deep tight gas Sandstone Reservoirs in the Southern Junggar Foreland Basin, Northwestern China

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ABSTRACT

The Jurassic formation in the foreland thrust belt of the southern Junggar Basin, contains rich natural gas resources, and is mainly composed of sandstones characterized by a bury depth of more than 6000m, an average porosity of less than 6.0%, and an average air permeability of less than 0.5mD. Natural fractures are ubiquitous in these deep tight sandstone reservoirs, and are thought to play a fundamental role in the accumulation and production of natural gas in these reservoirs. In this study, we focus on the development characteristics and major influencing factors of natural fractures in foreland basin, and an attempt is made to determine the potential contributions of natural fractures to deep tight sandstone reservoirs. A variety of analytical techniques are conducted, including geostatistical analyses of intensity, geometry and distribution of natural fracture in outcrops, drilling cores, image and conventional logs, and thin sections; physical properties analysis of porosity and permeability; physical and numerical simulation of deformation. By integrating the data and results above, we can present natural fracture patterns of the fault-related folds in foreland basin and clarify the variability of fracture intensity in deep tight sandstone reservoirs, especially the correlation between fracture and depth. Additionally, this project aims to evaluate the effectiveness of natural fractures in deep tight sandstone reservoirs, and the effects of natural fractures on such reservoirs. The results will provide valuable guidance for the exploration and development of tight gas sandstone reservoirs below 6000m in the foreland basin.