

Improved Techniques for Acquiring Pressure and Fluid Data in a Challenging Offshore Carbonate Environment*

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Abstract

The combination of low permeability, oil base mud and near saturated oils presents one of the most challenging environments for fluid sampling with formation testers. Low permeability indicates that the drawdown while sampling will be high but this is contraindicated for oils that are close to saturation pressure. A logical response is to therefore reduce the flow rate but in wells drilled with OBM an unacceptably long clean-up time would result.

The Pinda formation in Block 2 offshore Angola presents just such a challenge. Formation mobilities are in the low double or single-digits, saturation pressure is usually within a few hundred psi of formation pressure and borehole stability indicates that the wells must be drilled with oil base mud.

In the course of several penetrations of the Pinda formation a number of attempts were made to acquire representative formation samples but were stymied due to either excessive drawdowns that corrupted the fluid or by excessive contamination levels that rendered the samples unsuitable for laboratory analysis. Clearly a more flexible solution was required.

In this paper we review the results from previous attempts in the Pinda. We show the pre-job modeling that was done to predict the required flow rates and the anticipated drawdowns. Ultimately a two-step solution was used. We first ran a high efficiency pretest-only WFT in order to quickly gather formation pressure data and mobility data. This data was then used to design the sampling string which was a combination of an inflatable dual packer with focused probe. We discuss the decision process that governed the choice of pump, displacement unit, probe and packer. We pay particular attention to the unique pump configurations that were required to effectively manage the drawdowns when using the probe and also to allow sufficient flow rate when using the dual packer.

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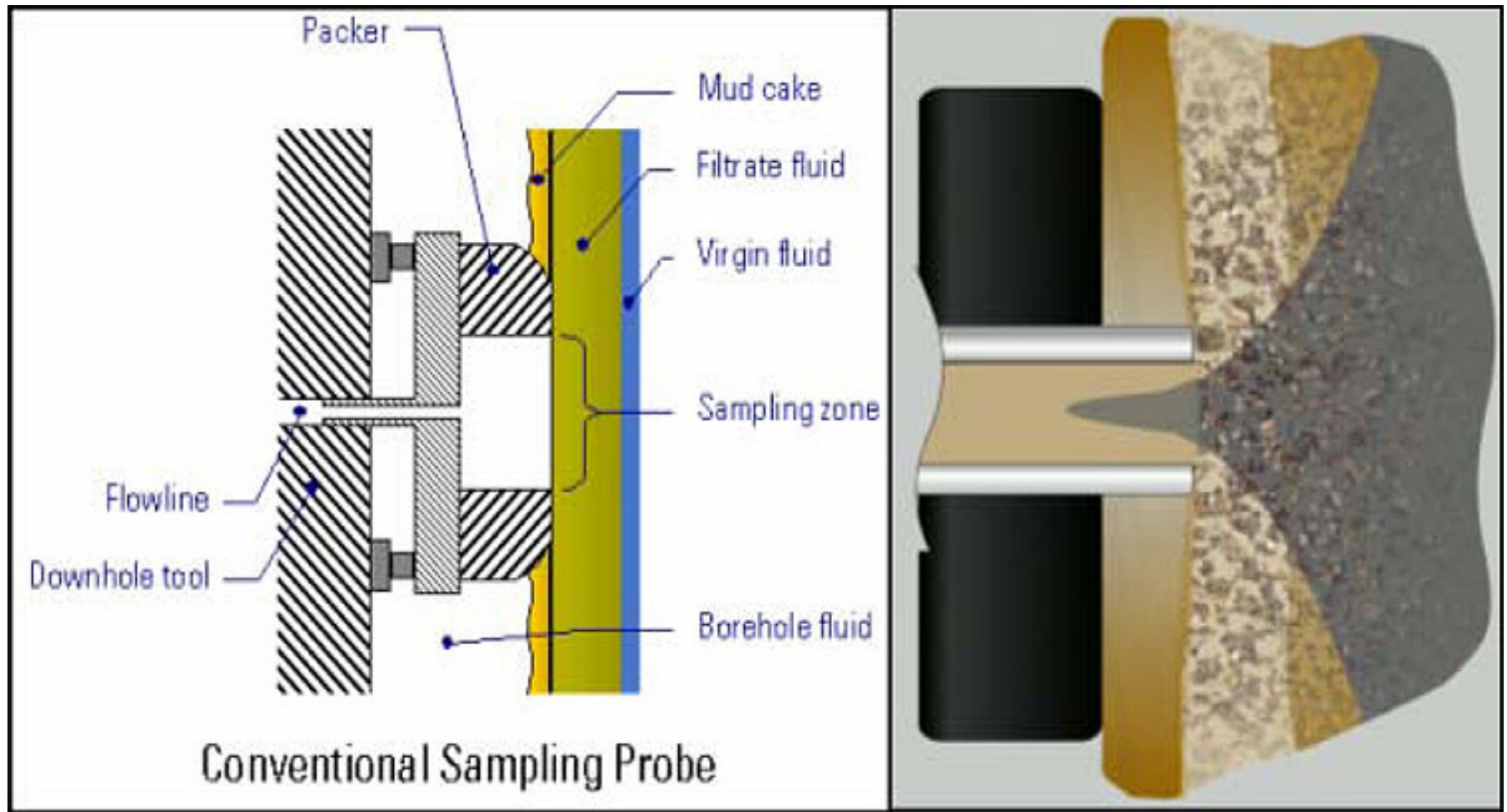


