3D Visualisation And Reservoir Modelling Using The Latest Technology

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It is common knowledge throughout today's oil and gas industry that communication between the different disciplines within a team is vital for evaluating hydrocarbon reservoirs. However, it is not always common practice to bring all the information on your reservoir into one interface. 3D visualisation is a very effective method of bringing people from a variety of different backgrounds together to discuss their field. Furthermore, the ability to combine geological, geophysical and engineering data into one immersive environment, as well as viewing a 3D representation of your reservoir, is an extremely powerful tool.

Today's PC based software offers the latest technology, which allows comparison and evaluation of data from different sources to come together into one application (at a much reduced price). New tools need to be multi-disciplinary.

Data Import and Analysis

A critical part of such a package is being able to import data in a variety of different formats. The types of data include seismic seg-y, well logs, interpreted lines and 2D grids. One of the common difficulties has been how the engineers will view the geological data without going to many different sources to find out more about the reservoir. Therefore we need the ability to be able to work on a common interface that allows access to other data types. The ability to allow engineers to import simulation results and properties at various time steps, whilst working on the same interface, bridges this gap.

The ability to visualise all data together allows the user to quality control their data like never before. Any discrepancies between data sets immediately stand out. Powerful filtering methods for visualising certain aspects of the data can be extremely useful. Filtering allows specific intervals and facies to be assessed, allowing the user to view features such as connected volumes or property values within a specific facies or object.

It is imperative to remember that 3D visualisation should not be used on its own but in conjunction with other conventional methods. Using data analysis tools allows the user to describe data in the form of graphical plots that can be manipulated. Viewing statistics of different types of data such as well logs, properties, 2D regular grids (surfaces) or point data sets are easily performed and is a good way of checking the quality of your input. Variogram maps and sample variograms can be constructed from input data and used as input for property modelling.

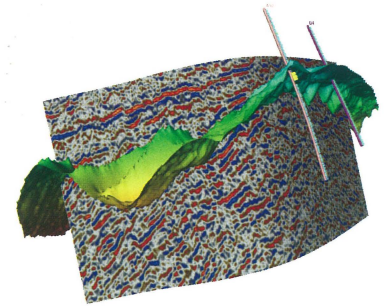

Fig. 1. Quality Control.

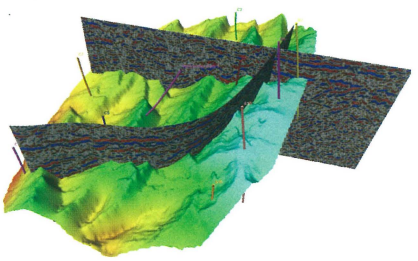

Fig. 2. Input Data.

Fig. 3. Fluvial Channels.

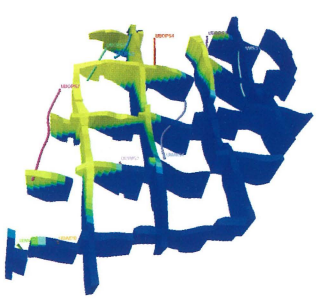

Fig. 4. Simulation Results - Water Saturation.

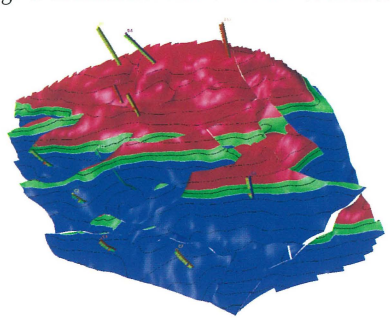

Fig. 5. Fluid Distribution Map.

Reservoir Modelling

Shared Earth Modelling involves a number of steps including creating a geological model, upscaling and reservoir simulation. Therefore it is an extremely appropriate tool as it requires a variety of information to be brought together to create a 3D computer based representation of your field.

A geological model, once constructed, allows us to view the reservoir as we believe it to be, based on all information brought together. This allows the modeller to portray their picture of the field to other colleagues, and thus allows others to discuss their different views and understandings of the reservoir.

How does reservoir modelling do all this? By creating a 3D fault model and describing the relationships between the faults, by building the stratigraphic layering, by constructing a 3D grid to be able to distribute properties as well as geological bodies.

Imagine being able to visualise your reservoir in 3D, and view different models with subtle changes to facies and property distributions. Viewing well trajectories and proposed well paths through your horizons and seeing where they cut through faults can prove to be very useful. Furthermore there are many cost saving advantages to being able to discuss and view various possibilities of proposed field development.

Discussion

Generating a reservoir model and performing numerical simulations based on your model requires input from many different sources. The importance of creating a model and quantifying the performance of a reservoir has been established for many years, as the results are used for evaluating options to optimise field development and production. Thus, integration is the key, as it should allow numerical results to be checked against geological inputs, all on a single platform.

Today's more powerful PCs and ever increasing technological advances make it possible for engineers, geoscientists and petrophysists to work together more effectively, and to have the opportunity to contribute their knowledge in an accessible environment, whilst even having some fun.

PESA News No. 56 (2002)