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How Modern Decline Analysis and Material Balance Technique can be Used to Answer One of the Most Important Questions.... Are We Leaving Oil Behind? : Case Study

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Abstract

This paper presents the results of Modern Decline Analysis and Material Balance study in a mature Field, in the Sabah State of the region of Malaysia. The study represents the first part of ongoing subsurface evaluations. The identification of non-drained areas using Modern Decline Analysis together with the use of Material Balance has led successfully not only to evaluate the potential but also to successfully determining the viability of infill well locations.

Prior to obtaining a clear understanding of the subsurface drive mechanisms and production data, reservoir simulation was used to establish reservoir potential and infill drilling evaluation. The results were highly variable and optimistic in some cases, and somewhat disappointing in others. Subsequent well results indicated large discrepancies between the static models and the actual field results. Once these discrepancies had been reconciled, a consistent understanding of the reservoir performance began to develop.

This paper presents the results of applying modern decline analysis and material balance techniques to different reservoirs, starting from the basic steps of quality assurance and quality review of the entire production data, in order to incorporate them together with the pressure of the neighbouring wells to the future infill target. Each reservoir was matched to the observed pressure, for both techniques Modern Decline Analysis and Material Balance, which again showed signs of non-drained areas, secondary support mechanism and infill opportunities. Modern Decline Analysis was carried out for each of the wells and from the results, a map of Contacted oil Volumes and Recovery Factor was generated for each of the reservoirs, where zones of high oil contacted volumes and low recovery factors were identified. Later Material Balance was applied to assess energy levels at the non-drained areas. As a result, several optimization and infill opportunities were identified.

Nowadays, one of the main challenges is to find remaining and additional opportunities in mature fields. This methodology can be considered as a first step towards the use of a full field 3D model to realize the opportunities. The proposed methodology is simple and easy to use. Again, this case study clearly demonstrates, that subsurface success depends more on correct understanding of the reservoir rather than the degree of complexity with which it is modeled. This methodology gave us not only a good understanding of the reservoir in terms of production and pressure, but also in terms of geology which brought out aspects that were not identified in the past and play an important role at the time of completing the new wells.

Overview

The field is situated ca. 55 km West North West of Labuan Island and is tied back to a surface facility located 28 KM to the SW. The field is located on the South Sabah continental shelf, in water depth of about 179 ft (Figure 1).