

# **Applications of Formation Micro Image (FMI\*) Interpretation to Canadian Coalbed Methane Exploration**

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## **ABSTRACT**

Coal reservoir properties control CBM production. Two critical coal properties related to coal permeability are fracture intensity and stress relationships. Schlumberger's Formation Micro Imager (FMI) records high-resolution micro-electrical wellbore data. Microresistivity data are mapped to produce wellbore images that document bed boundaries, stratigraphic surfaces, and fractures with resolution approaching 5mm.

FMI interpretation has five applications to CBM exploration. First, well-imaged fractures facilitate interpretation of fracture intensity. Open natural fractures are essential to CBM success in most basins; the most prolific reservoirs host orthogonal natural fractures. Fracture orientation relative to horizontal stresses and fracture-filling minerals are both critical for predicting CBM productivity. In seams without discrete fractures, the appearance of microresistivity images reflects the quality of cleating. Second, interpretation of drilling induced fractures and borehole breakout indicates the orientation and relative magnitude of subsurface stresses. Orthogonal FMI calipers yield a borehole ovality log, which can be integrated into image interpretation. Third, images can be used in wellbore trajectory planning. Deviated wells intersect more fractures if they're drilled perpendicular to the dominant fracture set; and these fractures can be oriented from FMI images in a nearby wellbore. Integrating local structure and stresses adds perspective to whipstocking/sidetracking decisions. Fourth, scaled FMI images can quantify CBM reservoir permeability. Estimates of fracture aperture, when integrated with well test results, can indicate the relative permeability of fractures or fractured zones. Finally, FMI images can orient and depth-match conventional and sidewall cores and provide high-resolution data in zones of poor core recovery.