

# Horizontal Cased Hole Shale Gas Well Evaluation - A Case Study

Salman Khalid

[Khalid2@slb.com](mailto:Khalid2@slb.com)

Ken Faurschou

[faurschouk@slb.com](mailto:faurschouk@slb.com)

Trevor Gorchynski

[TGorchynski@slb.com](mailto:TGorchynski@slb.com)

Schlumberger of Canada Ltd.

## Summary

Shale Gas industry is realizing the importance of horizontal shale well evaluation in the context of major cost savings through optimized completions. The heterogeneity of the reservoir along the lateral section directly impacts completion quality and hence efficiency and cost and production rates.

It has been difficult to demonstrate that significant heterogeneity may exist along a lateral even when it is presumably placed properly in the zone. We now have the opportunity to partially share a case study. This study will demonstrate observed variations in lithology, porosity, stress and anisotropy along the wellbore. It will also demonstrate how common understandings of stress and lithology correlations can sometimes be challenged.

## Introduction

Historically shale gas producers have been perplexed by the variability in production between similar horizontal wells. These wells are planned, drilled and completed in the same fashion and in the same zone where lateral continuity of the formation is expected but well A performs significantly better than well B, why?

The answer to this question is that the assumption of homogeneity along the lateral is an over simplification. However, in the interest of cost and speeding up drilling and completion time, this very **important factor has been ignored. As a result, the efficiencies which could have been achieved** through mapping the heterogeneity of the rock are not being realized. This discussion is all about heterogeneity and its mapping. The central focus is a case study of a Horn River horizontal well which is used to demonstrate this point.

## Theory and/or Method

New techniques have recently been developed to log and evaluate cased horizontal wells through casing without a rig thus substantially reducing the risks and expense that have historically been associated with logging horizontal wells in open hole on drill pipe. In addition, the logging suite includes a cement bond log to evaluate zonal isolation before the well is stimulated. These advancements provide information and answers equivalent to open hole measurements to allow the operator to acquire mission critical reservoir properties safely and economically.

## Examples

Attached is a picture of the data acquired in a horizontal shale gas well in Canada in cased hole. Of note is the significant variability in the lithology and many other volumetric measures.

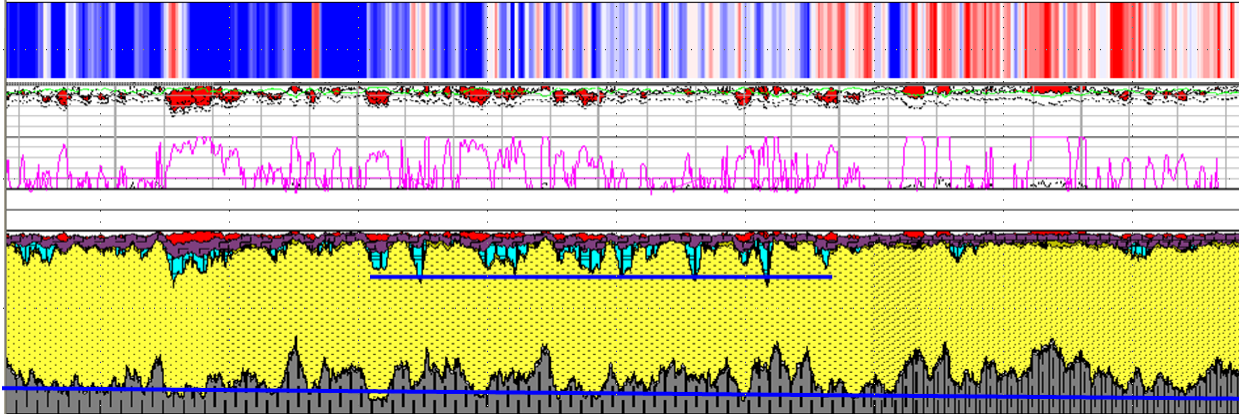


Figure 1: A section of a horizontal well showing significant changes in reservoir quality and rock stress along the lateral.

## Conclusions

Heterogeneity is real, and it is frequent enough to effect production expectations from horizontal shale gas wells. Reservoir heterogeneity can be mapped and used to optimize the completion and will be demonstrated in this case study.

## Acknowledgements

Xianran Zhao – Senior Petrophysicist  
Rob Badry – Petrophysics Advisor  
Ed Howes – Cased Hole Wireline Manager  
Agus Kusuma – Open hole Wireline Sales Manager  
Fraser Rasmussen – Wireline Operations  
Schlumberger Canada

Thanks to our undisclosed clients who kindly released the data for the benefit of the Industry.