

## SERVICES

### VERTICAL DRILLING

Vertical drilling today is not what it was 10, 20 years ago – “drilling for a kick,” in today’s environmental and regulatory environment, is a non-starter. Add on top of that the wells tend to be deeper, in more difficult formations and in HPHT environments, and there is a need for accurate Well Design Studies and on-site engineering supervision and modeling services to help avoid having any major issues arise.

HXR’s rigsite-based Drilling Specialists have decades of experience helping operators avoid costly mistakes and optimizing drilling operations.

HXR provides the critical services operators need to successfully drill these deep, HPHT wells. Detailed engineering and rigsite modeling, encompassing torque and drag, hydraulics, MSE/DSE, swab/surge and MPD/UPB design and monitoring, is combined with our Geomechanical/Wellbore Stability and Pore Pressure Prediction services to provide a complete geo-engineering service.

HXR utilizes three of the most advanced software packages available:

#### ERDPRO®

Proprietary software package that combines advanced drilling engineering and well design planning modules with calibrated field data inputs, allowing our on-site Drilling Specialists not only to make accurate modeling predictions for wells in the planning stages, but also to use actual parameters seen on the rig during the drilling operation itself to predict upcoming well conditions.

#### DEEPWATERPRO®

Advanced, user-friendly PP/FG prediction software that is proprietary to HXR. The software capabilities include:

- Uses RHOB, sonic (DT slowness), seismic, resistivity, Dexp, MSE/DSE inputs
- 2-D/3-D Seismic/Sonic Stacks — uses multiple 1-D velocities along actual wellpath to account for changes as the well is drilled out (ERD development wells)
- Utilizes various basin models (Eaton, Modified Eaton, etc.). New models/user-defined models can be added, and they can all be modified
- Log viewer that allows for all of the data to be viewed/QC’d
- “Lookahead” capability — allows for the user, using the current pressure change, to project ahead of current position to model what pressure may be, given current increase; gives rig team an idea of what they may potentially be facing if drilling continues
- It can automatically, from cation exchange (an X-plot of res/sonic), pick out “clean” shales
- Salts, wet sands and other special models can be interpreted (sands may show regression due to hydrostatic effect, etc.).
- Simple to use LAS reader
- Takes into account formation uplift and varying water depth for offsets
- Common datum automatically calculated

#### JEWELSUIE 6™/SFIB™

Can model, monitor and forecast wellbore stability during both the planning and drilling phases, and can give RT input into any potential instability issues. The software capabilities include:

- Accurate calculation of rock properties, overburden, formation pore and fracture pressure and horizontal stress from well logs and drilling data
- Minimizes risk and improves safety during drilling
- Identification of wellbore stability issues in both the predrill design and real-time during the drilling phase
- Wellpath optimization/casing design
- Identifies safe mud weight/ECD windows
- Decreased NPT
- Avoid lost hole sections/redrills
- Includes thermal effects and accounts for rock strength and anisotropy in weak bedding planes
- Full 3-D stress modeling for wellbore breakout and tensile wall fractures