

Maximizing Wireline Coring Efficiency in Upper Mannville Coals in South Central Alberta

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Introduction

Various coal characterization analyses, including proximate analysis, gas composition analysis, and gas-in-place estimations are imperative in the search for Coalbed Gas/Methane (CBM) commerciality. In order for these analyses to yield the best results, core recovery must be maximized and time to surface must be minimized. EnCana Corporation (EnCana) partnered with ReedHycalog Coring Services (RHCS) to improve wireline coring technology to maximize both speed and recovery efficiency in coring coals from the Upper Mannville in south central Alberta. The development of the program and the results of implementing these improvements are outlined within this presentation.

The Upper Cretaceous Mannville Group coals typically consist of one or more seams with cumulative coal thickness ranging from 4 to 12 metres over a stratigraphic interval of 14 to 80 metres. Due to the tremendous vertical heterogeneity and fractured nature of these coals, core recovery can prove to be difficult and somewhat unpredictable. Therefore, it is necessary to devise a system that can yield optimum, repeatable results (i.e. core recovery).

EnCana's primary objectives were identified as the following:

1. **Core Recovery:** Maximum core recovery is necessary for recording vertical sedimentological variations in the coal lithotypes, characterizing the cleat/fracture system, and analyzing heterogeneity in gas content throughout the seam(s).
2. **Core Quality:** The core, or cored intervals, must remain intact in order to make meaningful observations and conclusions about the vertical variability within each coal seam.
3. **Minimize Lost Gas:** This is the one component of total gas content that can not be directly measured; therefore, it must be extrapolated based on measures at a later point in time.

Minimizing the time required to seal the core material into the desorption canister ultimately improves the accuracy of the extrapolated value (lost gas).

4. Hole condition: When cutting a full diameter core, it is imperative that the hole diameter remains in gauge during and after the coring process. This allows for optimum results when running caliper sensitive advanced logging tools such as dipole sonic and various imaging devices.
5. Project Cost: The time savings associated with the wireline system used is an indirect cost savings benefit of the system.

Coring System

Wireline coring allows core to be cut and recovered without the need to trip the drill string. Therefore, eliminating drill string trips is essential for success in projects where time-sensitive core analysis is intended (i.e. desorption testing). Quick sample recovery is important for canister desorption testing and may minimize erroneous gas content data contributed to lost gas content (an extrapolated graph value). Figure 1 illustrates the time savings between conventional coring and wireline coring at similar depths. Please note that the recovery times illustrated in Figure 1 were determined from the time the coring stopped to the time the core material is sealed in desorption canisters.

