Saturation Monitoring Behind the Casing in High Friction Gas Producers

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ABSTRACT

Intervention to monitor well and reservoir performance is essential for ensuring competent reservoir management in producing fields. However, intervention is expensive both with respect to mobilization costs and loss of production. Furthermore, intervention always holds a risk for loosing the well with consequential expensive and time consuming remedial action. In consequence, the continual drive for the operational teams is to collect sufficient data of suitable quality, at minimal cost, disruption and risk.

The most commonly used methods for monitoring fluid saturation involve measurements of formation sigma or carbon/oxygen ratios made with pulsed neutron tools run on wireline. However, where porosity is known and where there is sufficient difference between the capture cross sections of the fluids in the formation, the count rates from non-pulsed tools contain sufficient information to allow changes in the fluids to be identified. The count rate approach has been applied to short, small diameter neutron porosity tools run in memory mode without a wireline. Significant operational and cost benefits have been demonstrated in high angle wells, on installations that have no wireline unit, and where height restrictions make it difficult to run long pulsed source tools.

Memory neutron tools were run in two wells in the UKCS Armada field. In the first well, a baseline pulsed neutron tool was run in 2000 to evaluate the upper part of the Maureen Sandstone, but the tool could not get down further to log the lower perforated interval. High gas saturations were indicated in the sands throughout the logged log interval. In 2003 memory neutron data were collected that confirmed there had been no water encroachment into the upper layers since 2000. The tool also managed to log the uppermost part of the lower perforations and showed that gas was also present.

The memory tool was run in a second well in December 2002 to provide a baseline saturation log prior to start of production in March 2003. It confirmed the presences of condensate in the wellbore at the base of the well.