

Performance of horizontal wells of Bentiu-3B sandstone reservoir of Greater Bamboo Field (Block-2, Sudan) in view of very high viscosity of oil and profile of the horizontal wells – case study

Kush Raj Keshari Singh and Elamin Suliman, Development Department, GNPOC Sudan,

Abstract

Approximately 100 mmbbl 2P OIIP has been established in Bentiu 3B sub layer of Greater bamboo fields by various exploratory, appraisal and development drilling. The vertical variation in viscosity from Bentiu 1A to Bentiu 3B has been the challenge for the exploitation of established reserve by conventional wells. The exploitation strategies in Greater Bamboo fields were conceptualized to develop the Bentiu-1 and Bentiu-3 layers separately in view of high viscosity contrast.

A number of horizontal wells have been drilled to optimally exploit particularly high viscous Bentiu-3B reservoir. Since the viscosity of oil of the Bentiu-3B reservoir is extremely high it was decided to carry out performance study of some key wells completed as horizontal well. An attempt has been made to analyse the performance of these key well completed in highly viscous oil bearing Bentiu-3B sub layer and its relation to the Horizontal well profile, proximity to the oil water contact, adverse mobility ratio, reservoir quality, Shale layers within the horizontal well, and the fault as well as edge water in the proximity.

The paper discusses the technical details of four cases of which each two wells belong Bamboo West and Bamboo Main fields. In the Bamboo West it has been observed that in one well the TVD was gained more resulting to the proximity to the OWC whereas the other well was planned and drilled at the edge of the structure as well as close to OWC and fault.

In the Bamboo Main one well has been drilled in zig zag profile which has no reason based on the all available data analysed. This type of horizontal well, although planned suitably, if not drilled perfectly results in the poor performance in production. The option of sidetracking could have been better option and saved the well. The other well drilled had poor data control from the nearby well. Thus the well trajectory was planned up dip but drilled initially as up dip later became down dip.

The performances of the horizontal well are greatly affected by the drain whole profile in the exploitation of high viscous oil. If the profile of the Horizontal well is maintained as gaining TVD profile i.e. down dip profile the tendency of the water to move up will be relatively lowered. This has been observed in the analysed horizontal wells. The proximity of the horizontal section to the OWC made them more water prone.

The horizontal wells drilled with Zig Zag profile, even at the best place of structure are the poor performer whereas the wells with up dip (loosing TVD Profile) may perform initially better due the structural advantage but they are susceptible for water hold up and may cease production later.

The paper recommends various processes and way forward to drill horizontal wells and exploit this high viscous oil of not only Bentiu-3B but also similar reservoirs.

