IMPORTANCE OF EXPERIMENTAL DETERMINATION OF RELATIVE PERMEABILITY CURVES IN PREDICTING THE PERFORMANCE OF GAS CONDENSATE RESERVOIR UNDER DEPLETION DRIVE

Fareed I. Siddiqui and Zahid H. Khan
Pakistan Petroleum Limited P.I.D.C. House, Karachi, Pakistan Ph. Off: 021-5683853-59

The depletion of gas condensate reservo1rs below the dew point results in retrograde condensate drop out in the reservoir. This drop out initially occurs in the near well-bore region and results in reduced gas saturation in the region severely affecting the well productivity. This adverse effect of condensate drop out on the gas deliverability needs to be ascertained to determine the economic viability of producing a gas condensate fie ld under depletion drive.

The extent of the economic effect of the loss in deliverability depends upon the rock properties, fluid properties and development cost. This paper discusses the importm1ce of rock properties like relative permeability curves in determining the future deliverability of the wells in a gas condensate field. The principles discussed in the study are applied on a field case of a PPL operated field, located in *Potwar region*. In the field, gas condensate is produced from two separate horizons, Tobra and Khewra reservoirs. Both these reservoirs consist of sandstone of moderate to low permeability. The reservoir is being produced under depletion drive and the average reservoir pressure has dropped be low the initial dew point of the gas condensate fluid. The wells have moderate deliverability and due to the drilling difficulties, the development wells are very expensive to drill, hence meticulous consideration is required for each development decision e.g. drilling of new development wells, installing new processing facility etc. For successful prediction of the field life and its profitability it is important to determine the future deliverability of the wells and to determine the future need of development wells. The study would use a numerical simulator model of the wells to predict the well performance and to perform sensitivity study to illustrate the need of experimentally determined relative permeabi I ity curves for accurate prediction of well performance. We developed well models for numerical simulator, using experimentally determined relative permeability curves. Example of the use of these models in recommending and designing a suitable stimulation technique for the well have also been presented in the paper. Well models of hydraulically fractured well were used to determine the effect of hydraulic fracturing job design on the deliverability of the well.

In this paper we illustrated that critical condensate saturation is not an important parameter in determining the reservoir performance. We also show that it is important to experimentally determine the shape of relative permeability curves in the relevant portion.