A Unified Drilling Solution Includes Well Planning, Drilling Engineering, and Geosteering

Today’s challenges require wellpath and engineering design optimization.

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Reservoir complexity drives the need for wellpath and engineering design optimization across all well planning and drilling work flows. Just as design wells within a 3-D geological model or seismic volume can shorten well planning cycle times, improve well placement, and reduce drilling risk, the ability to make real-time updates to those 3-D models, based on petrophysical log responses, enables rapid re-planning and engineering. This type of work flow can optimize well placement and maximize production; Paradigm Sydrill 2009 makes it possible.

**Collaborative work flow**

Sydrill 2009 is an advanced well planning and drilling engineering solution that uses integrated, multidisciplinary tools operating on a shared data management and interoperable framework. This enables discipline experts to work concurrently and share data as required.

**Real-time geosteering**

Sydrill 2009 can be used in combination with Paradigm Geolog Geosteer, a commercially available, contractor-independent geosteering solution. This unique work flow supports the fast creation of log-scale geosteering models ahead of drilling, facilitates interactive updates to geosteering models while drilling, and enables re-planning of wells using updated models.

**Well planning**

A 3-D geological model is shared by the engineering and geosteering applications. In this example, the 3-D model is created with Paradigm GOCAD as a single stacked t-surf file, but it could also be created from several industry-standard file formats. Using Sydrill, drilling targets are defined and the well is planned and engineered within a single application and validated against the geological model. Using 3-D pressure volumes, pore and fracture data can be extracted along the well and used to validate casing depths and optimize drilling hydraulics. The final well design is then shared with the Geolog geosteering application.

**Drilling and geosteering**

As drilling progresses, Wellsite Information Transfer Standard Markup Language (WITSMIL) real data is automatically loaded into Sydrill and Geolog using Paradigm OpsLink real-time data acquisition. The actual well position and positional uncertainty are calculated and visualized in the 3-D model and compared against the planned well. Actual LWD logs are also displayed and compared to the predicted logs.

Differences between the predicted and actual logs signal changes in geology and indicate that the model needs to be updated. Model updates are achieved through interactive picking of formation intersections and changing formation dip and bed thickness until the logs match. Large discrepancies may be explained by drilling through a fault and can be easily incorporated into the model.

In cases where model updates result in significant TVD adjustments, 3-D models can be sent back into Sydrill, where the “project-ahead” module can be used to plan ahead based upon the most up-to-date petrophysical interpretation. In cases where high doglegs are required to land the well, a quick engineering analysis can determine if the proposed track is drillable. If necessary, a sidetrack can be planned and the entire geosteering process repeated for the planned sidetrack.

**Summary**

This unique combination of products provides a flexible and powerful planning, engineering, and geosteering solution that empowers operating companies to take control of the well planning and geosteering process. Additionally, post well correlation of one or more wells in a given area provides a mechanism for delivering updated surfaces for updating the regional 3-D structural or reservoir model.

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