Figure 1. Conventional sampling and flow regime.

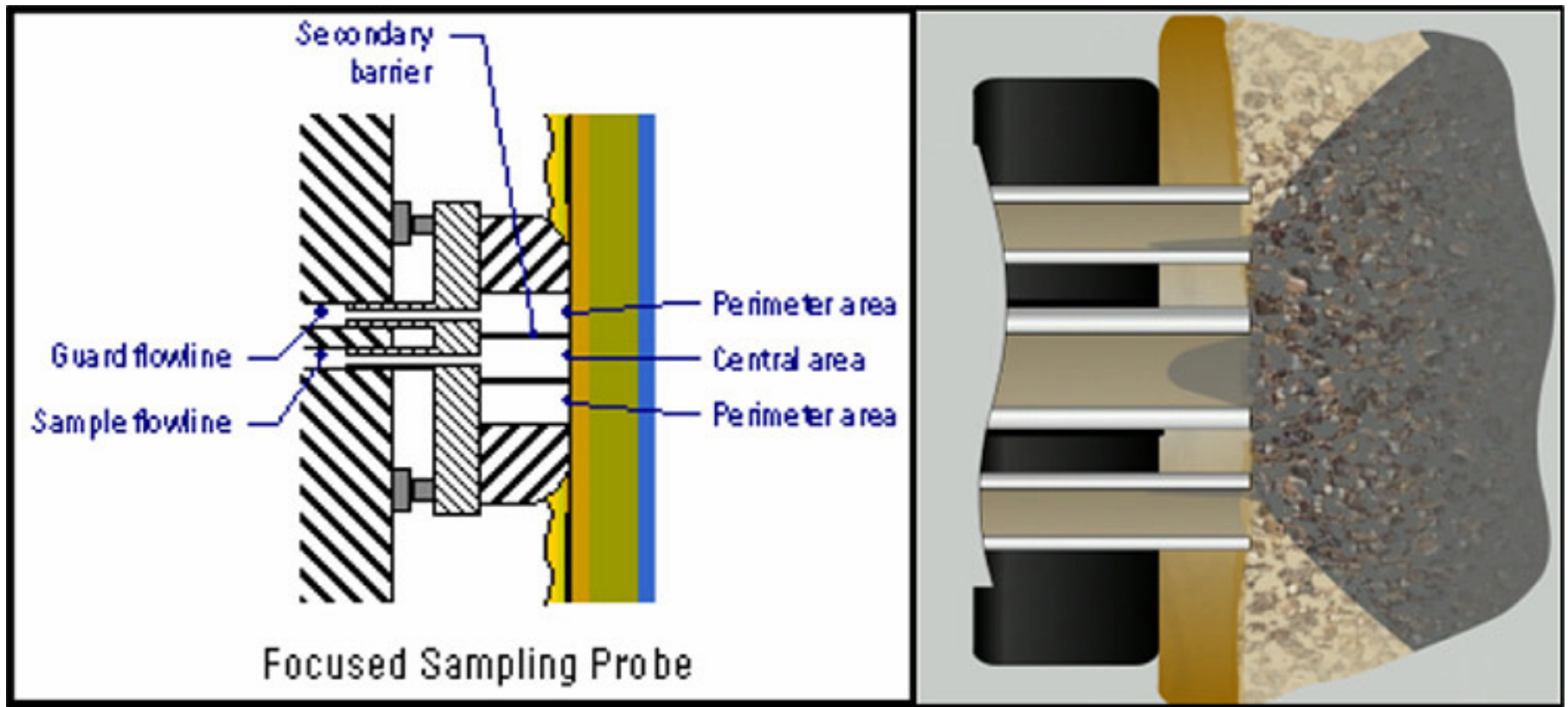


Figure 2. Focused sampling and flow regime.

