



Application of Formation Testing While Drilling (GeoTap) for acquiring formation pressure data from the Azeri, Chirag and Guneshli wells which were drilled in the Khazarian-Caspian Sea of the Azerbaijan Republic

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A new technology to acquire wireline quality pressure tests using a Logging While Drilling approach has been successfully implemented few years ago in Azeri, Chirag and Guneshli wells which were drilled in the Khazarian-Caspian Sea of the Azerbaijan Republic. The Formation Tester While Drilling tool (GeoTap) uses a testing sequence similar to wireline tools. A single probe is extended to the borehole wall and a small pretest volume withdrawn from the formation.

The resulting pressure transient is then analyzed for formation pressure, formation permeability and mobility information. Up-link and down-link capabilities have been added to achieve test control and quality feedback. An efficient downlink algorithm is used downhole to analyze the data. The parameters and pressure data are transmitted to the surface in real-time for continuous monitoring of the test. More detailed pressure data is recorded and retrieved after returning to surface. Use of a quartz gauge allows excellent accuracy.

Azeri, Chirag and Guneshli fields consist of layered sand reservoirs alternation with shale sequences and detailed pressure data is acquired on a high percentage of wells in order to understand lateral and vertical continuity of different flow units. The formation tester can be utilized with the 'triple combo' Logging While Drilling string which eliminates the need to rig up wireline on many wells. Wireline formation tester runs are time consuming – particularly if high deviation or high overbalance conditions are encountered requiring pipe conveyed techniques. Non-Productive Time is high when the wireline tools are stuck and fishing operations are required.

The Sperry Drilling GeoTap formation pressure tester service provides real-time formation pressure measurements. It bridges the critical gap between drilling safety and optimization, by providing early and reliable measurements of key reservoir properties, while improving reservoir understanding and completion design in real time. The GeoTap tester obtains direct pore-pressure measurements as the well is being drilled, with accuracy and precision comparable to that of wireline testers. The GeoTap service can eliminate the time, risk, and cost associated with running pipe-conveyed wireline test tools. It also measures annular and bore pressure while drilling, providing accurate, continuous, real-time hydrostatic pressure, and equivalent circulating density (ECD) information. This aids in determining and maintaining optimal mud weight, reduces formation damage, increases the rate of penetration, and increases operational safety. GeoTap benefits can be improvement of formation evaluation, real-time fluid gradients and fluid mobility (permeability/viscosity indicator), identification of fluid contact points, determination of reservoir connectivity/compartimentalization and depletion, increase safety of operation, determination of optimal mud weight and manage of ECD. We can also continuously monitor wellbore stability for assessments in order to reduce formation damage which in turns will help to increase drilling effectiveness (determine precise overbalance for maximizing ROP and continuously monitor hole-cleaning effectiveness with pressure-while-drilling, while reducing formation damage due to swab/surge). Save time and money by reducing rig down time associated with wireline testing. GeoTap Tool capable of performing more than 150 pressure tests per run and optional orientation of pressure measurement is available (top, right, bottom or left).

GeoTap testing has been completed with encouraging results in many wells up to circa 3000m deep. Data has been acquired successfully both in a "Drill-Test-Drill" mode and a "Post-Drill-Test" mode. GeoTap tests have spanned wide ranges of borehole temperature, pressure, mobility as well as formation permeability and overbalance conditions. GeoTap tests in Azeri, Chirag and Guneshli wells which were drilled in the Khazarian-Caspian Sea of the Azerbaijan Republic have proved that a logging while drilling approach can be successfully employed to acquire formation pressure data in open hole (which is also very useful for fluid gradient analysis, oil water and gas oil contacts delineation/identification).