The Use of GOI and MCI of Oil Inclusions in Reconstructing Petroleum Charge History of Gas-Condensate Reservoirs, the Mobei Area, Central Junggar Basin

Z.J. JIN, X.M. XIE, W.X. HU AND J. CAO

Exploration and Production Research Institute, SINOPEC, Beijing 100083, China; jinzj@pepris.com

Gas-condensate has been currently explored in Jurassic reservoirs of the Mobei area (central Junggar Basin, NW China). Abundant oil inclusions have been found in reservoired sandstones. In order to assess the existence and origin of the oil trapped in the oil inclusions and its relationship, if any, to the gas condensate, a detailed GOI and MCI study was carried out. This study represents a demonstration of the potential of GOI and MCI data to help understand the hybrid petroleum system in the area.

Almost all samples except for those from Well M101, M102, and M103, have GOI values above an empirical threshold (>5%) for oil accumulation. Other samples have a lower GOI (<5%). Given the lack of an intervening capillary barrier, the low GOI values are interpreted as a palaeo-gas/condensate column. The other consecutive high GOI samples are interpreted as defining the presence of a palaeo-oil column in these presently gas-bearing sandstones. It shows that there are different oil-gas charge histories in the area.

Two samples were collected for MCI study (Well P5 and Well M101), which are from the high and low GOI zone, respectively. MCI data suggest different oil-gas charge histories. The zone with low GOI values received two episodes, i.e., highly mature oil/condensate and gas charge sourced from the Lower Wuerhe Formation. In contrast, the zone with high GOI values has a complex oil-filling history. The paleo oil is most likely sourced from the Fengcheng Formation, while the current reservoired oil/condensate and gas mainly derived from the Lower Wuerhe Formation.

Large volumes of oils sourced from the Fengcheng Formation have been explored in the northwestern Junggar Basin, while little in the central Junggar Basin. The results of this study likely indicate that the palaeo-oil sourced from the Fengcheng Formation may be (1) been lost by breaching of the seal, (2) been displaced by the condensate, (3) been partly dissolved in the later condensate charge, or (4) sealed beneath the widespread Upper Triassic Baijiantan seal. Further investigations are required to asses these options.