# Challenges and Best Practices in the Development of Tight Gas Reservoirs in the Sultanate of Oman

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## ABSTRACT

With large volumes of gas discovered in good permeability reservoirs over the last 50 years, extracting gas from tight geological units was not traditionally considered a primary objective in the Sultanate of Oman. With field developments and depletion progressing, it was realized in the country and in the entire region that growth opportunities would need to be sought by developing tighter green fields or by improving recovery from poorly depleted tight units located between already well developed better quality units. Clearly, the limitation of natural flow potential associated to low permeability reservoirs turns their development economically challenging. To tackle this challenge, a quest for always more effective technical solutions able to enhance the productivity of every well and/or reduce their cost has been ongoing across the industry. Various development concepts are being investigated and trials carried out globally and in the region to turn the development of ever tighter gas reservoirs economical. When poor permeability reservoirs are charged with rich gas condensate, an additional level of complexity is added since the impact of condensate drop-out on well productivity is generally more severe than in reservoirs with better rock properties.

In the Sultanate of Oman, a large number of gas fields are located in North Oman in the west of the Ghaba Salt Basin and comprise three main deep gas bearing clastic reservoirs: the Barik, Miqrat and Amin. In one of the large gas field (>100 bcm in place) being currently developed, the Barik and Miqrat reservoirs with average permeabilities of 0.5 and 0.05 mD respectively are considered to be tight gas reservoirs, while the Amin has better properties (average permeability of 5 mD). With its one to two orders magnitude better permeability, the Amin has been the key contributor to the current production. However, the tight gas reservoirs Barik and Miqrat hold the most gas and condensate in-place accumulation and hence are primary targets to enhance the recovery and production performance of the field.

An integrated subsurface-surface study was carried out in 2016-2017 for this field. The objective of the study was to understand the historical production behavior of the field and propose an optimized next phase field development. The integrated study involved building a range of static and dynamic models capturing the subsurface complexity and its diversity in terms of rock properties. The models were used to evaluate a number of wells and compression options able to increase field recovery, particularly from the tighter reservoir units.

Throughout this presentation, a case study is used to provide an overview of the tools, workflows, technology plans and trials developed and carried out within the largest Exploration and Production Company in the Sultanate of Oman in order to improve recovery and profitability of its tight gas reservoirs developments.