Did the exploration well Myall Creek-1, plugged and abandoned in 1964, actually find the biggest gas field in the Surat Basin? – Introducing the Tinowon Formation stratigraphic play

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Abstract

In 1964, Union Oil Development Corporation drilled the exploration well Myall Creek-1 on the south plunge of a large structural reversal located on the western flank of the Taroom Trough in Queensland. The company elected to plug and abandon the well without testing sandstone reservoirs between 2070–2087 m KB, herein informally referred to as the Upper Tinowon Sands, and concluded that in this part of the basin fluvio-deltaic sandstones within the Upper Permian succession at large were of poor quality and not worth pursuing as a viable exploration target.

Forty years later, it appears that this well may, in fact, have discovered one of the largest conventional gas fields, if not the largest, in the Surat Basin. A twin to Myall Creek-1, located 68 m from the original well location, and drilled underbalanced by Origin Energy Limited in 2003/2004 as Myall Creek-6, flowed gas from the Upper Tinowon Sands at a stabilised rate of 6.3 MMCFD. This and other exploration and appraisal wells nearby have also demonstrated that the gas pools in the Upper Tinowon Sands previously discovered by Oil Company of Australia Limited in Myall Creek-2 and by Mosaic Oil NL in Churche-1 are part of the same stratigraphically trapped accumulation.

Excellent flow rates of gas have now been recorded from the Upper Tinowon Sands both by wells drilled conventionally with mud and by wells drilled underbalanced using liquid nitrogen. Intuitively, drilling these reservoirs underbalanced is expected to enhance deliverability. However, there is no unequivocal comparative test data available to date supporting this belief, nor any convincing petrographic evidence that indicates that these reservoirs would be subject to formation damage if drilled conventionally with mud.

Keywords: Tinowon Formation, stratigraphic trap, gas field, sequence stratigraphy, Surat Basin, Taroom Trough, seismic modelling, underbalanced drilling, formation damage, reservoir characterization, fluvio-deltaic deposits, paralic coal measures.

Introduction

Recent appraisal of the Myall Creek gas field by Origin Energy Limited (Origin) and of the nearby Churche gas field by Mosaic Oil NL (Mosaic) and Santos Limited has confirmed a significant new gas resource in the Surat Basin trapped in the Upper Permian Tinowon Formation, specifically in fluvial sands in the middle of this formation informally referred to herein as the Upper Tinowon Sands. This accumulation straddles Production Licence 174 (Origin operated) and Production Licence 192 (Mosaic operated), and is located some 10 km northeast of the township of Surat in central Queensland (Figs 1,2).

On 29 January 2004, Origin announced that the greater Myall Creek Field is likely to hold more than 40 billion cubic feet (BCF) of proven and probable (2P) recoverable gas reserves. On 27 May 2004, Mosaic announced that the results of an independent audit of the Churche Field indicated 2P reserves of 54.9 BCF, making the combined Myall Creek–Churche accumulation already one of the biggest in the Surat Basin.

This discovery is significant because it established that quartzose sandstones in the Upper Permian succession, locally at least, are capable of flowing gas at commercially sustainable rates from depths of around 2000 m. The previous perception was that these reservoirs were of poor quality and not worth pursuing as an