

Evaluation of source rocks using one dimensional maturity modeling in the Lower Indus Basin, Pakistan

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Abstract

Out of the numerous potential source rocks, present in the Lower Indus Basin, Sembar Formation is the most promising rock unit. The main objective of the study was to find out the lateral and vertical extents and the maturity (thermal) levels of the Sembar Formation in different parts of the study area. The study also aimed to infer the timing of oil and gas generation in the region. The study is based on 1D basin modeling (maturity modeling) of twenty two, mainly exploration wells, drilled in the region.

Isopach map of Sembar Formation demonstrates the lateral and vertical extent of the formation; whereas, temperature and Vitrinite Reflectance (R_o) contour maps indicate its maturity levels in different parts of the study area. It is inferred that the thickness of the overlying rock units (overburden) control the maturity level of the Sembar Formation.

It may be noticed that the findings of this study are fully in conformity with the ground realities of the Lower Indus Basin. Discovery patterns and the lateral distribution of various types of hydrocarbons (such as oil, condensate and dry gas) in the region coincides with the modeling results of the study, as can be seen from the burial history diagrams of the twenty two wells. Timing of various types of hydrocarbon generation in the region can be seen in petroleum system diagrams of individual wells. The study shows that Sembar Formation is matured enough to be considered as conventional petroleum source rock or can be exploited as unconventional shale gas source.