A hybrid model for selecting horizontal candidate wells for Re-fracturing of tight oil reservoirs - A case study in MH oil field, Junggar Basin, Western China

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The tight sandstone gas reservoir in southern Songliao Basin is naturally fractured and is characterized by its low porosity and permeability. Large-scale hydraulic fracturing is the most effective way to develop this tight gas reservoir. Quantitative evaluation of fracability is essential for optimizing a fracturing reservoir. In this study, nine fracability-related factors, particularly mechanical brittleness, unconfined compressive strength (UCS), mineral brittleness, cohesion, internal friction angle (IFA), natural fracture, fracture toughness, horizontal stress difference, and fracture barrier were obtained based on a series of petrophysical and geomechanical experiments. Taking above factors into consideration, a modified comprehensive evaluation model is proposed based on analytic hierarchy process (AHP) method. The UCS and IFA were removed from the AHP model based on the results of factor correlation analysis. The transfer matrix in the weighting procedure was applied to improve the consistency of judgment matrix, and the fuzzy matrix was employed to promote the objectiveness of final decision. The fracability evaluation of four reservoir intervals in Jinshan gas field was analyzed. Field fracturing tests were conducted to verify the feasibility of the proposed evaluation model. Results showed that the tubing pressure curve is more fluctuated in the reservoir interval with more developed natural fractures, and gas production is higher in the reservoir interval with greater fracability coefficient. The field test data coincide with the results of the proposed evaluation model.

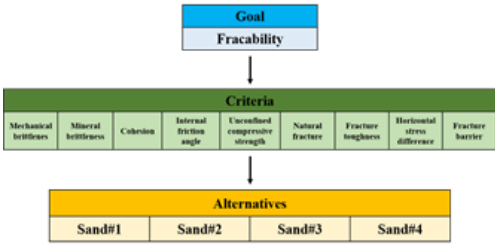

Figure 1. Hierarchy structure of analytic hierarchy process model for optimizing reservoir candidates

Biography

Rui He has his expertise in oil and gas reservoir stimulation mechanical and engineering technology. His fracability evaluation model based on AHP method creates a new pathway for candidate selection in naturally fractured sandstone reservoirs. The model is improved in many ways compared with previous similar models, and it was firstly applied in field test. The results show that the field test data coincide with the results of the proposed evaluation model very well. His work can help reduce irrational judgments of well selection for prioritized fracturing operation, and the engineering cost will decrease and more oil & gas may be obtained if his model is applied more widely.

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