

Paper Number: 2761

Source–Reservoir Assemblage Types and Differential Accumulation Mechanisms in Tight Oil Reservoirs — A case study in Qingxi Sag

Qun Luo, Chen Zhang and Yunzhao Zhang

China University of Petroleum, Beijing, China; luoqunzc@163.com

The quality of source and reservoir rocks as well as their spatial assemblage types are crucial factors that control the charging, accumulation, and enrichment of tight oil. However, there are still deficiencies in the knowledge about these factors, especially regarding differences in the mechanism of charging, accumulation, and enrichment of tight oil between different source–reservoir assemblage types, which restricts the formation of theory as well as the process of exploration and development. Taking Qingxi Sag in the Jiuquan Basin as an example, we have drawn conclusions by field observations, core descriptions, and drilling analysis that there may be eight types of source–reservoir assemblages. Among these, there are three basic types, namely, the lower-generating and upper-reservoiring type, upper-generating and lower-reservoiring type, and sandwich-like type. In addition, there are two special types, the self-generating and self-reservoiring type and source–reservoir interbedding type. Moreover, the other three types are composite types, which are the lower-generating and upper-reservoiring type I, upper-generating and lower-reservoiring type II, and sandwich-like type III. Among the abovementioned eight types, the first five types are common. The results of statistical drilling and nuclear magnetic resonance experiments mutually verify the corresponding relation between the source–reservoir assemblage type and tight oil enrichment. The assemblage types can be ranked according to their positive correlation with enrichment in the following order, from the highest to the lowest: self-generating and self-reservoiring type, sandwich-like type, upper-generating and lower-reservoiring type, lower-generating and upper-reservoiring type, and source–reservoir interbedding type. Via physical simulation experiments and theoretical analysis, differences in the mechanism of charging, accumulation, and enrichment of tight oil among the five common source–reservoir assemblage types are revealed and explained. In addition, their accumulation and enrichment patterns are determined and principal controlling factors are proposed, namely, accumulation dynamics, charging patterns, and storage conditions, which are in fact closely related to the source–reservoir assemblage types.

