Go to Second Poster

1

INTRODUCTION

The Sulige Gas Field in the central Ordos Basin (Fig. 1) was discovered in 2000 and was put on stream in November 2003. The field was estimated to contain 18.85 Tcf of proven in-place gas in a gas-bearing area of 6,500 square kilometers, making it the largest in China. The stratigraphic reservoirs are characterized by low gas richness, low reservoir pressure, low permeability, and significant reservoir heterogeneity. The net pays consist of relatively high permeability sandstones that are encased among the low permeability tight sands (Fig. 2).

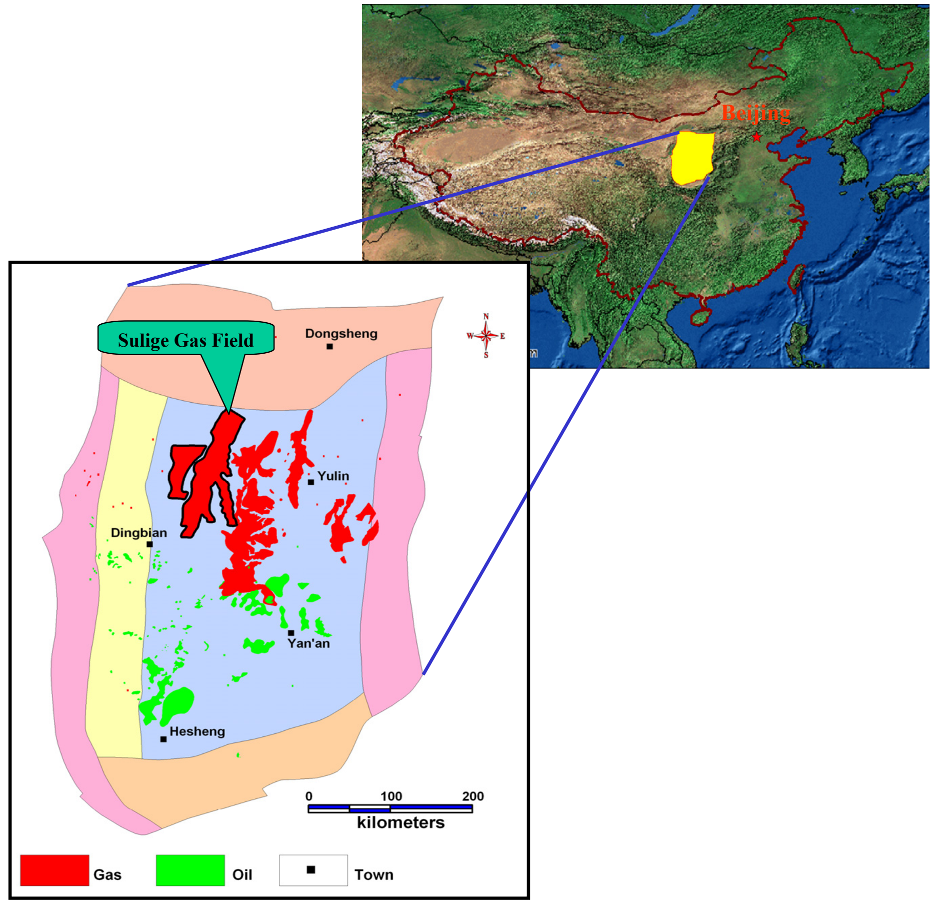

Figure 1. The Sulige Field location map.

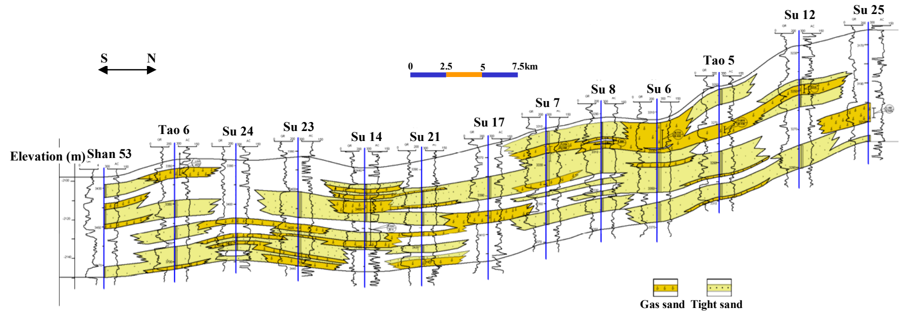

Figure 2. Cross-section of the Sulige Gas Field from well Shan 53 to Su 25.

STRATIGRAPHY

Reservoirs in Sulige Gas Field are dominated by coarse-grained sandstones of the Lower Permian Shihezi and Shanxi formations, especially those of the Shihezi 8 and Shanxi 1 units (Fig. 3). These sands, with an average burial depth of 3,200-3,500m, were deposited in a braided-river environment.

