

Controls on Oil Secondary Migration and Reservoir Distribution: A Case Study from Songliao Basin, China

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The Songliao Basin is the largest oil basin in China, where oil was found in 1959. However, most structural traps were exhausted with a decline in reserve growth . in 1960's. Since 1980's, the shift to search for non-structural traps has increased reserves substantially. This paper presents the new understandings in the controls on oil secondary migration in the Songliao Basin that led to this paradigm shift.

Matured source rock is wide spread within the Central Depression of the Basin, however, three types of oil pools (anticline, lithologic-fault, and lithologic) are developed in three different belts defined by the sand/gross ratio of the oil bearing formation within the depression.

When the ratios are larger than 0.5, most sandbodies are connected , and only can the anticlines trap oil and gas. These reservoirs are normally composed of multiple sand layers with a common water contact. When the ratios are less than 0.2, the sandbodies are poorly connected and lithologic oil reservoirs are formed. Most porous sandbodies in this belt are saturated with oil or gas, and often no water was present.

When the ratios are between 0.2-0.5, faults become the dominant factor, and litho-fault oil reservoirs are developed. Some sandbodies are connected to each other laterally, but reservoirs are normally composed of a single sand layer, hence multiple water-contacts exist vertically, and oil and water are inter-leaved horizontally. High-resolution 3D seismic is needed to define these traps formed with fault and pinch-out of sandbodies. These new understandings led to substantial new discoveries of non-structural traps within the synclines and slopes of the Basin.