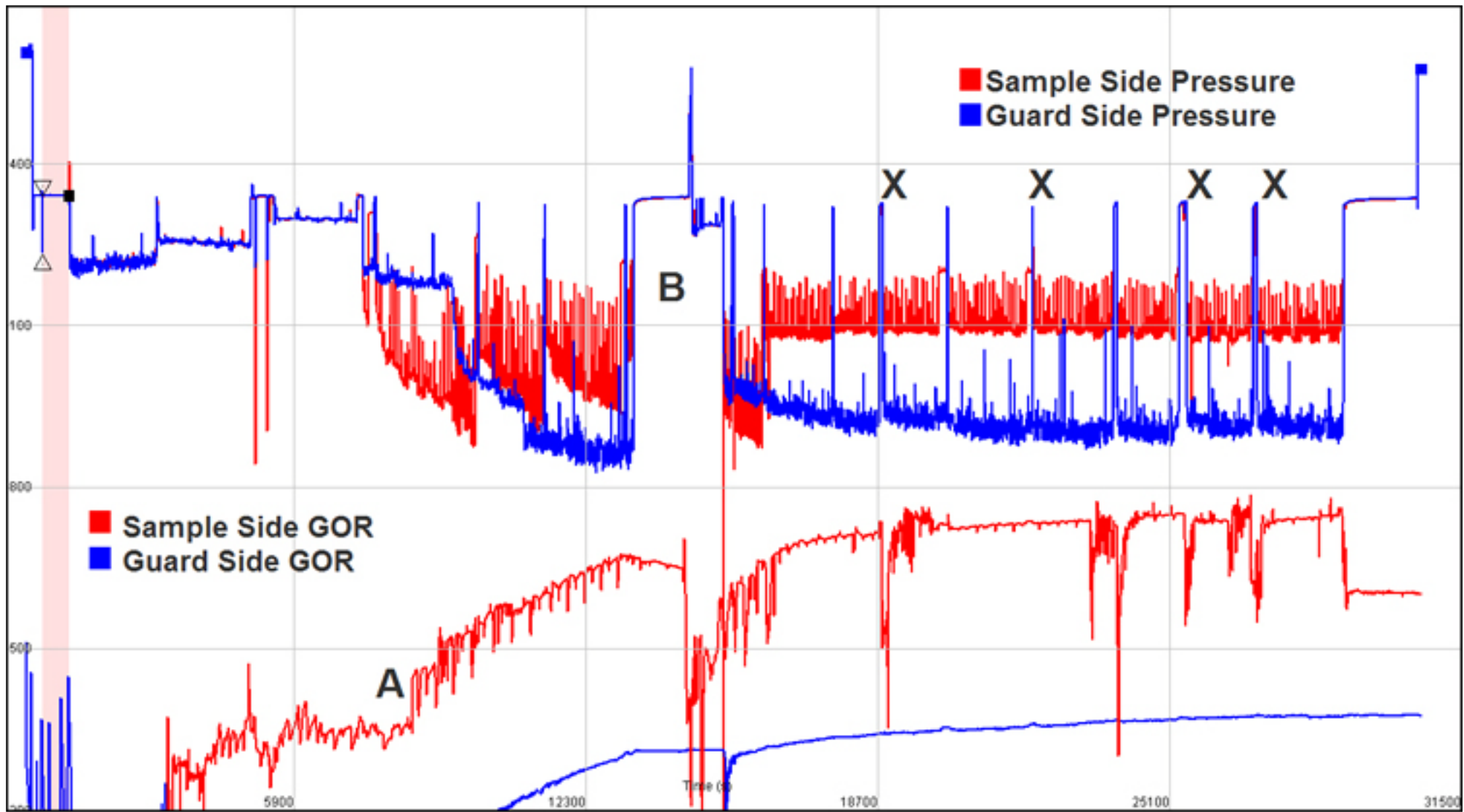


Figure 3. Full focused probe sampling station with fluid analyzer GOR data.