PETROPHYSICS

Sandstones in the Sulige Gas Field are characterized by low porosity and low permeability (Fig. 4). The porosity and permeability cutoff for net pays is 5% and 0.03 mD, respectively. Coarser sands have higher porosity and permeability, and hence better reservoir quality (Fig. 5&6). However, medium- and fine-grained sandstones do not form productive reservoirs.

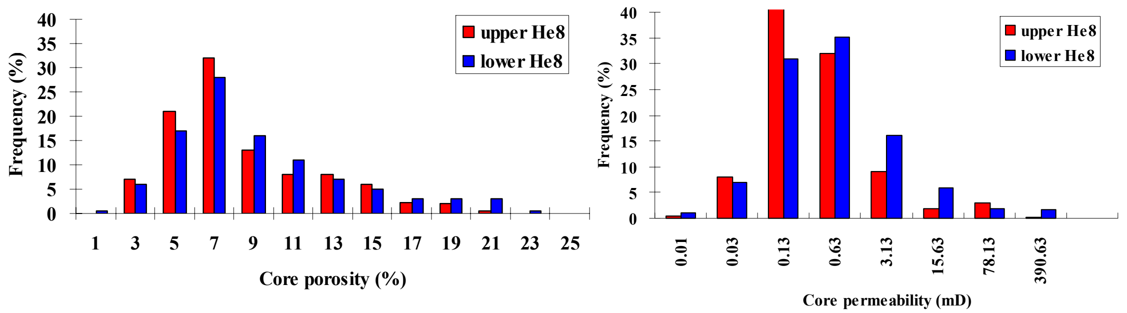

Figure 4. Porosity and permeability of the sands in Sulige Gas Field based on core analysis.

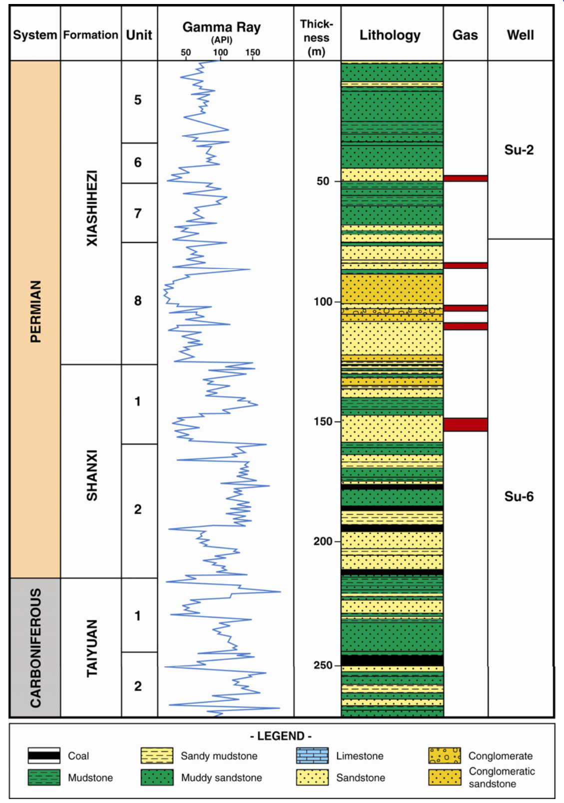

Figure 3. Stratigraphic chart of the Sulige Gas Field.

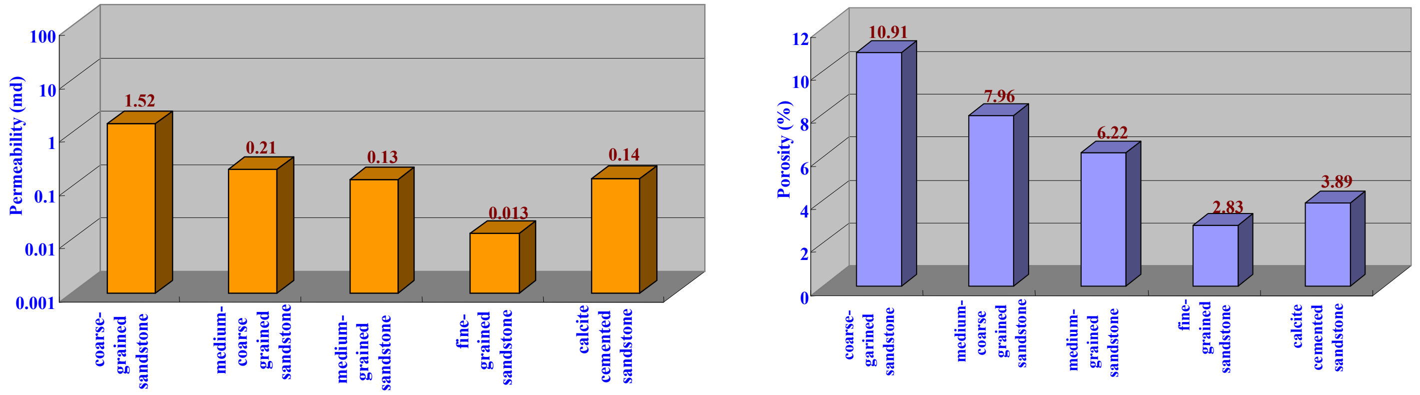

Figure 5. The relationship among grain size, lithology and petrophysics in the Sulige Gas Field.

