AAPG Datapages/Search and Discovery Article #90234 © 2015 AAPG Asia Pacific Region, Geoscience Technology Workshop, Opportunities and Advancements in Coal Bed Methane in the Asia Pacific, February 12-13, 2015, Brisbane Australia

Visualising Sweet Spots on 2D Seismic Data through 3D Volume Interpretation Techniques - CBM Case Study in Botswana

Ralf Oppermann[1] and Michael Scherer[2]

[1]OPPtimal Resource Solutions Pty Ltd
[2]Sasol Petroleum International

Abstract

Many CBM developments around the world are not utilizing or are under-utilizing seismic data. The development and increased use of automated seismic interpretation techniques, however, has created clear opportunities to extract a lot more information and value from existing seismic data, with small effort and at low cost. In addition, the very latest techniques, which were originally developed for 3D seismic data, can now also be applied to 2D seismic data, opening up many new reservoir characterisation opportunities previously considered not possible.

This presentation sets out to highlight the application of a new 3D seismic volume interpretation workflow to 2D seismic data covering a Coal Bed Methane Exploration target in Botswana. The study applied post-stack structural processing to a large, regional 2D seismic line, with the aim to review if the method would allow for the identification of faults at a deep-seated coal objective level and through this improve the understanding and characterisation of the CBM play. An additional objective of the study was to show if future seismic acquisition over the CBM asset could be justified given the depth of the coal objective and its location underneath extensive basaltic lava flows.

The talk will illustrate how the objectives of the study were met and how new information and value was generated by simple application of the very latest fault processing techniques to older, pre-existing 2D seismic data. The new information that was gathered has helped in improving the geological model for the coal deposit, supplemented an existing fracture analysis from surface/near-surface data, and has also encouraged the Operator to consider seismic acquisition over the CBM asset to better define fault & fracture sweet spots, perform more detailed reserve calculations and directly target sweet spots for increased production rates.

Further examples of fault processing results from various case studies around the world will be shown. These case studies illustrate that fault processing delivers groundbreaking insights into the physical description and understanding of resources by successfully and reliably delineating potential fluid conduits, fluid barriers or drilling hazards in the subsurface. The results emphasize the significant value that can be added when delineating 3-dimensional fault and associated fracture networks at high resolution and directly and quantitatively relating this information to drilling and production observations.

High-resolution fault extraction dramatically increases the number of faults that are identified from seismic data, and identifies many small-scale faults within a reservoir and also many fault penetrations in existing wells. Seismic fault penetrations in wells often show perfect matches with faults & fractures identified on image logs, in cores, from log correlation, temperature logs or well tests, but importantly also show perfect

matches with fluid flow indications (losses during drilling, hydrocarbon shows, fracture productivity, water channeling, x-flow between wells) or lack thereof (compartmentalisation).

It will be demonstrated that a step-change in the understanding of drilling and production issues can be realised, and that a focused application of the new technology workflows delivers increased recoveries from resources, and also results in safer, cheaper and more successful drilling operations. The new techniques are proposed as Best Practice workflows for the exploration & development of CBM reservoirs.