EVALUATING THE PREDICTIVE CAPABILITIES OF SEAL TECHNOLOGY

"HOT OFF THE PRESS"

Susan Hippler
ExxonMobil Exploration Company, Houston, Texas

Evaluation of the predictive capability of seal technology requires a systematic and disciplined comparison of pre-drill prediction to post-drill analysis. This presentation outlines the components of comparison that can ensure that the predictive capability of seal technologies can be evaluated and enhanced for both geologic and production time-scales.

For exploration/near field wildcat wells, geologic time-scale seal predictions should include the chance of encountering an accumulation (i.e., risk), and a description of the hydrocarbon distribution (i.e., size). The hydrocarbon distribution can be described via pay thickness and/or column height distributions for a given well location. A probabilistic approach would describe the distribution with associated chances of occurrence. Common technologies employed are mechanical and capillary top seal analysis and fault seal analysis. Post-drill analyses should include an evaluation of whether the well was a valid test of the seal element, a description of the hydrocarbon distribution (i.e., column height(s) if known), and the controls on trap fill. While prediction success or failure is often known within months, one well may not be enough to determine if a significant column has been encountered and/or fully describe the column height distribution.

On the production time-scale, seal technologies are commonly used to describe fault transmissibility, from which many different types of predictions can be made depending on the question being asked (i.e., how many wells do I need or what is my estimated ultimate recovery for the field?). Post-drill analyses include evaluation of static and dynamic pressure data (if available). While static pressure data may indicate the presence or absence of draw-down within an adjacent, undrilled fault block, this information does not provide a measure of transmissibility. Well tests, interference tests and full-field production history data provide much greater potential for calibration to fault transmissibility predictions. While prediction success or failure may be evident quickly after production begins, in some cases this may take years to determine.

For either geologic or production time-scale predictions, evaluating success should involve consideration of the scale of the prediction (i.e., one reservoir or an entire interval; one fault block or an entire field?), as the definition of success may be different for one well versus an entire drilling program. In fact, the success of a technology needs to be monitored on a portfolio basis, as predictive capability can often only be demonstrated from a suite of wells which includes both successes and failures. Finally, with this type of data set, the cause of failed predictions can be identified (i.e., misapplication of technology, flawed input, and/or failure of the technology) and trends cycled back into technology development.