Seismically constrained static reservoir characterisation and modelling using inverted seismic data

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The M3 carbonate, Central Luconia, Offshore Sarawak project executed in 1998 was the first 2D constrained sparse spike inversion (CSSI) project in SSB/SSPC. The Jintan carbonate 3D seismic inversion followed suit, which led to the acquisition of Block SK8. Seismic inversion has since been carried out for both carbonate (F28, B11, E6 and F13 areas) and clastic (D35, Kinabalu and SF30) reservoirs in Sabah and Sarawak. A number of additional projects for CSSI have been identified for 2000/2001.

Traditionally, Sarawak Shell Berhad and Sabah Shell Petroleum Co. Ltd. have been using seismic reflectivity data for seismic interpretation. However, seismic reflectivity data only show the characteristics of the seismic interfaces and not the internal properties of the reservoir. Hence it is difficult to interpret changes within the reservoir itself. This can be resolved by converting the reflectivity data to acoustic impedance (RUNSUM) data. However, this RUNSUM still constitutes uncalibrated bandlimited data, and therefore seismically inverted data using CSSI technique are more superior because it utilises wavelets derived from the seismic and well data as well as incorporating the low frequency component from the well in generating the acoustic impedance.

CSSI has helped to generate acoustic impedance data that represent the near true acoustic reservoir properties of the subsurface. Furthermore, the technological advancement of both Shell proprietary and third party software enables the analysis and display of these attributes and makes seismically constrained near absolute acoustic impedance data easier to produce. The near absolute acoustic impedance data can be directly converted to porosity and permeability of the reservoir. These results can be used as input for reservoir simulation and dynamic modelling.

Reservoir characterisation and modelling using the results of CSSI is becoming a standard procedure in formulating the Field Development Plan for our remaining fields. The presentation will highlight some of these examples and the learning points from using seismic inversion data for reservoir characterisation and modelling.