Efficient Evaluation of Existing and Bypassed Pay in Older Generation Wells – A Cased History

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Abstract

This case history describes the use of a 43mm (1- 11/16 inch) combined carbon oxygen (CO) and pulsed neutron capture (PNC) instrument to evaluate existing and bypassed pay in older generation wells. Two wells are used to illustrate the data analysis techniques that quantified current producing oil from the Basal Belly River formation (Upper Cretaceous sand), highlighted additional potential commercial oil bearing formations, and finally located bypassed gas which produced in commercial quantities when perforated.

Within the Pembina field (Twp. 47 Range: 4W5) a number of wells drilled in the early 1960's, and some drilled as recently as 1992, are currently producing oil, on pump, from the Basal Belly River formation, an Upper Cretaceous predominantly continental sandstone. The operator of the field wanted to optimize existing production by quantifying reserves through re-evaluation of water / oil saturations after years of historical production. In addition the potential of bypassed pay – both oil and gas - was to be investigated, occurring in the Lower and Upper Belly River formations. The challenge in this environment is to distinguish oil from fresh water (Rw between 0.48 to 0.56 Ohm-meters @ 25°C) and identify bypassed gas in sand formations with typical porosities in the range of 18-20%. Due to the 1960's vintage of most of the wells, the original open hole wireline data is limited to an Induction Log (IEL) and MiniLogs (ML). No information about the borehole or cement quality exists on most of these well in the area of interest.

The Reservoir Performance Monitor (RPM-C series) was selected as the means to provide an efficient cased hole evaluation of bypassed and existing pay in a series of wells. The RPM is a 43 mm diameter by 9.1 m in length logging instrument, making it flexible in terms of rig up from a mast or crane and providing maximum ability to enter the majority of well and tubular geometries.

The through-tubing multifunction pulsed neutron instrument has varied operating modes allowing pulsed neutron decay (PNC), pulsed neutron spectrometry (CO), pulsed neutron holdup, neutron activation water flow, and radioisotope measurements. The modes of operation can be selected from the surface. The instrument offers improved CO and PNC measurements due to an innovative 3 detector design which offers additional response ratios. The instrument is much less statistical than previous generation pulse neutron devices due to higher count rates and improved detector design.