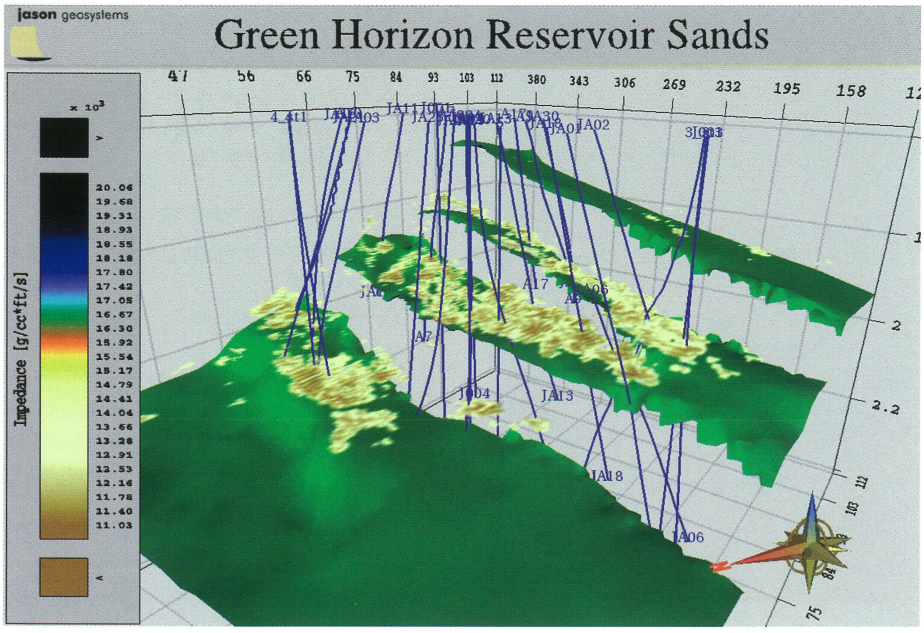
Fast And Accurate Reservoir Characterisation By Volume Interpretation And Analysis Of Rock Property Cubes



Seismic reservoir interpretation today typically involves detailed section-based interpretation of reservoir reflection events, their amplitudes and other reflection attributes. If wells are available an attempt may be made to link back the seismic reflection attributes to well control to help interpret lateral attribute changes. This interpretation process has several drawbacks. It can be very time consuming, in particular in the case of complex reservoirs. Second, reflection attributes are a property of the interface of two layers, which can make it difficult to determine the cause of lateral changes in attribute amplitudes. Finally, tuning complicates both section interpretation and the use of reflection attributes.

Both the cycle time and accuracy problems associated with conventional interpretation can be addressed with the Jason Geoscience Workbench (JGW). JGW is Jason Geosystems' flagship product for integrated, quantitative, reservoir characterisation, providing both the methods to derive rock property cubes and the tools for volume analysis and interpretation.

Within JGW, many inversion-based workflows are provided to turn seismic, geologic and well information into rock property cubes such as acoustic impedance, which are consistent with all input data. The advantage of working with rock property cubes is that they can be directly and quantitatively related back to well control, using crossplot analysis or functional methods. Such an analysis will often show how the rock properties can be used to discriminate selected lithologies and fluids. This information can then be used to drive volume based reservoir interpretation, as demonstrated in the example from a Gulf of Mexico field:

In this example, an acoustic impedance cube was first produced with a JGW inversion method in which, as part of the process, the wavelet is backed out to reduce tuning. Then, using JGW 3D volume visualisation and analysis tools, in a single interactive step, reservoir layer points are highlighted, which the log analysis shows to be oil-bearing sands. This volume representation can be manipulated in many ways to highlight the reservoir zones, study connectivity between the reservoir units, and to automatically capture the units to determine their size, thickness and to map their top and base.

Additionally, using petrophysical relationships, acoustic impedances can directly be mapped to other rock properties to obtain, for example, porosity and HCPV maps. As a further step, the analysis can be augmented by using further rock property cubes derived, for example, from offset seismic data. Relative to seismic amplitude and attribute interpretation, application of these JGW technologies achieves the desired objectives of strongly increasing reservoir characterisation accuracy and greatly reducing interpretive cycle time.

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