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Planning and Drilling Execution of Early Permian wells in two string design by implementing new drilling and cementing technologies

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Abstract

The development of Early Permian reservoirs in the Fairview area is limited by highly depleted shallower Bandanna coal seam gas and naturally fractured formations that would not allow to reach the original geological goals. Offset wells in the area had been executed as 3 string well design due to long open hole section across depleted Bandanna and multiple loss zones. Multi-stage cementing was required to ensure there is proper zonal isolation. These resulted in significant incremental cost to achieve 5-1/2" production casing. Through the depletion of upper coals, fracture pressure in these zones has decreased due to reduction in pore pressure.

Drilling in two string design carries higher execution risk due to long open hole section, depleted formations and differential sticking, highly fractured formations, narrow window between fracture gradient and pore pressure, and multiple loss zones which demands special techniques for Losses treatment and hole stabilization while drilling. Considering the downhole conditions, which pore pressure ranging from 2 to 9 ppg in the different formations, the importance of zonal isolation, establishing barriers in aquifers and achieving overall cement coverage is also extremely important.

With introduction on various new designed fibrous LCM, SentinelCem plug design, foam cementing non-standard operations, Santos has achieved major success in curing lost circulation issues and developed few Permian fields.

This Paper include how two string design successfully implemented to drill early Permian wells include: Design review, Operational challenges, Introducing and implementing Foam cement first time CSG Australia, LCM criteria and SentinelCem plug as mitigation. Drilling engineers and supervisors can use this paper as an Operational guidance to minimize the risks to ensure Challenging depleted and highly fractured zones can be successfully drilled.



Ensign 968 Rig with Foam Package



Foam Cement returns