IDENTIFICATION OF BREAKOUT BEHIND CASING: METHODOLOGY TO OBTAIN OPENHOLE EQUIVALENT CALIPER MEASUREMENTS THROUGH SLOTTED LINER USING THE DENSITY TOOL

Paper Ref : **SPWLA-2021-0046**

Authors : **Laurent Mosse (Schlumberger); Stephen Pell (Santos Ltd);**
Thomas J. Neville (Asia-Pacific Formation Evaluation Services Pty Ltd)

Speaker : **Laurent Mosse**

Abstract:

Growth in the coal seam gas industry in Queensland, Australia, has been rapid over the past fifteen years, with greater than USD 70 billion invested in three liquified natural gas export projects supplied by produced coal seam gas. Annual production is of the order of 40 Bscm or 1,500 PJ, with approximately 80% of this coming from the Jurassic Walloon Coal Measures of the Surat Basin and 20% from Permian coal measures of the Bowen Basin.

The Walloon Coal Measures are characterized by multiple thin coal seams making up approximately 10% of the total thickness of the unit. A typical well intersects 10 to 20 m of net coal over a 200 to 300 m interval, interbedded with lithic-rich sandstones, siltstones, and carbonaceous mudstones. The presence of such a significant section of lithic interburden within the primary production section has led to a somewhat unusual completion strategy. To maximize connection to the gas-bearing coals, uncemented slotted liners are used; however, this leaves fluid-sensitive interburden exposed to drilling, completion, and produced formation fluids over the life of a well. External swellable packers and blank joints are therefore used to isolate larger intervals of interburden and hence minimize fines production. Despite these efforts, significant fines production still occurs, which leads to failure of artificial lift systems and the need for expensive workovers or lost wells. Fines production has major economic implications, with anecdotal reports suggesting up to 40% of progressive cavity pump artificial lift systems in Walloon Coal Measures producers may be down at any one time.

The first step in solving this problem is to identify the extent and distribution of fines production. The wellbore completion strategy above, however, precludes use of mechanical calipers to identify fines production-related wellbore enlargement. A new caliper-behind-liner technique has therefore been developed using a multipledetector density tool. Data from the shorter spacing detectors is used to characterize the properties of the liner as well as the density of the annular material. This is particularly important to evaluate as the annulus fill varies between gas, formation water, drilling and completion fluids, and accumulated fines. The longer spacing detector measurements are then used in conjunction with pre-existing open-hole formation density measurement to determine the thickness of the annulus, and hence hole size, compensating for liner and annulus properties.

This methodology has been applied to several wells completed in the Walloon Coal Measures. Results have demonstrated the ability to identify zones of borehole enlargement behind slotted liner, as well as intervals of either gas or fines accumulation in the annulus. In addition, the technique has been successful in verifying the placement of swellable packers and their integrity. The application of this solution has been used to drive improvements in the design of in-wellbore completion programs and in the future will help drive recompletion decisions and trigger proactive workovers.

2021-2022 SPWLA DISTINGUISHED SPEAKER SERIES

Bio:

Laurent Mossé is the technical director of petrophysics for Schlumberger Reservoir Performance Evaluation. After working at CERN in Geneva and obtaining a PhD in fundamental physics from the French Nuclear Agency (CEA), he worked 9 years as physicist and technical leader on R&D projects in a Schlumberger engineering center in France (including Platform Express integrated wireline logging tool and the Dielectric Scanner multifrequency dielectric dispersion service projects). Laurent then focused on multi-physics interpretation as a petrophysics domain champion, spending 9 years in various positions in Latin America, Middle East, Asia, and Europe. Laurent is coauthor of 30+ papers and holds several patents in the oilfield industry.