Integrating Seismic Monitoring and Intelligent Subsea Gas Wells

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Abstract

This study outlines how advanced techniques including seismic inversion and intelligent completion have been integrated to optimize the development of a complex deep water gas field which is considered, by its heterogeneity & its geological setting, as a complex field.

This paper details the steps of using the integration between seismic inversion and intelligent completion and their positive effects on field development plans. Seismic inversion offer outstanding capabilities that increase the understanding of the distribution of potential gas bearing zones in this complex field where inter-well information is limited. Implementing intelligent completion provided control of dissimilar pressure zones and compartments with full production information from each one, which gave unprecedented production and reservoir management in this heterogeneous reservoir and extended-reach developments. The fact remains that the business of deepwater development is complex and continuously evolving, everything is expensive drilling, completion and project cost. The field is a heterogeneous reservoir which contains both structure barriers like faults and stratigraphic barriers like facies variation, suggesting that resource exploitation will be difficult at all stages from exploration to production. AVO forward modeling was also carried out to understand if gas ‘sweet spots’ may be visible from analyses of amplitudes. The updating of the reservoir model allowed us to additionally identify a new undrained area for an infilling well. The de-risking activities to optimize well location were integrated by a detailed analysis using seismic tuning charts. Intelligent completion wells helped reduce well intervention to minimal numbers & improved the economic value of the wells. It helped in managing well flow in a safe operating envelope, enhanced the production efficiency in a cost effective manner, allocated zonal production, improved well surveillance and identified development strategy of the field & used it as a tool for determining the location of infill wells. This study provides valuable findings about using the integration between seismic inversion and intelligent completion to effectively develop, manage production & identify opportunities from complex deep-water gas field.