

September 2020 – CSUR Technical Webinar #1

What really matters when it comes to reservoir characterization and well performance? A case study from the Duvernay Formation.



**TECHNICAL
WEBINAR
SERIES**

**"WHAT REALLY MATTERS WHEN IT
COMES TO RESERVOIR
CHARACTERIZATION AND WELL
PERFORMANCE? A CASE STUDY FROM
THE DUVERNAY FORMATION."**
By Carolyn Currie, Core Laboratories
Canada.

Carolyn Currie, professional geologist & Manager of Geology at Core Labs Canada, was back in the limelight as she presented a Duvernay Formation Case study for the attendees at CSUR's Technical Webinar Series. Her presentation was titled "What really matters when it comes to reservoir characterization and well performance?" The primary objective of the study was to determine the main driver for Duvernay production – rock properties or completion strategy? As with most unconventional reservoirs in North America, there is significant debate as to what the dominating factor is for each play or region.

Carolyn's thoughtfully laid-out presentation began with a quick geological & depositional overview of the Duvernay from East to West. This highlighted the major regional areas typically associated with the Duvernay – the East Shale Basin region, the Pembina / Willesden Green area (South) and the Kaybob / Fox Creek region (North). In addition to characterizing the specific features of the play going west, the speaker also summarized the associated key attributes that typically define a shale play's success. Specifically, reservoir thickness, pressure gradient, lithology, porosity & permeability, and the total organic content & thermal maturity indices were explored during the study. As indicated by the speaker, among the various shale plays in North America, the Duvernay has one of the highest ratios of hydrocarbon filled porosity to total porosity!

Carolyn then shifted gears and focused on the numerous types of completion strategies employed by the various operators over the past almost ten years of history in the Duvernay. She pointed to distinct differences in certain parameters between regions. For example, the lateral horizontal length, number of stages and total fluid pumped per well were generally higher within the East Shale Basin development, while the amount of total proppant placed per well was typically higher in the Kaybob / Fox Creek region. Although there have been some regional experimentation & specific strategical variations, it would appear that the Plug & Perf (Ball Drop) system is the most dominant (~86%) completion technology being utilized to access the Duvernay production.

Finally, the speaker presented the results of her Multi-Variate Analysis (MVA), which took into account both the rock properties and the completion parameters. The analysis was conducted separately for the rock properties and completion parameters initially within the Southern & Northern areas. However, in the aggregate analysis, with all the parameters for both regions included, overall completion strategy / parameters were determined to be the more influential drivers of production from this formation. Furthermore, the speaker noted that the effects of pressure-dependent permeability should not be downplayed as data / studies suggest that unconventional reservoirs are

extremely pressure dependent. The system permeability, which consists of matrix permeability (including relative perm effects) and un-propped & propped fracture conductivity are all pressure sensitive. As such, a careful approach and a managed pressure drawdown strategy is recommended throughout the reservoir's production history to maximize recovery and achieve favourable economics.

ABSTRACT: One of the most frequent questions we get from clients across the globe at Core Laboratories is on well performance. Operators are often questioning their lower production rates, and sometimes their higher rates, compared to competitors in their vicinity. The situation is no different in Canada. As data is more readily available competition between acreages/land holdings and operators can be fierce, but in a polite way.

The Duvernay Formation is Canada's own quintessential unconventional shale play which is often compared in some ways to the Eagle Ford Formation in South Texas. With successes in the condensate/volatile oil window in the Kaybob area, and more recently the oil window in the East Shale Basin, many operators have dabbled in the Duvernay wanting a piece of the pie; however, they often come up a little short. Is this due to the variable reservoir quality across the basin/maturity windows? Probably. Could this be due to variations in completion/stimulation designs and how the wells are produced? Likely. Who can we blame for poor well performance, the geologist or the engineer? Maybe the more important question to be asking is what can we learn from this well and what can we do next time to improve the result?

The first part of this presentation will summarize the geology and reservoir quality in each of the key areas. The second part will summarize variable completion designs including lateral length, proppant used, and total fluid volume, to name a few.

Knowing all these parameters is great, but what we do with them is key. We are entering a period where big data and analytics are king, but we are struggling to conceptualize this into our workflows. This presentation will take a holistic look at these datasets and determine the most important parameters that inevitably make the Duvernay tick.

PRESENTER: Carolyn Currie, Core Laboratories Canada.

Carolyn Currie's primary position as senior geologist and project lead has included work on various unconventional plays in North America and globally including Duvernay, Montney, Wilrich, Eagleford, Marcellus, Midland Basin and Deep-Water Mozambique. She currently serves as the Manager of Geology and Integrated Studies, leading such projects as the Duvernay, Montney and Wilrich/Spirit River consortia studies in the Canadian office. Throughout her time at Core Laboratories and previous projects (including her master's project), she had logged, described, interpreted and integrated 500+ cores ranging from unconventional shales, tight sand formations, deep water sandstones, heavy oil/oil sand cores.

THIS EVENT WAS MODERATED BY Ryan Macauley, Chevron Canada.



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BY CAROLYN CURRIE, CORE LABORATORIES CANADA

September 10, 2020 | 10:00 - 10:40 am | Zoom
****pre-registration is mandatory****
