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'Geology Drives Technology' - Application of Coil Tubing Underbalanced Drilling in the Cooper Basin, Australia

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Abstract

Record breaking oil prices and the forecasted upward pressure on gas prices form an exciting future for Australia's hydrocarbon industry. This commercial back-drop is creating a heightened interest in new technologies capable of improving recovery factors and accelerating production particularly in brownfield environments.

One such technology is Coil Tubing Under Balanced Drilling (CTUBD). While CTUBD is not a new technology, it is largely unproven in deep, hot, hard-rock environments such as the Cooper Basin, Australia. This paper outlines the rationale for applying CTUBD in the Cooper Basin which is founded on a fundamental understanding of the geology. The value of CTUBD is based on reviewing incremental reserves from the following three sources; 1) the benefits of lowering the reservoir abandonment pressure due to the addition of damage free wells, 2) the acceleration of reserves from extended production tails into the current economic window and 3) incremental reserves obtained from accessing previously undrained sands. A methodology for determining the value of CTUBD based on the first point is the focus of this paper.

Finally, the paper presents an in-depth review of a five well campaign in Field A, distilling the results into an improved candidate selection methodology that can be applied to future campaigns.

Introduction – Field A Development History

Field A is one of the largest and most mature gas fields in the South Australian Cooper Basin. The field was discovered in 1966 with first gas online in 1969. Base field production

contains large 'tail gas' that would become reserves if it could be accelerated ahead of the plant economic limit. The potential 2P reserves contained in the "tail" is approximately 20Bcf. Acceleration of tail gas (ie economic capture) has been partly addressed with stage wise compressional upgrades commissioned in the mid 1980s, late and 1990s.

Field A currently has 33 active gas producers and has produced approximately 595Bcf (**Figure 1**). Initial well online rates have ranged between 5-15mmscf/d. The performance of high rate wells is thought to be attributed to the intersection of high permeability streaks which are evident from core within the target sands. Field wide static gradient and Pressure Build-Up surveys (PBUs) were performed over the period 1989 - 1991 which revealed that the pressure depletion across the field varied widely and that many wells were subjected to high near wellbore skin damage due to poor drilling and completion practices. Presently, reservoir pressures are observed to be between 650psia to 1000psia from an initial pressure of approximately 3400psia.

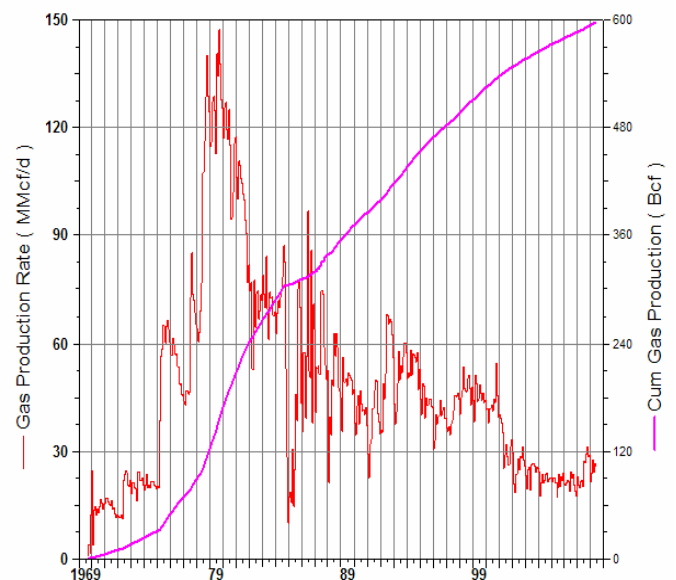


Figure 1: Field A Historical Production

The current forecast field ultimate recovery is moderate (62%) and the well spacing is broad by North American standards (500 acres/well), highlighting the potential for further infill drilling to improve recoveries.