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Kuwait Oil Company Employs a Systematic Approach to Ensure Successful Underbalanced Drilling Project: A Case Study

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Abstract

Kuwait Oil Company (KOC) is considering adapting new technologies to ensure that strategic resources are optimally explored, developed and produced during the life cycle of their oil and gas fields. Among the various options available to achieve these objectives, Under-balanced Drilling (UBD) technology is considered to be one of the most effective methods when it is effectively applied in conjunction with horizontal and/or Multi-lateral well drilling and completion techniques

Accordingly, KOC decided to pioneer the introduction of this new technology by employing a systematic scientific approach to screen the Mauddud reservoir in the Greater Burgan field for under-balanced drilling candidacy, in order to ensure a successful implementation of the pilot project.

The screening process incorporated reservoir, production, drilling, Geology & Geophysics and operational data with risk analysis incorporated into a rigorous expert system aimed at maximizing the value of any UBD operation. The screening process was performed in two phases; a high level low resolution screening and in depth high resolution analysis.

Phase I comprised of:

- Evaluating and ranking the Mauddud reservoir with respect to its risked probability of being successfully exploited with horizontal underbalanced drilling and completion techniques as opposed to conventional methods.
- Comparing candidate reservoirs against global database of analogues proven to be suitable with UBD.

Phase II comprised of:

- Quantifying drilling-induced damage and determining the impact on the productivity on the Mauddud reservoir.
- Comparing under-balanced and overbalanced costs, production rates, projected revenues and Net Present Value (NPV).

This paper describes the expert system methodology used in the screening process and provides a discussion of the results obtained. The Phase II study findings provided KOC with detailed damage analysis, production forecast and economic benefits that under-balanced drilling could offer as compared to conventional drilling & completion technologies.

The UBD Screening Process

This paper investigates the reservoir suitability of underbalanced drilling using an Expert System screening process that was developed in conjunction with leading industry consultants to increase success in candidate selection and to evaluate the benefits of underbalanced drilling over traditional drilling and completion technology in terms of reservoir performance.

The screening process began by taking basic information for the Mauddud reservoir and processing the information through the expert system phase I software. This software rates the candidacy of the reservoir to help determine the likelihood of achieving success with underbalanced compared to overbalanced drilling and completion techniques. All data input was reviewed for completeness and consistency.