

## **Tight Sandstone Oil Potential in Mature Reservoir, South of Songliao Basins**

**Wenqi Zhang<sup>1</sup>, Fei Gu<sup>1</sup>, Zhou Lyu<sup>1</sup>, Yang Zhang<sup>1</sup>, and Fang Xu<sup>1</sup>**

<sup>1</sup>Research Inst. of Petroleum Exploration and Development, PetroChina, China.

### **ABSTRACT**

Since the successful development of tight oil, the tight reservoirs has become a hot topic in China. The Qingshankou source rock in Songliao Basin is one of the most potential tight oil target in China. Although shale oil and tight sandstone oil had been notice in recent years, Qingshankou tight sandstone oil has attracted more attention. To better understand the potential of the tight sandstone oil and their well performance, DQZ oil field was taken as a study target in south of the Songliao Basin and an integrated, regional study has been done by using core, production and well log data.

The sedimentary environment of Qingshankou formation is the deep lake, where the shale is the main rock type. The thin tight sandstone located in the shale was formed by the river delta from southwest. The shale is the main source rock of the study area, with the TOC content is around 2% and the maturity is from 0.7 to 1.0. Tight sandstone reservoirs are in the path of hydrocarbon migration, and has good hydrocarbon bearing property.

Based on the core observation and analysis data, combining with the logging and dynamic data, the property conditions of tight sandstone oil were studied. Through study, we can notice that reservoirs, whose porosity below 9% and permeability below 0.1md, still have good oil-bearing properties. Therefore, the reservoir porosity cutoff was changed from the original 12% to 9%, permeability cutoff from the original 1md down to 0.1md.

After lower the reservoir property cutoff, more tight reservoir target was got. Due to the poor physical properties, the complicated pore structure, and the fine-grained rock logging properties, it is difficult to judge Tight reservoirs oil-bearing and characterize the Initial Oil Saturation (IOS). Basing on the research of fluid saturation, physical properties, lithology, and logging properties, Tight reservoir fluid saturation quantitative characterisation has been realized by using formula-transformation on Archie's Formula. The concrete steps include several parts: 1) Petrophysical test was carried out on siltstone, muddy siltstone, mudstone, and other Fine-grained sediment rock. Petrophysical parameters, which was used on tight reservoirs fluid saturation interpretation, was obtained; 2) According coring test and logging data, physical properties - Resistivity chart is established; 3) By comparing the differences of resistivity under oil and non-oil two cases, the tight oil can be clearly identified; 4) Using the Petrophysical parameters, Fluid Saturation of tight oil was calculated by Archie's Formula. Comparing with the initial oil saturation data which obtained from the sealed coring analysis, the results have a strong correlation with the core data; furthermore, the results also match the well testing and production data. This paper extends the conventional reservoir fluid Saturation interpretation to the tight reservoirs, and provides geological basis for the tight reservoir development.

According to the above method, the potential tight sandstone oil reservoirs in the study area was found and evaluated. Tight sandstone reservoirs are optimized for hydraulic fracturing tests, and industrial oil flows was obtained. The research target, about 500 square kilometers, is expected to increase the tight sandstone oil reserves by 50 million cubic meters.