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Stochastic inversion as a part of static model building

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A stochastic inversion was carried out in a producing gas field, offshore Sarawak. The output of this inversion work was used as an input to the field static model and subsequently tested by the reservoir dynamic simulators. Although, the field was aerially extensive, only three wells with good quality logs were available. Another well drilled within the field was left out for verification purposes. Density, P-Sonic, Porosity and Lithology logs were used for this project. An interval with a thickness of approximately 200 ms (about 600 ft) was inverted using the Statmod module of the Jason software package. The entire inversion interval was divided into three zones, the shales above the reservoir, the gas filled reservoir and the water filled part of the reservoir. Three different lithofacies, shale, gas sands and water sands, were defined. Lithology probability density functions were built for each lithology type within each zone using the input well logs. Within the gas reservoir, the probability density functions of the two lithology types, gas sands and shales showed limited separation, increasing the uncertainty of the results. In addition to building the probabilities, the well logs were used to define the variograms for the Lithology, P-Impedance and Porosity distribution. Various horizontal ranges were tested in an effort to optimise the variogram shape given the limited number of wells. Additionally, seismic data and an extracted wavelet were used for inversion purposes. Finally 60 realisations each including lithology, porosity and P-Impedance volumes were generated together with residual seismic traces. The residuals were used only for QC purposes. Sand volume and average porosities within the gas reservoir zone were calculated for each realisation. Net porosity volumes were estimated for ranking purposes. The median, low and high cases were extracted and were exported to the static model building tool. The results of this inversion became an integral part of the static model and by reducing the uncertainties enabled the asset team to decide on future activities in the field with greater confidence.