Gray coarse-grained sand
Well #6, 3324m

Gray medium-grained sand
Well #26, 3357m

Gray inclined-bedded fine-grained sand
Well #5, 3296m

Grayish-green fine-grained sand
Well #43-6, 3326m

Figure 6. Representative lithologic facies in the Sulige Gas Field.

SANDSTONE PETROGRAPHY & DIAGENESIS

Reservoir sandstones are typically lithic sandstones, with rock fragments dominated by quartzite, phyllite/slate, and volcanics (Fig. 7). High content of quartzitic fragments and quartz grains (Fig. 8) in coarse-grained sandstones is responsible for the preservation of primary porosity. Fluid circulation in primary pores resulted in the formation of secondary porosity. In contrast, medium- and fine-grained sandstones have a high content of soft rock fragments. These soft rock fragments experienced tight compaction, leading to a decreased primary porosity and poorly developed secondary porosity. Sedimentary facies control sandstone textures and compositions, diagenetic facies, and reservoir quality (Fig. 9).

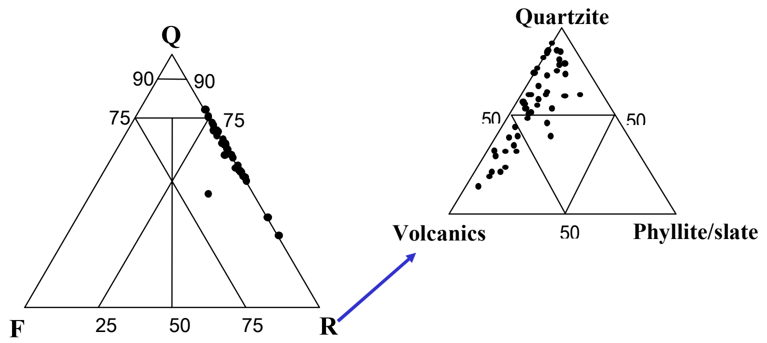

Figure 7. The composition of sandstones in the Sulige Gas Field.

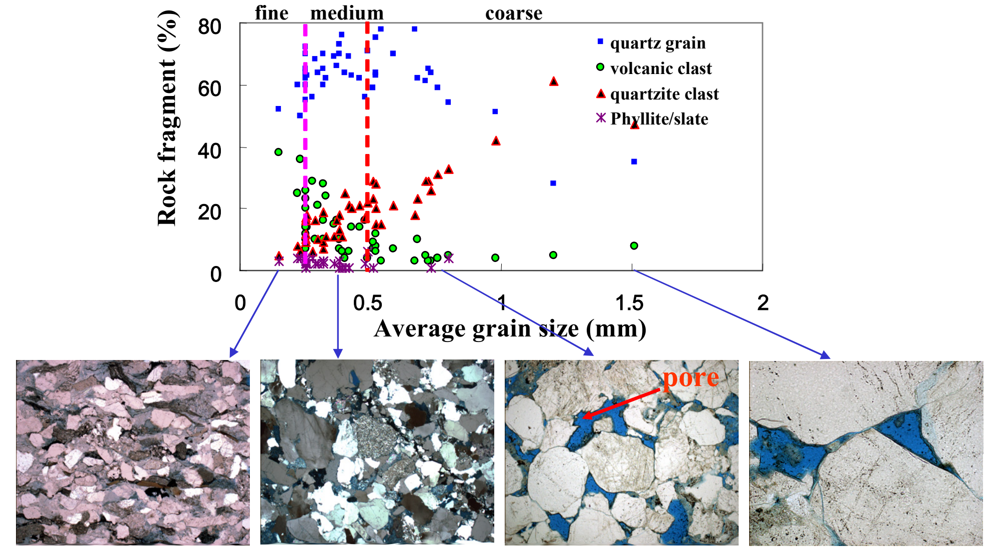

Figure 8. Grain size, rock fragments, and porosity.

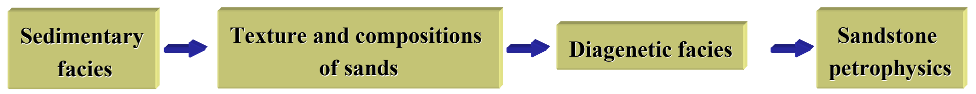

Figure 9. Controlling factors on reservoir quality.