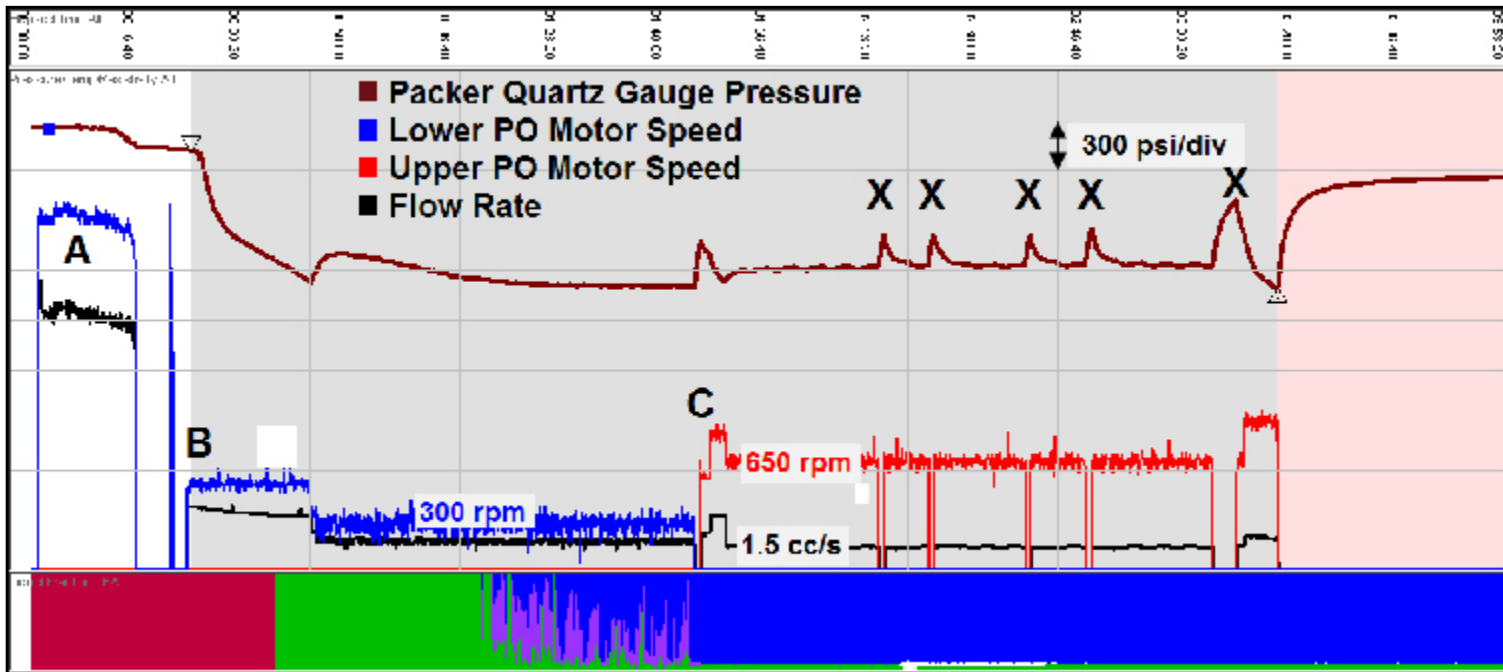


Figure 4. Dual packer sampling station.

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