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An Integrated Approach to Field Surveillance Improves Efficiency in Gas Lift Optimization in Bokor Field, East Malaysia

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Abstract

Proper fieldwide production surveillance for artificial lift is critical in brown field operations to ensure optimum field production and efficiency. Using appropriate processes, tools and technology, production surveillance is able to be conducted in efficient manner. These tools play an important role in well diagnostics to cater for appropriate production optimization for the field.

The Bokor field is located 45 km off the coast of Sarawak, East Malaysia. The reservoir sands are highly unconsolidated at the top of the structure and gaining consolidation with depth. Almost all intervals are produced in non-commingled production mode, with dual string arrangements. Most strings require artificial lift due to low reservoir pressures and viscous fluid properties. Gas lift is the artificial lift method used in the field.

The field gas source is supplied from a nearby field and compression facilities in Bokor. However, with ageing compressors and fluctuation in gas availability, it is critical to effectively allocate lift gas to the most prolific producers. One of the main challenges is to better utilize the lift gas consumption for the wells with unpredictable gas supply which creates significant instability in the field. Hence, fieldwide gas lift optimization is one of the main initiatives for production enhancement in the Bokor Field. Venturi orifice type valves were installed in selected wells on one of the platforms as a pilot project, and extended to a fieldwide campaign. The Venturi orifice allows constant injection flow rates (critical flow) with a differential pressure across the orifice equal to 10% or more of the upstream pressure. Benefits include constant injection rate with constant injection pressure and therefore increased production flow stability, a critical operational constraint in dual string completions. The wells in which the valves have been installed show better stability in gas lift injection rates and casing head pressure as compared to previous installed "conventional" valves.

In addition to the Venturi technology, an integrated surveillance tool is installed to properly monitor individual well performance and therefore the field production. The surveillance tools include the real-time high density data capture system and automation software which enable up-to-the-minute nodal analysis update and gas lift diagnostics. This paper demonstrates the role of field surveillance practice and rigorous gas lift optimization workflow can improve the efficiency of production operations.

Introduction

The Bokor field is located in the Baram Delta, Sarawak, East Malaysia. It was discovered in 1970. The field is operated by Petronas Carigali Sdn Bhd. The first phase of development began in 1982/83. The cumulative production of 170MMbbl of oil has been produced to date through 47 wells with 97 active production strings. The field comprises multiple stacked reservoirs in unconsolidated sand. Gravel pack is used as sand control method. The oil is under saturated with 19-20 API in shallow reservoir and 22-24 API in deeper reservoir. The gas/oil ratios ranges from 100 to 250 scf/bbl. The reservoir is supported by strong water drive however most strings require artificial lift due to low reservoir pressures, prevailing fluid properties and continuously increasing water cut.