Real Time Monitoring of Well Testing: A Revolutionary approach to Prove, Confirm & Improve – A Case Study

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Abstract

East coast of India has got few very challenging gas fields to explore. One of these fields was awarded to a state owned Oil & Gas Company. At field level, the challenges are to explore tight reservoirs, high pressure/ high temperature reservoirs and isolated gas sand pockets. In one of the well test the maximum temperature recorded was 450^0 F.

The last exploratory well was drilled at the periphery of the block and client wanted to test conclusively. After lots of complications during drilling, logging & cementing, the well was finally got ready to test. Due to unsuccessful attempts to complete MDT, there was a lack of dynamic permeability information which plays a crucial role in well test design. The only reference for permeability was a CMR log which was not calibrated using dynamic permeability. Another complication in well testing was poor response of CBL-VDL log due to losses occurred during the cement job.

Petrophysical analysis from openhole data acquired was showing a good column of gas reservoir and relatively cleaner sand but due to lack of permeability information, the well test design was uncertain. There were few water zones also which could not be isolated because of bad cement. Though cement squeeze job was performed for zonal isolation but client was not confident about the squeeze job effectiveness.

Considering all these complication, it was decided to monitor the job real time and attempt to make well test successful. Ten different options for the test design (for different permeability & different drainage area) were presented to client. It was conveyed to client transparently that based on well performance after perforation, the test program will be steered to meet the objectives and also that bad cement behind casing could cause inefficient cleanup and water production during testing.

It is a very challenging operation at all stages of test design, real time monitoring and interpretation.

The Interact was setup to transfer the data from rig to client office and to testing Operation Support Center real time to monitor the job. After the zone was perforated at given underbalance, real time transmission of data started. The well was not performing as expected and the client wanted to call off the test as soon as possible. Based on CMR permeability estimation, client was expecting the permeability range of 2 to 20 mD, hence client started concluding that well has been damaged badly during drilling and due to vey high skin well is not performing as per expectation. The reservoir Engineer interacting with the client presented arguments to the client for continuing and completing the test program, in order to understand the exact reasons behind underperformance of the well, which could be result of either high skin or low permeability.

The client appreciated the logic and followed the complete test sequence. Once the downhole data retrieved and analyzed, it was confirmed that the reservoir permeability was extremely low and there was no significant wellbore damage, hence well was underperforming due to low permeability of the reservoir.

Client appreciated the value of Real Time monitoring of well testing jobs. In this paper, step wise approach towards real time monitoring of well testing will be illustrated.

Conclusion

Real Time Monitoring is a cost effective way to make every well testing job successful by optimizing the test design real time. It enables the user to make real time decisions to bring maximum value to reservoir characterization and to optimize the rig time effectively and efficiently during testing operations.