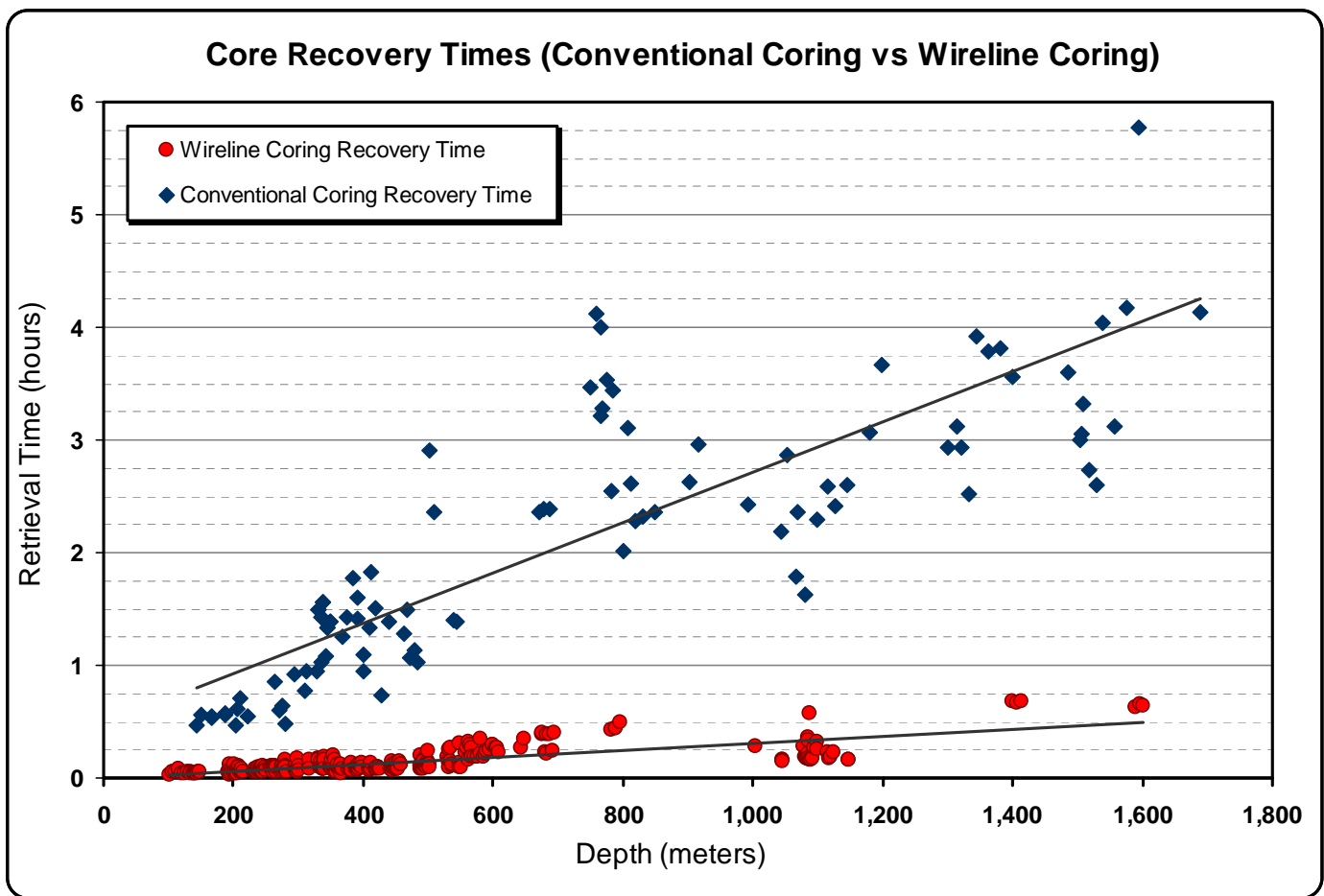


Figure 1: Core recovery time comparison between conventional coring and wireline coring samples (courtesy of TICORA Geosciences (a division of Weatherford Laboratories)).

The wireline system, in comparison with other commercially available systems, obtained larger diameter core (3-3 ½" (76-89mm) diameter core) which, volumetrically, allowed for extensive analysis and decreased the headspace volume in desorption canisters. Prior to advancements in wireline coring systems, a majority of the CBM coring projects were done utilizing a conventional plastic-lined coring system (obtaining a 3 ½" (89mm) diameter core). Therefore, a large percentage of desorption canisters were built to hold the larger core. Furthermore, the wireline system used for the EnCana project had the versatility, if needed, to drill between coring intervals with removable drill insert plug (two-piece bit technology). The drill ahead feature may save rig time, which often contributes to the largest fraction of the coring operations economics.

Program Developments

During the seven well program, several obstacles were encountered while coring. Modifications to the equipment and the coring environment were necessary to overcome the challenges, identified as follows.

1. **Poor Core Recovery:** One of the primary objectives of EnCana's coring program was core recovery. Understanding the vertical heterogeneity and fractured nature of the Mannville coals, modifications were required to the coring parameters and coring equipment to optimize the system performance.
2. **Lost Circulations Zones:** Lost circulation is a concern with any drilling program. This becomes especially concerning during coring operations as the material used to heal the well bore may not be conducive to coring operations.
3. **Picking Core Point High:** Selecting core point is directly related to the location of the offset wells in the area. The sedimentological nature of coals may make selecting the coal tops difficult. Therefore, procedures needed to be implemented to overcome this challenge.

Conclusions

Working as a team, EnCana and RHCS were able to overcome the challenges attributed to coring coals in the Upper Mannville formation. During the initial seven wells for EnCana's CBM program, several modifications were made to the equipment as well as reconsidering the traditional way of looking at coring coal. The lessons learned through the initial core wells have been incorporated into EnCana's subsequent CBM coring programs. To date a total of 24 wells have been cored for EnCana's CBM program with an average recovery of 88% (94.4% core recovery for the seventeen wells following the initial seven well program). The success of this coring program is due to good communication and collaboration between the two parties throughout the course of the program.

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