

January 2022 – CSUR Technical Webinar

Pressure – Based Diagnostics for Evaluating Treatment Confinement in North Montney

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**TECHNICAL
WEBINAR
SERIES**



PRESSURE-BASED DIAGNOSTICS FOR EVALUATING TREATMENT CONFINEMENT IN NORTH MONTNEY

PRESENTED BY

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Dave Cramer, Senior Engineering Fellow within ConocoPhillips' Global Completions Engineering Team in Houston, Texas, was the guest speaker for this instalment of CSUR's Technical Webinar Series. The North Montney play in Northeastern BC is an important part of ConocoPhillips' holdings in Canada. The objective of the presentation was to provide an in depth summary of the work done on a recent 12-well Pad, which had a significant number of breaches and confinement failures during the completion operations. The results of the analysis have also been detailed and published in a technical paper (SPE #205003).

Utilizing a zipper frac pattern, with up to 40 stages per well, a limited entry design, and dissolvable plugs for isolation between stages, the 12 wells on this Pad were completed into the Upper, Middle, Lower, and Lower B2 Montney intervals. The subsequent completion history and data exhibited multiple occasions where treatment confinement or isolation was not successful, resulting in numerous poorly completed stages. As part of the study, the Completions Team at ConocoPhillips used surface and bottomhole (where available) pressure data to determine the cause of failure or breach. The pressure-based analyses, together with supporting fibre-optic, micro-seismic, and post-completion wellbore imaging measurements provided conclusive evidence and plausible reasons for loss of confinement, including proppant induced erosion.

As indicated by the speaker, failure to isolate between stages can occur when the frac plug cannot maintain a seal or if the casing integrity near the frac stage is compromised. The plug failures can result in a significant portion of the pumped fluid and proppant to migrate to previously treated stages. Similarly, an extensive casing breach could result in uncontrollable propagation of fractures to offset wells. In either scenario, these types of failures lead to ineffectively stimulated stages throughout the horizontal legs. The speaker also advised that having bottomhole recorder data provides a considerable advantage (and accuracy) over surface data in conducting these types of pressure-based analyses. Bottomhole pressures calculated from surface data can often be in error by a significant amount, especially

given that the calculations are typically based on correlations and do not necessarily take into account the actual fluid & mechanical conditions along the pipe.

SUMMARY

In multiple-stage hydraulic fracturing treatments performed in horizontal wells, treatment confinement is the state in which fracturing fluid and proppant flow out of the wellbore only through the specific perforations targeted for the fracturing stage. The terms treatment confinement and treatment isolation are synonymous. Isolation from previously treated intervals is a necessary condition for efficient treatment along the lateral. Failure to confine fracturing stages can be a result of failure of the frac plug to maintain a seal or the development of casing breaches (holes) in the proximity of the frac plug. Both conditions can be strongly impacted by proppant induced erosion.

This presentation is based on a case study in which casing erosion and breaches were exhibited in fracture treated horizontal wells in the northern part of the Montney play. Integrated diagnostic methods based on data from treating pressure analysis, fiberoptic measurements, and downhole imaging were applied to investigate the root cause of failure. It was determined that treatment pressure analysis was effective in diagnosing casing and associated fracture plug integrity-loss events. This was achieved by (1) identifying treating pressure trends and anomalies during the main part of the treatment that signify confinement loss, (2) calculating near-wellbore friction at the end of treatments to compare to the friction expected for a confined treatment, and (3) analyzing step-down tests conducted during the pad stage and overflush stage at the end of the treatment to determine the near-wellbore frictional components of perforation friction and near-wellbore tortuosity. This information enabled comparison of previous with current treatments for determining the effects of job design and fracture plug modifications on treatment confinement.

The primary objective of this presentation is to describe the process of assessing treatment confinement using only stand-alone pressure-based analysis. This is achieved by comparing the analysis results with fiber-optic and post-treatment wellbore imaging measurements. Also highlighted is the use of downhole gauges for accurately calculating pipe friction, which is necessary for accurately calculating bottomhole treating pressure at the active treatment interval.

PRESENTER: *Dave Cramer, Senior Engineering Fellow - ConocoPhillips Global Completions Engineering*

Dave Cramer is a Senior Engineering Fellow on the ConocoPhillips Global Completions Engineering staff in Houston, TX and specializes in hydraulic fracturing applications and pressure analysis. He has published 68 technical papers and holds two U.S. patents and one provisional U.S. patent. He is a registered Professional Engineer in Colorado. Dave has been selected as an SPE Distinguished Lecturer on two occasions, in 2003-2004 and for the current 2021-2022 campaign. He was the SPE Region Director for the U.S. and Canada Rocky Mountain region from 2004-2007. His industry recognitions include the SPE International Cedric K. Ferguson Certificate (2020), SPE International Distinguished Member Award (2019), SPE International Completions Optimization and Technologies Award (2011), and SPE Denver Section Henry Mattson Technical Achievement Award (1993).

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presented by
Dave Cramer
Senior Engineering Fellow
ConocoPhillips Global

Tuesday, January 25, 2022 10:00am MT
****pre-registration is mandatory****

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