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Successful Implementation of Non-Intrusive Multi-Phase Metering Technology in Tight Gas Fields

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Abstract

Accurate measurement of production rates is essential for reservoir management as means for ensuring controlled depletion across gas fields, as function of well performance. For tight gas producing formations, with substantial volumetric rates of condensate and water, the flow from each well requires continuous monitoring to achieve a robust performance analysis. Typically, a Multi-Phase Flow Meter (MPFM) is utilized to measure the flow rate of each fluid phase, although it implies extended operational requirements. With large number of producing wells, investments in efficient and inexpensive technologies is significant to measure rates in different flow conditions.

Thus, a sonar meter along with a multi-trace technology has been applied as an engineering solution to determine three phase production rates throughout tight gas fields during the start-up phase. Prior to deploying the sonar meter and multi-trace technologies, a field test was conducted on several wells that represent different flow conditions to ensure the technology's functionality in all wells located in the field, due to the wide range of production profiles.

To satisfy and validate both the sonar and multi-trace against separator measurements, success criteria on the field trials were set for gas, oil and water measurements. Both the separator and meter used the same PVT parameters as an input, and the test was conducted at different rates of hydrocarbons and water. The test was designed to confirm operational safety, efficiency and footprint of the set-up in comparison to conventional testing set-ups which require excessive rig up. The technology relies on the sonar principle to measure gas rates and multi-trace to measure liquid rates.

The conventional testing set-up is commonly done through a slow process that involves shutting in the well, depressurizing the line and connecting a conventional test separator. On the contrary, the sonar meter technology doesn't require such process and can be applied with minimal intrusion through clamping the meters on flow lines. This solution enabled efficient mobilization between wells and therefore allowed frequent testing of multiple wells within a short period of time. This was achieved by the simple and efficient application of sonar metering and multi-tracing with minimal logistics required to measure multiphase flow. With over a hundred tests performed in the field since the first implementation, the technology showed consistent performance on a broad range of applications, well layouts and flow conditions, enabling a successful production ramp up.

The implementation of the described solution enabled high flexibility and improved testing frequency, as well as rapid identification of wells that are producing outside the defined parameters, in addition to enhancing decision-making to optimize field performance. The paper will also highlight the added value gained from this technology on cost reduction for well testing operations and the economic gain with the avoidance from well shutdown time.