The Shale Gas Challenge

Unconventional plays are characterised by a wide range of challenges. Every plays being different, there is no unique solution. Multi-scale elements, contradictory data and highly complex reservoirs need to be thoroughly considered to ensure the highest possible recovery. Uncertainties and risks assessment is critical in the hydrocarbon extraction from shale plays because it enables the most time and cost effective drilling strategy. An integrated pluri-disciplinary approach is vital to evaluate the economic potential of a reservoir and forecast production while optimizing recovery, well placement and fracture stimulation.

The challenges for Shale Gas reservoirs are not that different from conventional reservoirs. You still have to:

• Predict the characteristics of undrilled areas
• Predict the fracture density away from the wells and predict reactivation areas
• Assess risks and uncertainties
• Identify sweet spots and assess stimulated reservoir volumes
• Plan wells
• Simulate production and increase recovery factors

The Solution - Building the 3D Geological Model

No reservoir is completely homogeneous; there are always heterogeneities that are important for the drainage of the reservoir. Roxar RMS has the toolbox to model these in 3D.

The first step is to build a Structural Model or a Framework Model that defines the vertical and lateral extension of the reservoir. The tools in RMS are fast and robust, and can in very few steps generate 3D grids and maps of any reservoir - from small and simple to big and complex.

The next step is to populate the cells in the 3D grid with properties defining the characteristics of the reservoir, such as rock types, porosities, permeabilities, and hydrocarbon saturation.
The property modeling toolbox in RMS is rich, and contains a handful of different methods to represent heterogeneity in three dimensions. Conceptual models, trends or seismic attributes can all be used to guide the distribution of rock types, permeabilities, or any other parameters you want to model in 3D.

Modelling Fractures - Addressing the importance of fractures and SRVs

One also needs a good estimation of the size of the Stimulated Rock Volume (SRV) and to be able to calibrate this volume using relevant data such as microseismic data and the recovery from previous fracking stages.

To this end, microseismic data can be used to generate a SRV region(s) within the simulation model. These regions become areas of changing permeabilities which help in simulating production in shales.

Understanding the behavior of a shale gas reservoir is a lot about understanding the fractures. RMSFracture is a tool within RMS specifically designed to:

- Predict the fracture density away from the wells
- Predict which fractures are likely to contribute to flow
- Model dynamic properties of the fractures in a way that is consistent with observation

Identifying Sweet Spots and Planning Wells

With a 3D model describing the characteristics of your reservoir, you have the means to identify sweet spots - areas where you should plan your wells. Various attributes such as Poisson’s Ratio, Organic Carbon (TOC), Brittleness, Thickness, Thermal Maturity, Gas Content etc., can be calculated in RMS as a function of other seismic or geomechanical attributes.

Use the “Facies Classification” tool in RMS to classify and quantify productive shales.

RMS has a fully integrated well planning module, RMSWellplan, with all the functionality you need to pick targets and plan wells from surface to reservoir. With RMSWellplan you don’t need to leave the modeling environment to plan wells - it is all integrated into one solution.

Simulation Production from the Wells

Roxar RMS’s integrated reservoir simulator solution, RMSFlowsim, should be used to simulate the production from the wells, and simulate the effects of fractures and different fracture models. More advanced simulation is available with Roxar’s Tempest MORE simulator, part of the Tempest Reservoir Engineering suite.

Take advantage of the market’s best reservoir modelling toolbox to improve the reservoir management of all kinds of reservoirs – including SHALES.

To learn more please visit www.roxarsoftware.com or email us on rss.marketing@emerson.com.