RM04

The Only Wrong Way to Use Seismic in Static Modeling is Not to Use it at All

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SUMMARY

Static modeling of a hydrocarbon field accumulation is a critical stage in any field development plan. The static model, which gives an estimate of the hydrocarbons in place, can significantly impact decisions around possible ways the field can be developed. The estimated volumes and the dynamic results may vary dramatically if input data is violated or if a stochastic approach is used to construct the rock property models.

Seismic inversion can be used to build robust sub-surface facies and property models as it reflects the available data with respect to core and logs. Unfortunately inversion data is commonly not available to projects. When seismic inversion data is not available, geologists/static modelers still need to find a way to extrapolate facies and rock properties identified in the cores and logs between the wells. The challenge may increase if the number of wells is not enough to extract the required horizontal and vertical variograms, which is the case in most of the fields at the appraisal or early development phases. The extrapolation of facies and properties can be very time consuming and may not be as objective as using seismic inversion volumes.

This paper describes a successful case study for one of the fields in the Gulf of Mexico, where the 3D seismic volume was tailored to guide the interpolation of the log data across the field. Property modeling was done by establishing a relationship between log properties and seismic attributes without violating the required vertical heterogeneity of the reservoir. The up-scaled log data was used to provide the primary data set (primary variable), in which case, the seismic cube was then used as a secondary data set (secondary variable) to construct the property models. The results of this workflow were very satisfactory when compared to the first pass inversion model.

Sampled seismic volume (left picture) showing the capture of the high/low amplitudes in the normalized probability volume (right picture).