Making Collaboration a Reality

Realistic uncertainty quantifications enable better decisions through accounting for both risk and potential upsides.

BY ARNE SKORSTAD, EMERSON AUTOMATION SOLUTIONS

For a long time, a combined workflow from seismic modeling (through geomodeling) to reservoir engineering has been many oil companies' goal for achieving a unified collaborative reservoir model. Paramount to this goal is that, although the reservoir model is integrated and promotes collaboration, it should not always require all disciplines to work on the same model at the same time. On the contrary, it puts all efforts into a common framework while being flexible and elastic enough to allow different models to be built to support various decisions. This workflow requirement describes the Roxar Big Loop.

The Big Loop is a philosophy for creating a reservoir model through a workflow linking the static and dynamic domains defined by the user application and data at hand. The workflow supports the propagation of relevant uncertainties and dependencies of the data and model parameters to obtain realistic uncertainty quantification. This linking of uncertainties and parameters ensures that reservoir model changes seen as necessary for replicating actual flow data are made under geophysical and/or geological constraints. This makes any update of the reservoir model realistic given all available data but also linked to the geological framework.

Since the uncertainties are propagated from where they are captured to where they matter in the modeling, it follows that the different disciplines involved need to uphold the same understanding of these uncertainties, thereby requiring collaboration.

One example of a highly important uncertainty is the depth of the top structure of the reservoir. Uncertainty in the velocity model in particular, but also in the interpretation of the reflector, will lead to some uncertainty bound around the base case delivery from the geophysical community.

When the reservoir engineers do history-matching, the dynamic data might suggest a change in this top structure. By not just delivering the most likely top-structure depth but also the actual uncertainty of it given the geophysical model and data, the geophysicist supports the history-matching exercise by narrowing down the search for the most optimal depth given the dynamic data and also ensuring geophysically realistic history-match results. In return, the geophysical model also is updated and enhanced, benefitting from data and insight from a different domain and from the history-matching on dynamic data.

Putting all tasks in an automated workflow means that contributors must avoid manual edits of the resulting reservoir model since in general these are nonreproducible, subjective and nontransparent. Having a fully automated workflow enables full reproducibility, meaning that when results are generated all that is needed to recreate results is running the workflow again. Work therefore should be made on the model parameters and set up rather than the result. This means that all contributing domains have a shared ownership of the results, not the individual that chose to make subjective changes to account for a particular data type. A tighter collaboration emerges as a natural consequence.

Since the workflow in both the static and dynamic domains are fully automated, the user also can utilize parallel processing capabilities by creating many possible, so-called equiprobable scenarios. By doing so, an ensemble of many possible reservoir models can be created.

Yet which is the right one? The answer is, none.

All models are approximations of reality and at some stage will deviate from the truth. It is just a matter of detail and time. Having an ensemble of models that honor the data, however, enables users to add to their knowledge the validity of the models by estimating them from the ensemble itself.

With realistic uncertainty quantifications, better decisions can be made through properly accounting for both risk and potential upsides. Then decision makers can make transparent and optimal choices based on quantified estimates of future production estimates—the key benefit of the Big Loop workflow.

For more information, visit Emerson at booth 720. ■

Nodal System Delivered to Mitcham Industries

Collaboration has resulted in small, light system with extended run time.

CONTRIBUTED BY INOVA GEOPHYSICAL

INOVA Geophysical has delivered a 5,000-node Quantum system, fully integrated with INOVA's high-performance iX1 data management system, to Mitcham Industries, ready for immediate deployment in the Middle East.

INOVA's continuing collaboration with Innoseis has produced a next-generation nodal system, and with the integration of iX1 and Quantum, INOVA can now offer the industry the smallest and lightest system with the longest run time (50 days at 24 hours) together with a fast, industrial-strength downloading and data management system, high-productivity source control and a full range of highly effective quality control (QC) tools. This package offers users improvements in crew costs and operational efficiency without sacrificing data quality or QC capability.

Quantum adds another dimension to INOVA's broadband product portfolio, which includes AHV-IV 364, 380 and UNIVIB vibrators, the Vib Pro HD and Shot Pro HD controllers, and the G3i HD land cable system, analog or digital (single sensor) and analog transition zone as well as the HAWK 3-C nodal acquisition system. In partnership with Mitcham, INOVA can now offer a comprehensive selection of products designed to meet any exploration challenge, whether the need is for a low-impact, environmentally sensitive nodal and mini-vibe operation or for high-productivity high-density low-frequency desert crews. ■

The Quantum system is fully integrated with INOVA's high-performance iX1 data management system. (Image courtesy of INOVA Geophysical)