

The Geology and Engineering Sweet Spot Technology Services Project

Technology introduction

Due to the complex geological conditions and strong heterogeneity of reservoir properties, the implementations of shale gas resources development have great risks and uncertainties such as horizontal drilling, well completion, and hydraulic fracturing treatment. Ultimately, it will directly affect the productivities and productions of shale gas wells. Therefore, it is particularly important to enforce the identification and fine characterization of natural fractures in horizontal drilling blocks, to conduct geomechanics study and detail 3D geomechanical modeling, and to implement real-time optimization and adjustment of wellbore trajectory during horizontal drilling and hydraulic fracturing treatment operations.

Based on detailed 3D geological modeling, fine tracking service for new wells, 12 specified services in three aspects and dynamic tracking analysis and evaluation of producing wells have been carried out. Tasks include shale gas drilling and fracturing design optimization, real-time tracking and adjustment, and dynamic tracking and evaluation of production wells, and efforts are made to improve the average production per well, cumulative production per well and the overall recovery rate of the block, so as to achieve both highspeed and high efficient development of the shale gas reservoir.

Technology states

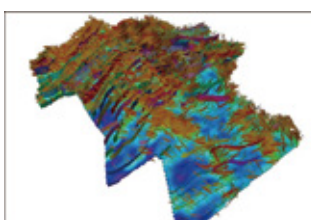
The shale gas field in Changning area is the main area of new gas producing capacity built-up of Southwest Oil & Gas Company. In order to ensure the final implementation results of shale gas wells and to improve the efficiency of the overall shale gas development, Anton brings in the technical team with rich North America and international shale gas development experiences carries out 3D geological and geomechanical modeling, continuously optimizes the implementation plan of shale gas horizontal wells, strengthen the seamless integration between the geological model iterations and the on-site implementation, and achieves real-time tracking and optimization in the implementation process of drilling and fracturing.

Through comprehensive analysis and evaluation of static and dynamic data of producing wells, drilling, completion and fracturing designs and implementations, and production scheduling, the accuracy of understanding of reservoir geology is verified, the influence of engineering technical factors on single well productivity, cumulative production and controlled reserves volume is quantified, the main control factors are identified, and the whole process optimization of drilling and completion of new wells, hydraulic fracturing and production is guided. The team tracks and evaluates abnormal producing wells, analyzes its reasons to make suggestions on the next step, fully develop the potential of producing wells, and to improve the block development efficiency.

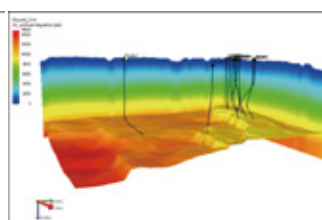
Application case

By closely integration of geology, drilling, hydraulic fracturing as well as other related disciplines, we have completed studies on three-dimensional fine seismic interpretation, quantitative prediction of high-quality shale reservoir properties (sweet spot), three-dimensional geological modeling, multi-scale natural fracture detection and modeling, geomechanical modeling, drilling process optimization and hydraulic fracturing design optimization, effective guidance on the implementation of shale gas horizontal wells. The project has achieved the following main results:

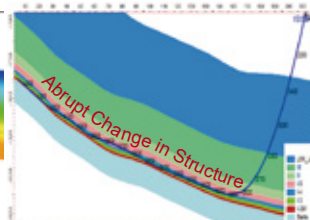
- ① The structural characteristics of the main target strata in Longmaxi formation are described in detail, and the drilling depth of the target strata conforms to the three-dimensional geological model to within 2 meters.
- ② The multi-parameter three-dimensional geological model, in-situ stress results and three-dimensional geomechanical model have provided strong support for the preparation and implementation of horizontal well drilling and hydraulic fracturing strategy and design.
- ③ Conduct drilling optimization research and put forward specific technical measures to improve drilling efficiency and cost reduction.
- ④ Closely integrated with the development and production of horizontal wells, Anton actively developed early drilling risk warnings for new wells in the Ning 209 Block, actively carried out coring and stratigraphic division for Ning XXX well and effect analysis for HXX-X well after hydraulic fracturing, and has achieved good result.



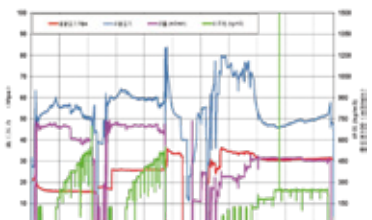
Natural Fracture
Distribution Model



Three-Dimensional
Stress Field Model



Drilling Trajectory
Optimization and Adjustment



Real-time Optimization and
Adjustment for Fracuring